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QUEENSLAND AGRICULTURAL JOURNAL

VOL. XXIV. 1 DECEMBER, 1925. PART 6.

Event and Comment.

The Current Issue.

A valuable progress report of Banana Beetle Borer investigations by Mr. Froggatt is an important feature of the December Journal. The report is illustrated with some very fine plates the work of Mr. I. W. Helmsing, of the Division of Entomology and Plant Pathology. Comparative trials with ratoon and annual Upland cotton carried out by the department in 1924 are described by Mr. Evans. Mr. Wells has a note on cotton thinning and spacing experiments for the season 1924-25, and another on spinning tests of Queensland cotton. Agriculture in Queensland is further reviewed. Mr. Francis has some interesting observations on the plants of Charleville. Mr. Girault has a note on an imported lucerne pest, with a description of two allied species. He also supplies a descriptive note on the Australian Ophioninæ (*ichneumon—Flies*). The work of the Bureau of Sugar Experiment Stations is well covered in useful observations and reports. Other well-supplied features make up a number of more than usual interest.

The 1925 Wheat Harvest.

A recent inspection of the principal wheat-growing districts, by the Director of Agriculture (Mr. H. C. Quodling) for the purpose of studying the various influences affecting production, and at the same time to observe progress in the wheat improvement work of the Department in relation to the breeding and evolving of varieties suitable to Queensland conditions, has shown that there is a marked increase in the area cropped this season. Growers generally have also kept right up to date in the use of modern labour-saving machinery and slowly, but surely, a gradual improvement in methods of cultivation and in the varieties sown is evident. Altogether there is every reason for an optimistic opinion regarding the future development of the wheat industry in Queensland.

No country is free from seasonal set-backs, and nowhere in the world are producers in the happy position of enjoying an uninterrupted run of good crops and prosperity. This year in many localities dry weather and late frosts were responsible for reduced yields on low-lying and exposed country; luckily, however, the incidence of these unfavourable factors was not so pronounced elsewhere, with the result that average yields are good and many individual crops are of record dimensions. All this tends towards a full realisation of the Wheat Board's estimate of a 2,000,000 bushel crop.

Dry Farming.

If successful production were only a matter of good cultivation on scientific lines so that the land might be kept in a condition to receive the rainfall and to store moisture for the development of the ensuing crop, wheat-growing would become more popular—assuming, of course, that payable prices for grain are forthcoming. It has been clearly demonstrated by the dry farming experiments carried out at the Roma State Farm that the safer method to adopt—and this is equally applicable throughout the State—is to burn the stubble and start the cultivator to work immediately after the removal of one crop in preparation for the next. Plough at the first opportunity, where the soil requires ploughing, and keep the surface in a well-worked condition to maintain "a weed-free blanket mulch" to check the loss of soil moisture due to excessive evaporation. Proof of the soundness and efficiency of such a method was demonstrated some years ago by summer fallowing a field at the Roma Farm, and permitting practically all the rain which fell to percolate to the subsoil and holding it there by the method outlined for the benefit of the approaching crop. In this instance the effective rainfall during the growing period amounted to only 1.76 inches for a return of 24 bushels per acre. As it takes ordinarily about 4¼ inches of rain to pass through a crop to produce a 15-bushel yield, it is obvious that this greater return was only possible through conserving the summer rains. If this system were universally adopted there would be fewer disappointments on the score of reduced yields or crop failures through the incidence of dry weather.

Wheat-growing Essentials.

Personal contact with a number of producers has clearly shown that good judgment and experience in the matter of soil treatment and farming practice are as essential to success in wheat-growing as in any other forms of agriculture. One has to visualise a very wide perspective before attempting to arrive at the part taken by the wheatgrower in the general scheme of primary production. In the Southern States wheat-growing is often a full-time job; here, on account of certain climatic and soil advantages, not enjoyed by his Southern confrere, the grower of wheat on the Darling Downs may also be a very successful maizegrower and dairyman, or a producer of fodders, canary seed, barley, oats, lucerne, potatoes, or other minor crops; and if conditions permit he may combine sheep and lamb raising with wheat production. Obviously, this greater versatility in the matter of production calls for a very careful study of the conditions under which this cereal is grown, in order that officers of the department may render the most helpful service in assisting to build up and stabilise the industry. For example, the man who combines wheat and sheep, and this undoubtedly represents an excellent balance in the matter of economic production, finds that he is in a position to farm large areas with the aid of tractor-drawn implements and machinery. Given the necessary capital and equipment, a greater use can be made of heavy, black soil country of which there are almost illimitable areas still undeveloped on the Darling Downs.

The secret of working these deep, heavy black soils of the plains is to take advantage of their "self-working" capacity. Aeration and nitrification go on naturally; the tendency of the soil when contracting in dry weather is to fissure and crack to considerable depths. When rain falls, much of it percolates deeply into the subsoil and the whole mass of soil in process of expansion undergoes a perceptible movement, visible on the surface, where a natural mulch is formed. To attempt to plough soils of this character to any depth is to turn up rough, intractable lumps. Obviously, the "one way" and the "stiff shanked" cultivators are quite capable of accomplishing all the cultivation required for the production of a crop. As a matter of fact, this class of soil under ordinary circumstances does not require to be ploughed for wheat and is rich enough to produce heavy crops for many years to come without the aid of artificial fertilisers. Under such conditions the demand is for late maturing, good stooling wheat like "Currawa" and "Cleveland" for the main crop, which can be sown early, in April, and fed off at intervals until the beginning of August; a choice of favoured varieties for mid-season and spring sowing being made to suit individual requirements.

The farmer who combines dairying with wheatgrowing and is located on the more sheltered country on the ridges and slopes contiguous to the plains also favours

a proportion of slow maturing wheat, but in the generality of cases his selection includes a slightly greater percentage of mid-season and spring sown varieties.

The mixed farmer, with his more intensive methods of cultivation and crop rotations, has to be guided by seasonal conditions and other circumstances incidental to his operations, such as the time for sowing and ripening, the character of the season, and the situation and soil on which the wheat is to be planted, all of which exercise an influence in the matter of the choice of varieties. One important feature in the case of certain spring wheats is their capacity to make the best use of a limited amount of soil moisture for the production of a crop in the shortest possible time. These examples are mentioned merely to illustrate that a single variety of wheat cannot possibly be expected to meet the varying conditions and environment under which crops are to be grown over a planting season extending, say, from April to July.

Some Favoured Wheats.

At the present time no variety enjoys the popularity of "Florence" in the grain-growing districts of the Downs, or as a hay wheat in the coastal districts. It, however, suffered a good deal this year from frost on low-lying country. Growers, while agreeing as to its general excellence, complain of the loss through the tendency of the grain to shatter when ripe. As the present season may be regarded as a dry one, varieties which lodged badly last year—a wet one—and gave much trouble when harvested, stood up well this season and generally furnished good returns. Examples of these are "Canberra," a reputed cross between "Federation" wheat and "Volga" barley, which returned thirteen bags per acre at Willowvale; and "Gluyas," a South Australian selection from Ward's wheat, which proved a fairly consistent cropper, seven to nine bag crops being quite common. These two being mid-season varieties and slightly slower in development, were not affected by late frosts as much as "Florence" or other spring-growing wheats. Moreover, the former wheats benefited generally by the late rains. An example may be cited where crops of "Canberra" and "Florence" were grown side by side, the former returning thirteen bags and the latter five bags per acre.

The excellent yields and quality of grain obtained in previous seasons with "Pusa No. 4," a spring wheat with a similar growing period to "Florence," introduced about fifteen years ago by the department from India and brought into general cultivation after a series of tests extending over several seasons, were responsible for a fairly general sowing of the variety under rather varying conditions. Knowing "Pusa" to be susceptible to frost, careful observation was made respecting its behaviour when grown on different situations. Generally speaking, it was badly frosted on low-lying and exposed flats, and suffered, in common with "Florence" and other quick maturing wheats from this cause, and from the plants being too far advanced in growth when the late rains were experienced in October. However, on the slopes and higher lands "Pusa" exceeded expectations and proved its capacity to yield heavily, twelve and up to fourteen bag crops being not uncommon, with an occasional yield of fifteen bags per acre. This variety, clean this year, is somewhat liable to rust in wet seasons, but notwithstanding this drawback gave thirteen and fourteen bags to the acre last year when rust was prevalent. One feature can always be relied upon with "Pusa"—it will fill and hold its grain and produce a plump, fairly bright sample even when badly rusted and subjected to a lot of wet weather at harvest time, and may be regarded as superior in these respects to any other variety at present in cultivation in the State.

Rust in Wheat.

Rust has a most important bearing on the future of wheatgrowing in Queensland. Resistant capacity of varieties must never be lost sight of. The department is keeping in close touch with this problem through its field staff and each season engages in comprehensive tests. Observation, Comparative Test, and Pure Seed Propagation Plots have been established in several districts, and these link the Wheat Breeding Farm at Roma with the prospective grower.

The Importance of Pure Seed.

Good reasons exist for advocating the general use for planting purposes of seed true to type and free from impurities, as wheats become readily intermixed. Obviously, the time to make seed selections is while the crop is ripening, when volunteer varieties can be removed.

Bureau of Sugar Experiment Stations.

SUGAR CROP PROSPECTS.

The Director of the Bureau of Sugar Experiment Stations (Mr. H. T. Easterby) has returned from an inspection of the Experiment Stations at Meringa, South Johnstone, Mackay, and Bundaberg. The sugar districts of Cairns, Innisfail, and Tully were also visited.

Cairns.

The Cairns district was found to be somewhat dry during October, especially the Mulgrave and Gordonvale areas, and from a business point of view the town of Cairns was much depressed owing to the long-continued rotary strike of wharf labourers. The difficulty experienced in getting sugar shipped away had led to the building of large new sugar stores at Hambledon, Mulgrave, and Babinda. This was, however, only regarded as a temporary expedient as the holding of large stocks of sugar at the mills is not favoured, because, if accumulations occur owing to difficulty in shipping, an early wet season would have an extremely prejudicial effect on stored sugar. A very bitter example of this is remembered from the huge stocks of sugar stored at Mackay in the early part of 1918. It is unfortunate that in addition to other troubles, grubs have caused considerable damage in the Cairns areas this season. Another depressing feature was that farmers were for the most part only receiving reduced payments for cane to enable them to pay the costs of cutting.

Innisfail.

Innisfail had been experiencing some dry weather, but good rains occurred towards the end of October, at intervals, and the young cane was looking green and healthy. At South Johnstone crushing was proceeding rapidly, 130,000 tons of cane having been put through the rollers up till about the 20th October. Grubs had not been very troublesome.

The commercial cane sugar in the cane at that time was 14½ per cent., the average to date being 12½, the cane put through each week being about 6,400 tons. There has been little growth in the cane since June last, and a great deal of late cut cane is still very backward, so that much of it may not be cut this season.

There have been a large number of cane fires, notwithstanding no permission has been given by the mill to burn. The effect has been to make work slow in the mill, and to give considerable trouble in the manufacture of sugar. All the mills in the Innisfail district have been obliged to erect large storage accommodation for sugar. Goondi mill was doing excellent work and expected to get through its large crop by about the 18th December. The Mourilyan mill had experienced some difficulties in the early part of the crushing, but was now making up for lost time.

The cultivation of bananas is now being again seriously undertaken in the Innisfail district, owing to the advent of the railway rendering same possible. There are now between 400 and 500 acres of bananas in this area. Some of the farms are on the Fisher's Creek tram line and others on the main North Coast line, comprising about fifty growers. Scrub is being rapidly felled for this purpose. The secretary of the Fruit Growers' Association (Mr. Page) is well satisfied with the progress that has been made so far, and it will open up an avenue for settlers unable to grow sugar.

Tully River—The New Mill a "Made in Australia" Triumph.

The fine modern mill on the Tully had just reached completion at the end of October, and is the finest sugar-mill in Australia. It has a normal milling capacity of 50 tons of cane per hour, and will easily be able to treat 7,000 tons of cane per week. The crushing plant consists of a Searby shredder and four huge three-roller mills, each roller being 6 feet by 34 inches. Each mill has an independent drive. Overhead is a travelling electric gantry. There are five large superheaters and four effet pots with a heating surface of 20,000 cubic feet. Four immense vacuum pans deal with the boiling of the syrup—2 coil pans and 2 calandria pans. Beneath these are eight enclosed crystallisers, 7 feet 3 inches in diameter by 26 feet long. Below this stage are the fugals, sixteen in number, all electrically driven.

The boilers are six water-tube type, made in Wolverhampton by Thompson, four being arranged to burn megass which is automatically transferred and fed, while the other two will be coal fired. The chimney is 100 feet in height and contains over 100,000 bricks, every one of which was laid by one man. An electric winch operates the trucks conveying fuel to the boilers. These boilers will provide all the steam for driving the crushing engines, a few small steam engines, and three Bellis-Morcom electric generating sets, which latter supply the power to drive all the motors which operate pumps, elevators, crystallisers, centrifugals, cane rakes, and many other pieces of machinery, and for the electric lighting of the yard and the mill. The approximate floor space of the mill is 70,000 square feet.

A particularly fine view of the powerful crushing plant is obtained from the pan stage. Looking down on this series of rollers so massive and resistless in strength, one is filled with admiration for the engineering ability and constructional skill that has brought it into being. From the crushing station an equally impressive view is obtained of an immense wall of machinery comprising the pans, effets, crystallisers, and fugal stations. At Banyan Creek, which is the source of the mill's water supply, two Kelly and Lewis centrifugal pumps electrically driven have been installed, capable of delivering 300,000 gallons of water per hour. There is also a spray system for cooling condensed water provided, and many other details.

The whole of the machinery, excepting the electrical plant, boilers, and fugals, has been made in Australia, and a feeling of pride is engendered that this should be so. Walker's Foundry have built a great part of the machinery and erected the mill, the Bundaberg Foundry having constructed the effets and juice heaters. The construction of the mill has been in the charge of Messrs. Barbat and Sons, of Ipswich. The engineer for the Bureau of Central Sugar Mills (Mr. Chalmers) has been on the building and plant during erection, and Mr. J. Cran, formerly manager of Babinda and South Johnstone, will be the first manager of the Tully mill. A thriving township is now growing up around the mill, including the first bank to open—the National Bank of Australia. The new mill was to commence crushing on the 5th November, preliminary trials having been made. It is expected that some 18,000 tons of cane will be treated during the remainder of the season, but next year a very large crushing is anticipated.

Mackay.

The district of Mackay was found to be cutting the biggest crop of cane in its long experience. Every mill anticipated exceeding its original estimate. The young cane was looking particularly well. Rain is needed, but the district is not very dry yet. The Hatton district has a fine appearance this year, and the Cattle Creek mill has a good crop and appears to be over the worst of its difficulties.

Bundaberg.

The Bundaberg district has had a long dry spell, and rain is urgently needed. The appearances there last week were promising for rain, and some useful showers fell in different parts of the cane-growing areas.

All the experiment stations have harvested good crops this year, and the work for next season is well in hand. New experiments have been laid down, while the work of seedling propagation at South Johnstone is still advancing.

Summary.

Within the sugar industry itself little or no trouble with labour has been experienced this year, but outside industrial unrest has considerably affected the industry. Large stocks of sugar are held at many of the Northern mills owing to the impossibility of getting the staple loaded during the recent rotary and overseas strikes. It is stated that much of this sugar will not get away till about April or May of next year. This, in addition to the industry having to carry the loss in exporting its surplus, will lead to much uncertainty as to the final price for sugar, which may not be determined till near the commencement of next crushing.

The mills generally are still holding to their earlier estimates, and if these are realised the year will be a record one for production. The district of Mackay alone expects to manufacture 85,000 tons of sugar this season, and many other Northern mills are expecting large yields of sugar. A few of the mills have reduced estimates, but this is compensated for in larger yields at other mills.

CANE PEST COMBAT AND CONTROL.

The Director of the Bureau of Sugar Experiment Stations has received the following report (17th November, 1925) from the Acting Entomologists at Meringa, near Cairns, Messrs Burns and Mungomery.

Entomological Exhibit at Innisfail Show.

One of the chief advantages of a show to a district is the bringing together of all classes of the community to enable people to gain a more intimate knowledge of their immediate surroundings and resources, and also to enable them to discuss freely important economic questions, and in these respects shows have been frequently referred to—and very aptly, too—as the "Shop windows of the district."

Some of the economic points often under consideration by the majority of the canegrowers of the Innisfail district were embodied in the exhibit of this Entomological Station at the recent Innisfail Show, held on the 3rd and 4th of October, and this exhibit, which was placed in a very conspicuous part of the hall, was the subject of much interest and discussion, being much appreciated by all who viewed it.

Featured in this exhibit were many showcases depicting the habits and life-cycles of many species of cane beetles, together with various digger wasp parasites, as well as their hyper-parasites; the beetle borer with its controlling parasite, the Tachinid fly; the giant white ant which causes extensive local injury on the Lower Burdekin; and a great many pests of minor importance to sugar-cane.

Various charts were displayed relating to the life history of the "grey-back" cane beetle (*Lepidoderma albohirtum* Waterh.) and its methods of respiration in some of its earlier stages; and with a direct bearing on this latter subject were two charts illustrating diagrammatically the advantages and disadvantages of fumigation during dry and wet weather respectively.

Bottled specimens, in spirits, of cane grubs of various species were also comprised in the exhibit, and much interest was evinced in this topic.

Mr. Mungomery of this Experiment Station was in attendance, and the opportunity was taken by several of the farmers and others interested in the sugar industry of asking questions and discussing with him different problems directly affecting them.

Notes on Bud Moth (*Opogona glycyphaga* Meyr.).

This pest, though one of comparatively minor importance only, has been, and is at present, doing damage to the "eyes" of cane generally throughout Northern canefields. The centres of injury by this insect are invariably confined to the buds and region near them, also to the areas enclosed by and near the leaf sheaths.

Owing to their small size and seclusive habits, the larvæ of this moth are frequently passed by unobserved.

There are several broods during the year, the autumn and summer ones completing their life-cycles in a considerably shorter period than the broods that are produced in the winter and early spring months. On an average the life-cycle occupies about three months, this time being either prolonged or diminished according to the state of the weather. In specimens bred at the Laboratory during the past four or five months, larvæ that were taken on 27th June (then about two-thirds grown) were full grown by the end of July and beginning of August. Some that pupated on 10th August emerged as perfect moths on 25th to 27th August, making the duration of the pupal period, on an average taken from four specimens, twenty days. In specimens bred out during the latter part of September and in October, the pupal period only lasted from fourteen to fifteen days.

The larva of this insect when fully grown measures about ¾ of an inch long (individuals vary slightly), the body is cylindrical and narrow, of a semi-transparent dark straw colour suffused with pale brown or pinkish brown. The head is darker brown and shining; on each body segment from the third one from the head are situated in the lateral areas several minute brownish blotches. Those larvæ when taken from their tunnels or sheltering places are very active, crawling along with a series of rapid, jerky undulations.

The pupa, which is brown and measures about ⅝ of an inch long, is enclosed in a small silken cocoon usually to be found under a dead leaf sheath or folded leaf or else in a crevice. Woven in with the silk on the exterior of the cocoon are numerous small pieces of dead cane and grass, &c., which give the cocoon an appearance so similar to that of its surroundings that it is very difficult to detect.

The moth is a very pretty insect; across the expanded wings it measures about ⅝ of an inch, and is coloured as follows:—The forewings are yellow with a shining purplish brown apical and sub-apical patch, which extends to the hind margin; shoulders at base, dark purplish black. Hindwings narrow, elongate, yellow with fine obscure greyish markings. Both wings are ornamented with long cilia (hairs) fringing their outer margins. The antennæ are yellow, slightly more than two-thirds length of costa, the basal joint is much stouter than the succeeding ones, and is purplish black in colour. Head, pro-thorax and meso-thorax purplish black; meta-thorax and abdomen pale ochreous. Legs yellow, hind pair with their tibiæ covered with dense cilia.

The moths rest by day with the wings folded along the body tent-like, and always have their antennæ projected in front of them in two parallel lines. They are to be found under cane leaves, on stems, or any sheltered situations.

The tunnels made by grubs of the weevil borer (*Rhabdocnemis obscurus* Boisd.) and moth borer (*Phragmatiphila truncata* Walk.) in cane stalks are much resorted to by larvæ of *Opogona;* this affords the latter considerable protection from their parasitic and predatory enemies, and very probably accounts in a considerable measure for the light parasitism of the larvæ of this insect. A small Hymenopterous parasite in the form of a minute Chalcid wasp (*Stomatoceras gracilicorpus* Girault) has been bred in previous years at this Laboratory.

In the selection of "sets" for planting, it is wise to examine these carefully in order to make sure that they are free from larvæ of *Opogona,* for very often when these larvæ are planted with the sets, the buds are eaten underground, so causing "poor strikes."

Immersion of sets before planting them, in a solution of Bordeaux mixture, has been recommended by Mr. E. Jarvis as an efficient control measure. Immersion should be carried over a period of an hour or so to allow thorough penetration of the poison to any young larvæ that may be overlooked. This method of control also greatly minimises the chances of attack by fungus organisms where the tissues of the cane have been damaged by insects or mechanical injury.

"Frenchi" Cane Beetle Grubs Active (*Lepidiota frenchi* Blackb.).

The period of activity of the grubs of this cane beetle and others which have a two-year life-cycle has now commenced, and will continue until late autumn. These grubs may now be found in their second and third stages feeding at cane roots, and are by far the predominant species of grub to be found now that those of the "grey-back" (*Lepidoderma albohirtum* Waterh.) have long since transformed into the pupal and adult stages.

Adult beetles of this species occur each year, but every second year there is a greater emergence, showing a marked periodicity. The beetles usually emerge in November or December, according to the occurrence of the rains. A couple of weeks after emergence the beetles mate and commence ovipositing. The young grubs appear some three or four weeks later, and continue their activities till the onset of winter, when they go deeper into the soil and form a chamber in which to hibernate over the cold weather. With the advent of spring again they come up to the cane roots and recommence feeding; by this time they are in the second and third stages. They continue their destructive work until the next winter, when they again tunnel deeper into the soil, form their pupal cells and undergo the transformation to pupæ. In this stage they remain for a few weeks, emerging as beetles about October. The perfect beetles remain in the pupal cells often for five or six weeks, hardening and awaiting the first soaking rains to enable them to burrow upwards and emerge.

The distribution of this beetle is not so general in canefields as compared with the "grey-back." It seems to occur more sporadically, the same areas seemingly being affected year after year. In this case farmers who are troubled with this pest should note the areas in which it occurs, and fumigate accordingly; otherwise, if whole blocks be treated when only portions of them are affected, much waste of material, labour, and time will ensue.

To ascertain the exact locality of occurrence, digging under a few stools will reveal the presence or absence of these grubs.

Following this the question has often arisen whether the damage which is sometimes attributed to the "grey-back" in March and April may have been caused by *frenchi* grubs operating in the preceding spring and summer.

CANE PESTS AND DISEASES.

Mr. W. Cottrell-Dormer, who is investigating cane diseases and pests, has reported (20th November, 1925) to the Director of the Bureau of Sugar Experiment Stations (Mr. H. T. Easterby) as follows:—

In the course of a short visit to the Johnstone River district twenty-one farms were visited. These farms are situated in the Portion Ten Greenmount, Goodi, Sundown, Innisfail Estate, Queensland Estate, Mourilyan, Mundoo, and the Five-mile localities.

Diseases.

Leaf Scald.—This disease does not appear to be doing serious damage of any kind in any of the localities visited, though it was observed to be slightly prevalent in the Goondi, Sundown, Queensland Estate, Innisfail Estate, and Mourilyan localities. The disease is probably to be found at certain times of the year in most of the farms of the Johnstone River district, but at the present time at least, it is rather hard to find anywhere. The worst infections seen were in two blocks of Pompey, one near Goondi and one at Sundown, and it would seem that secondary infection of this disease is a very real and important matter in this and other very susceptible varieties. This point was especially brought forward on a visit to the South Johnstone Experiment Station where the disease was found to have attacked certain first-stage seedlings which had never come into contact with a knife of any kind, and whose closest proximity to other visibly infected plants was sometimes as much as 60 feet; cultivation had been of the usual type with horse implements and hoes.

Insect Pests.

Lepidiota caudata.—Several specimens of this beetle were collected at lights in the township. Caudata is a minor cane grub in the Johnstone River area.

Cheiragra sp.—Many hundreds of a small violet and brown Melolonthid beetle were observed flying about, pitching on, and mating on the leaves of young plant cane near Goondi mill. Many specimens of these beetles were collected and forwarded to the Meringa Laboratory where they were identified as *Cheiragra* sp. To the writer's knowledge, information relative to the correct economic position of these insects in the canefield is lacking.

Beetle Borer (Rhabdocnemis obscurus).—This insect is, if anything, on the increase in the Johnstone River areas and is doing serious injury to crops of Badila, Clark's Seedling, and Pompey. However, the coming season promises to be a very propitious one for the establishing of the Tachinid fly in certain parts of these areas, and more especially Mourilyan. It is understood that advantage is to be taken of this by the Meringa Laboratory.

FIELD REPORTS.

The Northern Field Assistant, Mr. A. P. Gibson, reports (19th November, 1925):—

Progress in the North.

Extraordinary progress was noted in Cairns and its sugar-producing areas. New and more modern buildings have replaced early day ones, and the town has completely outgrown its water supply. The surrounding sugar fields have expanded considerably, resulting in some very important areas appearing on the map, each and all calling for necessary tramway extensions which have been substantially constructed to convenient localities. These have a dual effect—(1) By cutting out derricking and railway transportation charges; and (2) accelerating the supply to the factories, thereby enabling them to treat the newly harvested cane in a fresher condition. This part of the business is important. It is obvious that such extensions required larger mills and more rolling-stock to cope with the ever-increasing tonnage. All available shed space on the wharves has been utilised for sugar, and the lines thereon are occupied by loaded sugar wagons. The mills on the whole have been running smoothly, but to carry on found it necessary to erect spacious and convenient sugar sheds to meet the ever-growing tonnage of sugar. This unexpected and compulsory expense, coupled with extra handling costs and shorter hours, must materially increase the cost of manufacture; and further, should the wet season set in before the stored sugar is removed, unforeseen losses may ensue.

Soils.

The light brown to red soil adjacent to the almost surrounding ranges appears to be the result of countless ages of rock disintegration, the base apparently containing ferric-oxide, which gives rise to the prevailing red and brown tints. Portion of this land has been growing cane almost continuously since 1882. Such continuous cropping, however, must naturally exhaust some of its essential plant food constituents, which may be restored by judicious cultivation and manuring. Some excellent alluvial soil was seen along the flooded plain of the rivers—Barron, Mulgrave, and Russell. The quality and texture of these varies considerably according to deposition at time of inundations. At Greenhills there are some 900 acres of undulating, very friable red volcanic scrub soil, the greater part of which some years ago was under cane; to-day, perhaps a quarter of the whole is under the plough, due to the almost continuous grub destruction. The remainder is now running rampant with lantana and Chinese burr. The leaf deposit from these, if left for any great time, should increase organic matter in which this soil is deficient.

In the great picturesque Babinda Valley, through which the main North Coast railway passes, the soil is mostly grey decomposed granite with several very interesting tongues of volcanic brick red soils, extending into the grey. The granite country, as a rule, yields a sweeter cane than does the red, but the latter produces heavier crops. A successful grower on the red soil informed me that 39 acres of N.G. 15 (ninth ratoon) recently harvested had returned him just over 28 tons per acre.

The Crop.

The crop for the three mills—Hambledon, Mulgrave, and Babinda—has been estimated at about 540,000 tons. All previous weekly records in cane and sugar have been totally eclipsed, and the present average cane quality is very high—probably at its best. Much of the crop yet remains to be treated, and although damage has been performed by grubs, rats, and borers, it is at present thought the aforesaid estimate will be realised. It is expected that Mulgrave will complete its crop this year. Hambledon probably will not. Babinda, most likely, will crush into February. The management is endeavouring to make up lost time as far as possible, and are crushing to 10 p.m. Saturdays, resuming 4 p.m. Sundays, cane supply permitting.

Harvesting.

The crop being excellent, little or no trouble has been experienced. The harvesters on the whole appear to be of a superior class, and it is said are making big cheques. Much cane is being burned previous to harvesting, and it has been in no small degree disappointing to the farmer to have much of this condemned as being totally unfit for manufacture. The unburnt cane being treated, generally speaking, is very trashy, and it seems very apparent there is no attempt being made to free the stem of embracing sheath and leaf. When cane has been loaded upon trucks standing on the permanent way (which is sometimes done) trash is unavoidably scattered over the line. This should be removed at the growers' earliest convenience, thereby obviating a possible cause of fire from ash or sparks from a passing locomotive. The ground cutting in places was considered to be bad, so much so that the owners found it necessary to have same levelled off by hoes.

Cultivation.

This is the area of big farms. Growers are taking full advantage of their opportunities, and so far the cultivation has been done under ideal conditions; but, speaking generally, it is not as perfect as it might be, although there are times when this is hardly possible. Ploughing is performed mostly by disc ploughs drawn by various makes and types of tractors. As a rule, hoeing cane in cleared ground is avoided as much as possible by the timely use of implements. When it has been decided to plough out the exhausted crop, it is recommended to make use of a narrow cut in preference to a wide one, thereby cutting the stubble up finely and permitting same to disintegrate more quickly. After the trash is burned the ground should be freed of decaying rat and grub eaten cane; this may be drawn into lines by a horse rake and subsequently burned. By so doing the breeding grounds of some of our most dreaded pests are destroyed.

Ratooning.

There are many ways of doing this, the best perhaps is to throw away from the stool with a shear plough and burn up the centres. Ratooning, unfortunately, is too often delayed with the following results:—(1) Ash or inorganic matter is lost; (2) the ground becomes so refractory that inferior subsequent intertillage

ensues; or (3) the new root system developed is severed, thereby temporarily retarding crop growth, more especially during a dry time. Then we have volunteering, relieving, and rolling, the latter three having their advantages and disadvantages—the greatest enemy is perhaps fire.

Pests and Diseases.

Rats and grubs have been responsible for much crop destruction and increased harvesting rates. Farmers can assist in keeping the rat under control by systematic poisoning and clean farm surroundings. Beetle and moth borers also bud moths were noticeable, more so on the moister areas. Fortunately for the canegrower, the self-made holes permit the ingress of predaceous foes which help keep them under control. Few beetles were noted on the wing, their emergence probably being delayed until further rains fall. Leaf Scald, Leaf Stripe, and a little Mosaic disease were noted, more so in the Babinda area. Gum was not noticed, other than that already reported at Aloomba. Many brown caterpillars were found eating the cane foliage of plant and ratoons at Babinda. The apparent careless methods of plant selection may be attributed to the spreading of our most dreaded diseases, and the sooner this is realised the better will it be for our great industry.

Planting.

Little planting was in progress at time of my visit. The soil appeared to be in fair tilth, but somewhat dry. In one instance the seed (B. 147) in use had been soaked in water. The drill ploughs are often drawn by tractors and the plants deposited thickly by drop planter, with a soil covering of some 4 inches. No fertilisers were being applied with the plants. This is generally delayed until a later stage. Some well established and well cared for paddocks of new plant cane were noted throughout those districts, and like the ratoons, for interrupted growth wanted rain, more especially those adjacent to Gordonvale. The principal variety grown is N.G. 15 (Badila), and at present there is not a more suitable all-round cane, but we must not remain contented with this, and it is our object to find a better one. D. 1135 and H.Q. 426 (Clark's Seedling) as a rule do well on the poorer classes of soils, the former, being a deeper rooter, does not so readily suffer from the ravages of grub, whilst the latter is considered to be the reverse and most susceptible to gum. Care should be exercised when planting B. 147, as it is known that it is susceptible to disease.

Manuring.

The principal brands used are Meatworks, B3, and Howe's Mixture, at rates varying from three to five hundredweight per acre. This is generally applied by machine to each side of drills (plant or ratoons). Sulphate of ammonia is used as a top dressing, and offal from nearby slaughtering-houses is broadcasted heavily on resting grounds. This from an agricultural point of view is beneficial. A small quantity of mill compo is also used. Manures are being applied with success sufficient to induce the users to carry on with same.

Green manuring does not appear to be carried out to any great extent, but it would materially benefit the majority of soils. Cowpeas and a little corn are used, the latter is too similar to cane and may carry on Mosaic disease. Mosaic was noted in a small patch of corn grown for green manuring purposes.

At Babinda, on the main mill tramline, 40 lb. rails are taking the place of the 28 lb.; the latter are being placed on the Harvey's Creek and Buckland extensions.

It is yet early to definitely state the 1926 crop prospects other than they are promising at present, but generally speaking urgently require rain. Babinda had treated 108,000 tons to 8th November, another 70,000 tons yet estimated to crush. The weekly mill average quality is just about 15 c.c.s. at present.

The report of the Marine Superintendent showed that the sugar on wharves and approaches during the month of October was as follows:—

Hambledon Mill	3,452 tons
Mulgrave Mill	4,374 „
Babinda Mill	4,627 „
Mossman Mill	1,479 „
Goondi Mill	595 „
South Johnstone Mill	402 „
Mourilyan Mill	127 „
Total	15,056 tons

The Central Field Assistant, Mr. E. H. Osborn, reports (17th November, 1925) :—

Mackay Area (Carmila).

This comparatively new area looked remarkably well despite the fact that the weather had been too cold and too dry to enable the crops to make their best growth. Most of the cane is grown upon the south side of Carmila Creek and fairly adjacent to it, and the farms upon the western side are connected with the North Coast Railway at Carmila, by about 4 miles of engine-equipped tramway, laid down by the Plane Creek Mill.

A proportion of the land was originally scrub, mostly in pockets alongside the creek. These pockets are carrying very heavy crops of Badila of a very fair density, while upon the other soils M. 1900, Q. 813, H.Q. 426, and Black Innis are the main varieties. Of these, M. 1900 is easily the most popular, its striking qualities, tonnage, and density being good, and it seems to ratoon very well.

As for H.Q. 426 (Clark's Seedling), although in a few places it had ratooned well yet it was very shy in others. Considering how recently cane-growing has been carried out at Carmila, its progress is rapid. For its area it possesses a large number of tractors, and all farmers are interested in discussing any cultivation methods that promise success. Signs of Red Rot were seen in M. 1900, also a few stools of Striped Singapore carrying Downey Mildew.

Borers were noticed in the older Badila upon the creek banks, and the custom rather in vogue here of leaving the first two crops of trash upon the land (to save chipping) is not to be commended, for it certainly favours borer attack. In many low-lying portions mice have also caused loss this season. Heavy beds of trash means excellent breeding places for this pest.

Losses from cane killing weed were reported, especially upon the poorer classes of soil, but only very slight evidence of the weed was seen during my visits. So far the only cure for this seems forking it out thoroughly.

Of the new varieties a find stand of E.K. 28, fifteen months old, was observed on Mr. Wenzel's farm. This has been practically all sold for plants. A number of inquiries were made about Q. 813, and it is evident that more of this will be planted.

Diseases.—The disease that seems to be doing the most damage in the Mackay area is Red Rot, having shown up badly in M. 1900 and to a slighter extent in H.Q. 426, 7R 428 (Pompey), and Black Innis. Q. 813 seems to have offered strong resistance to it so far. It seems to be spreading, and, as long as plant selection and general control measures are neglected, will continue to do so. When cutting plants a slight reddish discoloration may appear in the cut end of the flesh, and if the stalks are split up, it will be noticed traversing one or more internodes. It is variable in width, and broken in places by short narrow white patches, and if the disease is far advanced one or more of the nodes may have a dried or woody appearance. These markings are caused by fungus growth, and any plant showing the slightest discoloration is a distinct source of infection. The plant, unless badly injured, germinates quite well, and the stool looks healthy enough, but the Red Rot fungus will remain about it, and should the stool become weak from any cause and unable to resist the fungus, it will easily succumb.

Red Rot will not cause serious damage while cane is in a healthy and vigorous condition, but it will where the cane has been weakened by root diseases, poor soil conditions (bad drainage, &c.), or prematurely ripened by drought. It enters the cane through the root eyes, and through wounds from either insect attack or cultivation injury. Besides being a cane parasite, the fungus is able to live on undecayed stools. As Red Rot was at its worst where soil aeration was defective, affected growers should drain low-lying portions and lime and plough in green crops. Premature ripening owing to dry conditions should also be checked as much as possible by constant surface tillage. As Q. 813 is a resistant variety, and D. 1135 to a smaller etxent, these canes should be used on the infected field after liming and green crops. If healthy cane is used for plants, the methods described will certainly tend to check this insidious disease.

Proserpine.

Conditions were very dry and rain was badly wanted for the young plant and recently cut ratoons. Some very good young cane was noticed, so much so, that a good thunderstorm or two should ensure another very satisfactory crop for next year. So far the crops had cut well up to if not over the estimate, and some very good c.c.s. results were being obtained.

Among areas visited, Saltwater claimed some attention. This region is situated some 17 miles from the mill and connected by tramline. Mr. Shepherd, the owner

of Montrose, as the particular locality is called, has some 100 acres under plant cane (1924), and a little further on has another 22 acres of young cane. He has a mile of tramline. The land under cane was originally a light scrub, and seems mainly a strong dark loam broken to some extent and rough on the hillsides. Some very heavy Badila, twenty-months old, was being harvested, and had been carrying a very fair c.c.s. for such a heavy crop until a fire handicapped the harvesting operations. Luckily, however, the mill expected to take all the burnt stuff off without too much loss.

Banana Pocket.

This area still progresses. For 1923, 485 tons of cane were harvested; for 1924, 2,400 tons; while nearly 10,000 tons will represent this season's crop, with, say, 14,000 tons for next year. Some heavy Badila was being cut there, the ratoons of which also showed excellent growth. Many very nice patches of young cane were looking remarkably well. Unfortunately, some of the density returns from the very heavy Badila crops were upon the low side, but that must be expected under conditions prevailing.

The Southern Field Assistant, Mr. J. C. Murray, reports (16*th November*, 1925):—

Nambour.

Nambour has grown into a considerable cane-growing area, so much so that the mill is being taxed to its utmost to handle the crop. The existing tonnage would have been heavier were it not for severe frosts. Frosts, combined with bad conditions in the autumn owing to too much rain, so lowered the resistance of the cane as to bring about severe attacks of gumming disease on some farms. The most severely affected varieties are D. 1135 and Badila. Q. 813 is proving a very resistant variety to this disease, and on that account the farmers are strongly recommended to plant this cane.

Cane varieties making a good showing are Q.813, M. 1900 Seedling, H. 227, E.K. 28, Q. 1098, and H.Q. 285. Q. 970 is also making a good showing, especially in the ratoons. There appears to be an inclination on the part of some growers to confuse the variety H. 227 with E.K. 28. The former can readily be distinguished from E.K. 28 by its very close, erect foliage. The leaves of E.K. 28 are more fleshy and have a more lateral inclination from the growing point than H. 227. In the course of a previous visit made by the writer to the Nambour district he advised growers that H. 227 was a variety worth extending on account of its resistance to disease and frosts. Later observations have confirmed that opinion.

Varieties not recommended to be extensively planted in the Nambour district are D. 1135, N.G. 16, N.G. 15 (Badila), Mahona (N.G. 22), B. 208, or Gingila. This recommendation is made after careful observations, and the conclusion reached is that they are susceptible to disease, and it is not to their best interests if the growers plant them. It is to be noted, however, that these remarks apply only to the districts under review.

Farmers are requested to familiarise themselves with the names and appearance of varieties of which there are a great number. At their meetings, growers having new varieties should bring samples and hold discussions. The question of the behaviour of cane varieties and the possibility of improving weight and sugar content by selection is a very important one. While it is true that a variety under ordinary circumstances may run out, it is also true that with very careful selection varieties may be improved. The Sugar Experiment Stations can point the way, but farmers must co-operate. There is now a splendid group of canes distributed on farms which might be known as the Q. group of seedlings—that is, those canes designated by the letter "Q." It is probable that all these canes can be still more improved by selection, or at any rate maintained at their present good standard.

The small black beetle, *Pentodon australis*, is the one pest most frequently seen. The larger and more voracious cane grub is doing very little damage, although the larvæ of the sugar-cane moth is causing considerable damage in blocks of Gingila cane.

Mosaic still requires a good deal of attention. Assistance was given to growers on this occasion in relation to recognition.

Maryborough and Tiaro.

Tonnages are fair, but harvesting is proceeding slowly. The best crops on these areas are to be seen on the Mary River at Blackmount. Varieties generally making a good showing are M. 1900 Seedling, Q. 813, and Q. 1098. These are all good canes, and the growers could extend the planting of these varieties.

Cane diseases are not causing serious loss, although Mosaic is frequently seen. When finally ploughing out stools affected with this malady, care should be taken to see that they are burnt.

Growers should remember that very frequently the cause of cane falling out by the roots or of the stool showing prominently above the ground is due to subsequent cultivation. The drills should be kept open as long as possible when the cane is growing.

COMPARATIVE TRIALS WITH RATOON AND ANNUAL UPLAND COTTON CARRIED OUT BY THE QUEENSLAND DEPARTMENT OF AGRICULTURE IN 1924-25.

By G. EVANS, M.A., C.I.E., Director of Cotton Culture.

The Cotton Industry Act which was introduced by the Queensland Government in 1923 contained clauses prohibiting the ratooning of cotton. All cotton was to be uprooted and destroyed at the end of each season by a certain specified date. This clause brought forth such a storm of protest that the Government found it necessary to modify this section of the Act after the lapse of only a few months. At the same time the Department of Agriculture received instructions to carry out a series of experiments with a view to obtaining absolutely reliable data on the whole question. Ratoon cotton is defined by this Act as—

> "Cotton obtained from the second or any subsequent growth made by cotton plants, whether such plants have borne a crop or have been in any way cut down or burnt or destroyed or eaten by stock: the term includes tree cotton or any perennial cotton."

It was claimed by the "ratoonists" that ratoon cotton was just as good as annual cotton and should therefore receive the same range of guaranteed prices from the Government, and that there was no justification in making any distinction between the two. The spinners and manufacturers were almost equally unanimous in their opinion that the ratoon was inferior to the annual, and although they stated that the former was marketable under normal conditions, it was nevertheless not worth so much as the annual.

The Government policy towards the cotton industry has from the start been to promote the production of cotton of high quality, since it was realised that the high standard of living that obtains in this country, and as a natural corollary the high wages, would tend to make the establishment of a cotton-growing industry of a permanent nature a practical impossibility on any other basis, because otherwise the growers would be brought into direct competition with certain cheap labour countries that are at present producing abundant supplies of cotton of the more inferior qualities.

The Government was further faced with the problem that they had guaranteed the cotton crop over a series of years. Therefore, if ratoon was an inferior cotton and was allowed to receive the same price as the annual cotton, a considerable financial loss might result. Above all, it was felt that the reputation of Australia as a potential producer of good cotton might suffer serious damage. Now that a staff of graders has been trained and a system of basing prices on staple as well as grade has been formulated, this difficulty will to some extent be obviated, since with the introduction of a sliding scale of prices based on quality as a whole the ratoon grower will get a strictly fair price for his product, which will be no more nor less than it is worth.

There are other questions, however, such as the influence of ratooning in the direction of encouraging the spread of insect pests, that have to be considered. This is probably, in reality, the most important factor of all, and it is to be regretted that it is an aspect that has, up to the present perhaps, not received the serious consideration it required. There is no doubt that eventually, and probably before very long, the spread of insect pests will settle the question of ratooning once and for all in this State. It is significant that the Pink Boll Worm (*Platyedra gossypiella*) first appeared in standover cotton fields two years ago in

the Central district, and that from thence it has gradually spread outwards. Those districts on the coast that have gone in for ratooning extensively during the past season have suffered very severely from this pest, and will most likely continue to do so in the future if they persist in this practice. This matter of the connection between the practice of ratooning and the spread of certain other insect pests apart from the Pink Boll Worm, has received the earnest attention of my colleague, Mr. Ballard, the Commonwealth Cotton Entomologist, and it is not therefore my present intention to dilate on this aspect of the case. The trend of evidence seems to indicate, however, that unless a "dead season" of preferably three months is observed during which no cotton shall be in square, the pests will carry over from one season to another, and will become cumulative in their activities earlier and earlier in each succeeding season. In certain of the more inland districts the cold winters will probably render ratooning unprofitable, as most of the plants will be killed outright. But nevertheless, in every district, areas above the frost line occur which will serve as breeding grounds for these pests if the cotton is allowed to stand over. The control of insect pests, therefore, is a community matter and rests in the hands of the growers themslves. It is no use for the majority of the growers to clean up their fields by the prescribed date if one or two neglect to do so, since these neglected farms will serve as centres of infection for the whole neighbourhood.

Finally, there is the economic aspect. The question of relative costs of production, yields per acre, and net profits, are the points that will naturally be most closely regarded by the cotton-grower himself. The financial returns will depend partly on the freedom of damage from pests, as well as on the prices received, and also on the kind of cultivation given, the class of soil, and other factors.

In accordance with the instructions of the Government a series of experiments were designed to try and throw more light on some of the problems that had arisen in connection with the ratoon cotton issue. The truth had very largely been obscured owing to the fact that comparative trials had never been actually carried out in this State, although the results from other countries having somewhat similar climatic conditions to Queensland were in some cases available. It had become the custom to compare samples of annual cotton, often grown under adverse conditions, with ratoon grown under an entirely different set of conditions. Sometimes the varieties were quite distinct, and an annual cotton would be compared with a perennial or tree variety of an entirely different species.

It was felt, therefore, that the tests should be carried out with pure varieties of Upland American cotton, since this is the type commonly grown in this State, and that to make these as reliable as possible, the ratoon and annual cottons should be grown side by side, and on land as even in character as possible, in order to eliminate the climatic factor.

The tests were accordingly planted on land specially selected for its evenness on the three Government Farms available in the Cotton Belt. The soil on each farm represents a considerable area of typical cotton land in its immediate neighbourhood, and the tests extended over two seasons, since the plots to be ratooned had naturally to be planted in the 1923-24 season.

The experiments on the Callide Cotton Reasearch Station were in direct charge of Mr. L. W. Ball, the Manager, who was assisted by Mr. I. G. Hamilton, the Assistant Plant Breeder, in making the necessary detailed observations. The experiments at Monal Demonstration Farm were in charge of the Manager, Mr. S. T. J. Clarke, assisted by Mr. K. V. Henderson, the Experimentalist. At Gatton College, the plots are in charge of Mr. R. R. Anson, and the Department of Agriculture is indebted to Mr. J. K. Murray, the Principal of the Gatton Agricultural College and High School for permission to utilise this land and for affording every facility to conduct these experiments. The work entailed was full of detail, as fortnightly boll counts were made on a number of marked plants in each plot, and the degree of shedding and the incidence of disease noted. Temperature and rainfall records had to be kept and the cultivation books carefully written up. These officers carried out their duties with great care, and the results are therefore reliable so far as they go.

It must be remembered, however, that it is not wise to depend on one season's result only, and also that Queensland comprises several classes of cotton soil that are not represented in these three farms. The results are nevertheless published with the above reservations, as they will undoubtedly prove of interest and may direct attention to future lines of exepriment in this connection.

Experiments at Gatton Agricultural College Farm.

This farm is situated in the middle of the Lockyer Valley about 60 miles from the sea-board, and due west of Brisbane on the main railway line to Toowoomba. Latitude 27½ degrees south, longitude 152¼ degrees east. Between the valley and

the coastal belt is a range of hills known as the Little Liverpool Range which has the effect of shutting out a good deal of the rainfall, so that the total rainfall and the atmospheric humidity is considerably less than on the coast proper.

The land selected for the experiment consisted of a level uniform alluvial flat of great depth along the banks of the Lockyer Creek, consisting of a grey clay loam containing a good deal of silt, and rather heavy and difficult to work. The soil is not quite typical of the best cotton soils in the south-east of Queensland, as lighter and better-drained soils are usually preferred.

The season was not a particularly favourable one in this section of the State. The spring showers came early and caused the ratoon cotton to come away quickly and also allowed the annual to be planted in September. The subsoil was parched after a dry winter, however, and the light showers caused the plants to be shallow-rooted and to be somewhat soft and sappy. December and January were drier than usual, and the ratoon plants in particular shed a very large proportion of their squares and young bolls. Further damage was done by the heat wave in February, and this had the effect of practically finishing the productiveness of the ratoon. Heavy rain in March caused the annual crop to come away again and a fair top-crop was secured from this.

The variety was Acala selected seed, having been imported in 1923 from the Shafter Experiment Station, California.

Ratoon Trials.

Different methods of ratooning were tried and compared with the annual cotton. The plots were all half an acre in size and were laid down side by side on a very uniform strip of soil. The plan was as follows:—

Plot 1.—Ratooned to within 8 inches of ground level.

Plot 2.—Ratooned to the last node at ground level.

Plot 3.—Lightly pruned at the top to remove the ends of the branches which had been touched by the frost in the winter.

Plot 4.—Annual planted on 11th September, 1924, 4½ feet between the rows and thinned out to single plants at 20 inches.

Plot 5.—Same as Plot 1.

Plot 6.—Same as Plot 2.

Plot 7.—Same as Plot 3.

Plot 8.—Same as Plot 4.

At first the ratoon plots looked very healthy and put out numerous suckers with an abundance of squares and bolls, but when the dry spell came the roots were not able to support them and very heavy shedding occurred. The annual plants, on the other hand, made steady progress, and in spite of the vicissitudes of the season, finally ripened off far more bolls per plant than any of the ratoon plots. Boll counts were made on five marked plants in each plot throughout the season, and an examination of the figures thus collected brings out this fact in a most marked manner.

Every endeavour was made to keep the plots clean, and in fact more labour was expended to this end than it would pay the average cotton-grower to employ. In spite of this fact, the ratoon plants spread along the ground to such an extent that it became impossible to hoe in between them properly, and towards the end of the season Bell Vine (*Ipomœa*), nut-grass, and other weeds, got a strong hold and materially affected the yield in consequence. The yields for each half-acre plot were as follows:—

Plot No.		Seed Cotton in Lbs.	
		Yield per ½-Acre Plot.	Total of Two Plots.
1	Ratooned to 8 inches	95½	169½
5	Ratooned to 8 inches	74	
2	Ratooned to last node	73	222
6	Ratooned to last node	149	
3	Topped	96	172
7	Topped	76	
4	Annual	301	613
8	Annual	312	

The yields are low owing to the unfavourable season, but the difference between the annual and ratoon is nevertheless striking. The latter, as was the case at the other two farms, proved very difficult and expensive to pick, and did not prove popular with the students at the College in consequence.

Costs of Cultivation.

The costs of cultivation per acre of the various plots are given below:—

Plots 1 and 5 (Ratooned to 8 inches).

	£	s.	d.
Hand pruning, using clippers (49⅓ men-working hours—at 12s. 6d. per day)	3	17	1½
Eight cultivations at 2s. 6d.	1	0	0
Four hand hoeings at 12s. 6d.	2	10	0
Total	£7	7	1½

Plots 2 and 6 (Ratooned to Ground Level).

	£	s.	d.
Ratooning with cane knives (19¾ men-working hours—at 12s. 6d. per day)	1	10	9
Eight cultivations at 2s. 6d.	1	0	0
Four hand hoeings at 12s. 6d.	2	10	0
Total	£5	0	9

Plots 3 and 7 (Topped).

	£	s.	d.
Hand pruning with clippers (49⅓ men-working hours—at 12s. 6d. per day)	3	17	1
Eight cultivations at 2s. 6d.	1	0	0
Four hand hoeings at 12s. 6d.	2	10	0
Total	£7	7	1

Plots 4 and 8 (Annual).

	£	s.	d.
One ploughing	0	12	0
Two harrowings at 1s. 6d.	0	3	0
Opening drills and planting	0	6	3
Ten cultivations at 2s. 6d.	1	5	0
Six chippings at 12s. 6d.	3	15	0
Total	6	1	3

It will be observed that the rough and ready method of pruning with a cane knife was nearly as effective and much cheaper than pruning with hand clippers. The growth of Bell Vine rendered it practically impossible to give the two last hand hoeings to the ratoon plots, as after the heavy rain in February, this and other weeds completely took charge of these plots. The annual plots therefore actually received two more hand cultivations and two more horse cultivations than the ratoon plots.

Experiments at the Callide Cotton Research Farm.

This cotton research station is situated on the western side of the Callide Creek, which is one of several dry creeks with only an occasional flow after exceptionally heavy rains, and form what is known as the new settlement area of the Callide Valley. The farm is situated approximately in the centre of this new settlement, and both the soil on the farm area and the climatic conditions can be taken as fairly representative of the whole area. If anything, the particular area in which the farm is located may have a slightly less and more irregular rainfall than in those parts of the valley which are higher up and nearer the hills. The altitude is 530 feet above sea-level, and the latitude is approximately latitude 24½ degrees south, longitude 151½ east. Although it is only about 60 miles as the crow flies from the sea, yet the main coastal range intervenes, and consequently the humidity readings even during the wet season are comparatively low, and the rainfall probably averages about 28 inches.

The season 1924-25 was not an ideal one for cotton-growing, and the total precipitation during the growing season (October to March) totalled 18.32 inches. The spring rains were good and occurred at frequent intervals almost up to the middle of December. The young plants consequently put on a lot of wood and were somewhat sappy. In the case of the annual plants, only a shallow root system was developed. Even in January only light, although frequent, showers were experienced, and were not sufficient to wet the subsoil, which remained very dry. February saw the occurrence of a prolonged and very intense heat wave, which lasted in this part for nearly three weeks. The plants were in no condition to meet this calamity, and consequently practically the whole of the top crop of squares and a number of the smaller bolls were shed. Fortunately, the bulk of the crop had formed by the time the heat wave arrived, but a good number of bolls ripened prematurely and formed light cotton, and the absence of good rains after the heat wave terminated precluded the chance of a satisfactory top crop accruing.

The land reserved for the comparative trials of ratoon and annual cotton consisted of a grey clay loam of alluvial origin, very level in nature, and typical of a large area on the Callide. It was rather more than two acres in area, and was laid out into four plots of half an acre each. The variety was Durango and the seed was the purest in Queensland. The four plots were planted with cotton in October, 1923.

Details of Cultivation—Annual Plots.

Plots Nos. 2 and 4 were kept for ratoon and 1 and 3 for annual.

In Plot 1 the old stalks were cut out by the disc plough and burnt at the end of June, but the land was not properly ploughed until 14th August.

In Plot 3 the plants were disked out and burnt in May and then harrowed. The land was again disked and harrowed before seeding.

The after cultivation of both annual plots was as follows:—

6th October.—Harrowed and planted in rows 4 feet apart.
17th October.—Disc cultivated by the wiggletail cultivator.
24th October.—Disc cultivated by the wiggletail cultivator.
30th October.—Thinned to single plants at 2 feet apart.
10th November.—Disc cultivated by wiggletail.
23rd November.—Disc cultivated by wiggletail.
5th December.—Disc cultivated and "burned off."
22nd December.—Disc cultivated and "burned off."
19th January.—One-horse time scuffler.
30th January.—Crop "laid by."
25th March.—First picking.
20th May.—Second picking.

Ratoon plots had been planted 4 feet between rows and thinned to 2 feet in the row.

In Plot 2. The crop was hilled to 6 inches in the early part of the winter to protect the plants from any frost that might occur.

In Plot 4 the old stalks were left standing, whereas in the ratoon they were cut down to ground level. Most of the old stalks were killed to ground level by frost.

The after cultivation in both plots was as follows:—

18th August.—Ratooned level with the ground, the bushes raked off and burnt, and the land cross-harrowed.
28th August.—Cultivated with one-horse scuffler.
4th September.—Hoed between the rows.
5th September.—Cultivated with one-horse scuffler.
2nd October.—Cultivated with wiggletail.
31st October.—Cultivated with wiggletail.
10th November.—Cultivated with wiggletail.
5th December.—Hilled slightly and laid by.
16th February.—First picking.
1st May.—Second picking.

The yields per acre were as follows:—

	Lb. seed cotton.
Plot 1.—Annual	947
Plot 2.—Ratoon	610
Plot 3.—Annual fallowed	1,215
Plot 4.—Standover	540

Difficulty in Cultivating Ratoon Cotton.

The suckers from the ratooned cotton bushes spread out in all directions from the old root stumps and early in the season lay along the ground so much that horse cultivation had to be discontinued and hand hoeing, which is very costly in this country, had to be substituted. This land had only been under cultivation for two years and was consequently comparatively free of weed and was much easier to deal with than would have been the case with land that had been longer under cultivation.

The manager was successful in this case in keeping the crop nearly as free from weeds as in the annual plant alongside, but he undoubtedly took more trouble to accomplish this than an ordinary farmer could afford to do, because it was realised that unless the weeds were kept down both the yield per acre and the quality of the fibre produced would suffer, and it had been decided to grow the ratoon cotton under as favourable conditions as possible.

The Cost of Picking.

This item is one of the problems that faces the Queensland cotton farmer at present. The cost of picking all over the State last year averaged 2d. a lb. of seed cotton. Anything, therefore, that tends to aggravate this difficulty has to be avoided. In the ratoon cotton, owing to the spreading habit of the fruiting branches, a large proportion of the ripe bolls are found to be lying on the ground at picking time. This fact incidentally accounts for the fact that a considerable percentage of the ratoon cotton that is produced in Queensland is of a low grade. The bolls are also smaller and weigh lighter than the plant cotton, and these factors render picking expensive. As a matter of fact, the contract pickers who were engaged for the season by the farm manager refused to pick the ratoon plots after two or three days' trial. Their average tally on the ratoon was only 40 lb. for an eight-hour day, whereas on the annual they were averaging 84 lb. The result was that men on daily wages had to be employed to pick the ratoon and the picking costs worked out at 4d. a lb., or twice as much as for the annual.

The Effect of Frost.

Although one plot was hilled up well during the winter months, yet a considerable proportion was killed. About 40 per cent. of the old plants sprouted early in the season and another 10 per cent. came away later. The season was a comparatively mild one, and a higher proportion would probably die in other years.

Estimated Costs of Production and Profits per Acre.

The average of the two ratoon blocks comes to 575 and of the two annual plots at 1,081 lb. per acre. The following estimates are based on the farm records for the past season:—

COSTS OF PRODUCTION.

Ratoon Cotton.	£	*s.*	*d.*
Hilling up old crop	0	2	6
Removing and burning old stalks	0	10	0
Scuffled three times at 2s. 6d.	0	7	6
Disc cultivated three times at 1s. 6d.	0	4	6
Hoed once	0	4	0
Total for bringing crop to harvest	1	8	6
Cost of picking 575 lb. at 2½d. per lb.	5	19	9½
Baling of, bales, carting, &c.	0	6	0
Total	£7	14	6½
Value of 575 lb. at 4d.	£9	11	8
Net profit per acre	£1	17	1½

Annual Cotton.	£	*s.*	*d.*
Ploughing	0	12	0
Harrowing	0	2	0
Planting	0	2	6
Thinning	0	8	0
Six cultivations at 2s.	0	12	0
Total to harvest	1	16	6
Cost of picking 1,081 lb. at 2d.	9	0	2
Baling of, bales, carting, &c.	0	11	0
Total	£11	7	8
Value of 1,081 lb. at 5d.	£22	10	5
Net profit per acre	£11	2	9

This estimate is probably favourable to the ratoon cotton since the picking costs have only been estimated at 2½d., whereas the actual cost on this farm using daily labour was nearer 4d. a lb. Similarly, the ratoon value was placed at 4d. although the Government guaranteed price for the two top grades of ratoon during the year under report was only 3d. The ratoon produced in these blocks was much superior, however, to the average of this class of cotton at present produced in Queensland. Nevertheless, the grade and quality was markedly inferior to that of the annual cotton grown alongside, and it was decidedly shorter in staple and also more irregular in character. Although the prices obtained by these cottons on the

open market are not yet to hand, it is believed that a fair approximation has been arrived at by placing the ratoon at 4d. a lb. and the annual at 5d. for seed cotton.

The Occurrence of Insect Pests.

There have been repeated arguments brought forward in the last three years by those who support ratoon cotton, that it is not so susceptible to insect pests as the annual plant. A trained entomologist was accordingly stationed at the farm for the whole of the growing period and a series of detailed observations were made. His records prove conclusively that not only were all the common pests observed on the ratoon in abundance, but that in the year under report the damage done was at least as great on the annual. Further, it was proved that the ratoon plants provided a favoured breeding ground for pests early in the season, since this cotton was earlier by about six weeks than the annual. As a result, the annual plots adjacent to the ratoon became attacked at an earlier stage than usual, and the pests spread out from the centre of infection to outlying areas. The pink boll worm, for instance, made its appearance first in the ratoon and spread out gradually over the whole farm, the plots nearest the ratoon having the heaviest infection of this and other pests.

Experiments at Monal Demonstration Farm.

This Demonstration Farm is located about 80 or 90 miles due south of the Callide Research Station, from which it is separated by a spur of the Main Range which runs east and west. This farm, however, is rather more elevated, being nearly 700 feet above sea level, experiences more severe frosts in the winter, and, therefore, has a somewhat shorter growing season. On the other hand, being situated nearer to the hills, it possibly possesses a slightly heavier and more dependable rainfall, which may average about 30 inches for a series of years.

The farm consists of about 600 acres situated on the Monal Creek, which is one of several creeks that form the head tributaries of the Burnett River, and comprises an area of alluvial soils along the creek with a portion of the low, rolling hillsides and slopes that form the borders of the valley. The soils are typical of the Upper Burnett New Settlement area in which it occupies a fairly central position.

The season on the whole was favourable for the cotton crop. The spring rains were good and frequent, and resulted in the young plant forming too many lateral roots and not developing a tap root. A somewhat sappy growth therefore resulted. The heat wave, however, was not so prolonged or so severe as at Callide, and although the first picking, especially on the lighter soils, contained many small and prematurely opened bolls, yet, as good soaking rain fell afterwards, the result was a very heavy second crop. An early frost on 22nd April stopped any chance of securing a record crop, but, nevertheless, excellent returns were harvested, and the average for plant cotton over 16 acres was over 1,550 lb., the portion planted in late September actually giving 2,200 lb. of seed cotton to the acre.

As at Callide, the variety grown was Durango. The land selected for the experiment consisted of a strip of alluvial soil along the creek frontage. In this locality the soil actually on the creek lies higher than a hundred yards or so further back, and consists of a light sandy loam gradually changing to a chocolate, and finally to a dark-grey clay loam the further one gets away from the creek. The plots were laid out in long strips to include all these classes of soil and were as level as possible in appearance.

Description of the Experiment.

The ratooned block consisted of an acre which was planted in the second week of November, 1923, and from which a good crop was harvested in 1924. The rows were 4 feet 6 inches apart and a good strike was obtained, plants being thinned out to 18 inches apart. The plot was ratooned to within a few inches of ground level in September, 1924.

Although the 1924 winter was a comparatively mild one for this part of the Burnett, yet a great many plants were killed out and a stand of only 30 to 40 per cent. was left over in the spring. The gaps were, however, filled in to some extent by self-sown plants or "volunteers."

The next plot of 2 acres was half planted on 5th January and half on 5th March, 1924. The object of this was to test out a theory that had been expounded by certain persons that the best way to grow cotton is to plant in the autumn months when good rainfall generally occurs and a good strike can thus be assured. In this experiment the March plant was entirely killed out, not a single plant surviving the early frost of 22nd April which registered about 7 degrees of frost. The January plant was slightly better, as the plants were older and tougher when the

frost occurred. An actual count of the plants surviving was made on 13th December, 1924. The total number of plants still alive on the whole acre was 88, and of this 79 occurred on the top quarter of an acre near the creek where the soil was a light sandy loam and was slightly more elevated, so that the frost was not quite so intense. After the count, the plot was ploughed out and prepared for maize.

The actual experiment resolved itself, therefore, into a relative test of one acre of ratoon cotton and one acre of plant cotton alongside. The yield per acre from the annual plant was 1,693 and from the ratoon 430 lb.

The following tables give the dates of each cultural operation and the costs thereof of the ratooned as annual experiment. The cultivation given and the approximate costs of production are given below:—

PLANT COTTON BLOCK.

Date.	Operation.	Cost. £	s.	d.
1924.				
1st Sept.	—Ploughed to 6 in.	0	12	0
10th Sept.	—Harrowed	0	2	0
23rd Sept.	—Cultivated	0	2	0
31st Sept.	—Planted 15 lb. seed per acre in rows 4 ft. 6 in. apart	0	2	6
5th Nov.	—Thinned out to single plants at 20 in. apart	0	8	0
14th Nov.	—Cultivated	0	2	0
8th Dec.	—Hand hoed	0	4	0
23rd Dec.	—Cultivated and laid by	0	2	0
1925.				
15th Mar.	—Picking commenced.			
		1	14	6
Cost of picking 1,693 lb. at 2d. per lb.		14	2	2
Total		15	16	8
Value of 1,693 lb. at 5d. per lb.		35	5	5
Net profit		£19	8	9

RATOON COTTON BLOCK.

Date.	Operation.	Cost. £	s.	d.
1924.				
8th Sept.	—Old stalks cut down to 3 in. of ground level, removed and burnt	0	10	0
11th Sept.	—Disc cultivated	0	2	0
19th Sept.	—Spring tooth cultivated	0	2	0
1st Oct.	—Hand hoed	0	4	0
6th Nov.	—Hand hoed	0	4	0
1925.				
16th Feb.	—First picking.			
		1	2	0
Cost of picking 430 lb. at 2½d. per lb.		4	9	7
Total		5	7	7
Value of 430 lb. at 4d. per lb.		7	3	4
Net profit		£1	15	9

It will be noted that but two hand hoeings were given to the ratoon section. It was found impracticable to destroy all of the weed growth in the row spaces, so that the hoeings consisted mainly of destroying any large weeds which were close enough to the cotton plants to endanger the cotton becoming entangled with the seeds thereof.

As was pointed out, the land was in a deplorable condition after the removal of the ratoon crop, and heavy expense will be incurred in getting the plot cleaned up free from weed growth during the next few seasons.

Conclusions.

The results for the 1924-25 season are perfectly conclusive so far as these forest alluvial soils the concerned. The annual plots in each case gave very much bigger yields and greater profits than the ratoon. It is a pity that lack of staff, and other considerations, did not permit of a repetition of these experiments on other classes of soil, and particularly on some of the "scrub" areas.

The method of ratooning indicates that no better yields are to be anticipated from standover cotton than from bushes that have been ratooned to ground level

or to about 8 inches. From the point of view of the insect pest menace, the latter two methods are certainly preferable.

The chief difficulty with ratoon cotton is that it tends to put out a number of suckers early in the spring and that these spread out horizontally and hinder the use of cultivation by horse implements. Unless, therefore, the hand hoe is used (and this can only be done in small areas because of the great expense entailed) the weeds get the better of the cotton, and the soil moisture is rapidly used up. Any dry spell that occurs in November and December, therefore, results in the ratoon plant shedding its squares grown and bolls very heavily at this stage. This point was shown up very clearly by the boll counts taken. In order to try and obviate this difficulty an interesting experiment was conducted at Monal Farm. In the second week of December, two rows or ratoon cotton, each 10 chains long, were treated so that the suckers on each ratoon plant were cut away, only one strong sucker being left to each plant. At this stage the plant had produced all its suckers and was full of newly-formed squares. It took three men working with brush hooks half an hour to complete this work, or thirteen and a-half hours for one man to do an acre. With wages at 13s. 6d. a day, this would add 22s. 6d. to the cost of cultivation. The experiment was repeated on a small scale at Gatton. In each case the plants so pruned grew more normally and the remaining sucker grew more upright and produced bigger bolls and cotton of better quality than the ordinary ratooned bushes, but the actual yield per bush appeared to be less. Lack of staff did not permit this experiment to be carried out to a final stage, but the results so far as they went were interesting.

So far as pests were concerned, the ratoon plots certainly showed no superiority over the annual, and, in fact, in the Gatton plots the reverse was very distinctly the case. It was definitely proved at all three centres that the ratoon plots acted as a breeding ground for all the principal pests early in the season.

The difficulty of picking was much greater in the ratoon than in the annual, and this was to be expected, having in view the low spreading nature of the ratoon plants and the number of bolls that lie near the ground.

As regards the quality, it was the definite opinion of the experts on the cotton staff of the department that the ratoon was inferior in drag and lustre, and was also somewhat shorter in staple, and the fibres showed more irregularity in length. The grades were definitely inferior, and this was only to be expected, since the ratoon is earlier than the annual and suffered more from rain when the first bolls were ripe, and also since many of the bolls are so close to the ground, they naturally pick up dirt. A preliminary examination in the laboratory was made and the details are given below:—

Ratoon and Annual Cotton for Spinning Tests at the Shirley Institute, Manchester.

Brand.	Origin.	Class of Cotton.	Weight of 100 Seed Cotton.	Weight of 100 Seeds.	Weight of Lint from 100 Seeds.	Lint Index.	Ginning per cent.	Number of Bolls per lb.
3A ..	Monal Creek Demonstration Farm	Durango Annual	21·44	13·52	7·92	7·92	36·94	65·9
3B ..	Monal Creek Demonstration Farm	Durango Ratoon	20·62	13·14	7·48	7·48	31·4	71·2
2A ..	Melton Research Station, Callide	Durango Annual	20·72	13·6	7·12	7·12	34·3	78
2B ..	Melton Research Station, Callide	Durango Ratoon	17·74	12·43	5·31	5·31	30·1	98·2
1A ..	Gatton College	Acala Annual	17	10·98	6·02	6·02	35·4	86
1B ..	Gatton College	Acala Ratoon, pruned to 8 in.	13·94	9·14	4·8	4·8	34·4	77·4
1C ..	Gatton College	Acala Ratooned to last node	13·32	9·24	4·08	4·08	30·6	92·7
1D ..	Gatton College	Acala Ratooned cow pruned	13·12	8·88	4·06	4·06	32·3	86·5

N.B.—Weights are recorded in grammes.

In order to settle this question of quality, large samples from all these plots have been sent to the Director of the British Cotton Industry Research Association's Laboratories, at the Shirley Institute, Manchester, who has most generously promised to co-operate in this matter. The cottons from the various plots will be subjected to an exhaustive series of technicological tests and to a spinning test, and the results will be published in due course.

COTTON THINNING AND SPACING EXPERIMENTS FOR THE SEASON 1924-25.

By W. G. WELLS, Cotton Specialist.

The problem of the proper distance to space the plants and the rows in the cotton crop in Queensland is of a very complex nature, and it is questionable if a really satisfactory solution may be obtained. The soil and climatic conditions are so variable that it appears nearly impossible to arrive at any distances which will give the maximum yields for each season over a series of years.

There seem to be certain fundamental facts, however, which enter into the growing of cotton in nearly all parts of the State, and these must influence the problem of spacing and thinning to a marked degree. The weather records for nearly all sections of the cotton belt show that, as a rule, the rainfall is somewhat erratic during the late winter and the spring months. This necessitates a system of cultivation being employed in which the land is ploughed in the fall as soon as the cotton crop is removed and the soil left in a loose condition to allow full advantage being taken of any rains which may occur. This enables a grower to obtain a good strike on a light fall of rain, as the rootlets soon become established in the moist subsoil, and thus are able to develop even under droughty conditions.

The possibility of these droughts occurring after the planting period must be taken into consideration, as in some seasons they are of a prolonged nature, with a resulting check on the development of the plants, and in some cases cause the complete loss of the crop.

Another factor of great importance is the possibility of excessive amounts of rain being received during the critical period when the fruiting system of the plant is being formed. A reasonable amount of rain falling at this period is of great assistance in developing a well-balanced plant, while excessive rain may cause an over-development of the structure of the plant at the expense of the fruiting system.

It is obvious then that the problem requiring solution is, what system of spacing and thinning offers the most assurance that the plant will be able to withstand the variable seasonal conditions and return a profitable yield over a series of seasons.

With this as the accepted definition of the problem confronting the cotton growers, the Department of Agriculture and Stock has been conducting experiments in thinning and spacing for the past season on the State Stations, and with grower co-operators in different parts of the cotton belt.

The results obtained have not been altogether satisfactory, as several of the co-operators' plots were not taken care of properly, and, in some cases, attacks from various insects caused such losses as to make the experiment of little value. The experiments on the State Farms were completed, however, and these will be discussed to show the effect of the different spacings and thinnings.

Monal Creek Demonstration Area—Season 1924-25.

Mr. S. T. J. Clarke, Manager. Mr. K. V. Henderson, Investigator.

Row Spacing.	Plant Spacing.			
	6 Inches.	12 Inches.	18 Inches.	24 Inches.
3 feet 6 inches	1,834	2,030	1,344	1,393
4 feet	1,949	1,653	1,758	1,492
4 feet 6 inches	1,783	1,732	1,460	1,256
5 feet	1,711	1,548	1,345	1,223

Mr. Henderson's notes on the growth and general results obtained from this experiment are quoted.

> "The rows spaced at 3 feet 6 inches and 4 feet and plants at 6 inches, were very erect in growth, carrying little or no bottom crops. This was improved slightly, but not very much, in the wider spacing at 5 feet.
>
> "The 12-inch spacing was also deficient in bottom crops. At 18 inches, the spacing at 4 feet and 5 feet was the best, although there was very little difference between them and the 4 feet 6 inches. The 5 feet rows at 24 inches were the best in this section in regard to bottom crop, and would have probably given a higher percentage yield than the majority of crops on the farm, had it not been for a fairly bad insect attack early in the season.
>
> "Comparing the yields, the closer spacings have done the best, but allowance should be made for the rainfall for this season, which has been rather excessive."

The following table shows the rainfall for the season in which the experiment was grown, and also the average over a series of years for the corresponding months, so that it can be seen that the rainfall in the three critical months of the development of the crop—November, December, and January—was above normal and of sufficient intensity to have a marked effect on the development of the plant.

Season.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Total.
1924–1925	108	150	191	673	447	592	234	323	27·18 inches
1890–1924 .. .. (Average)	122	149	223	253	398	421	336	314	22·16 inches

Mr. Henderson noted that the bottom crop was lacking on nearly all spacings except the 24-inch distance in the 5 feet rows. This would seem to indicate that the closer spacings caused a rapid spindly growth due to the luxuriant growing conditions of the months of November, December, and January, and the fact that the soils on which the experiment was conducted were of a very fertile nature. Unfortunately, a heavy insect attack was received so that the yield per plant in the wider spacing was seriously affected.

The 6-inch spacing, with one exception, gave the highest yield per acre in all four of the spacings between the rows that were used. This can be explained by the fact that the greater number of plants per acre, while not having as many bolls per plant, would yield the greatest number of bolls per acre. Under conditions where there was abundant soil moisture, the competition between the closely-spaced plants would not affect the size of the bolls to a marked degree, and therefore the yield from the close spacing would be the highest.

Somewhat similar results were obtained in the way of yields on the State Farm at Home Hill under the managership of Mr. Munro. As will be noted, the results obtained were not so uniformly consistent as at Monal Creek.

HOME HILL EXPERIMENT.

—	6 Inches.	12 Inches.	18 Inches.	24 Inches.
3 feet 6 inches	950	784	921	647
4 feet	860	708	501	512
4 feet 6 inches	700	600	581	494
5 feet	653	575	706	749

Unfortunately, the first crop of bolls opened in the wet season and, according to Mr. Munro's notes, was destroyed. The boll rots caused much damage during the wet season and some damage was caused by a slight attack of the "boll worm" in the early growth. Monolepta Rosea was responsible for damage to the foliage during December, so that the non-uniformity of results possibly may be explained under these incidents.

The plants grew in most cases to an average of 6 feet in height and of a luxuriant nature, so that the loss of the lower crop under wet season conditions by boll rots could be expected.

The rainfall for the months from November to April, inclusive, was as follows:—November, nil; December, 1.72 inches; January, 2.30 inches; February, 10.85 inches; March, 2.10 inches; April, 4.08 inches.

One effect of the closer spacing between the rows was to lessen the yield at the third picking, all spacings between the plants in the 3½-feet row spacing with the exception of the 6-inch, having been markedly less than those of the wider row spacings. Not much difference occurred between the plant spacings in the wider spaced rows, so that the explanation may be that of extra light penetrating to the ends of the lower fruiting branches on the plants in the wider spaced rows and thus allowing the maturing of the bolls over more of the outer surface of the plant.

No appreciable differences were obtained at Monal Creek or at Biloela owing to the early frosts in the first place and the effects of the heat wave and early frosts in the latter place, which destroyed the whole of the top crop.

The experiment at the Cotton Research Farm at Biloela, in the Callide Valley, was placed on a piece of new cultivation. Owing to the adverse climatic conditions that existed from January on to the end of the crop, and to a somewhat spotted soil, a marked irregular growth of the plants was developed. In reality, the results obtained from the experiment cannot be considered to be of much value, but they are included in the report as a matter of record.

CALLIDE COTTON RESEARCH FARM.

Manager, L. W. Ball. Observer, I. G. Hamilton.

Yields in lbs. of seed cotton per acre.

—	6 Inches.	12 Inches.	18 Inches.	24 Inches.
3 feet 6 inches	1120·1	1057·9	1306·8	1369
4 feet	1252·4	1034·5	1306·8	1143·5
4 feet 6 inches	1064·8	968	1064·8	1210
5 feet	1045·4	1089	914·8	958·3

It is unfortunate that such a variation in the plot developed, as the conditions under which this crop was grown included a long, dry period during the critical stage of the development of the fruiting system which the experiments at Monal Creek and Home Hill did not receive. This is an occurrence which may happen in any season under such erratic climatic conditions as exist in Queensland, and it is very important that all experiments shall undergo such a test.

The season of 1923-24 at Home Hill more nearly approached this condition, so that the results from the same experiment which was conducted at this station in that season are included.

Home Hill (Manager, Mr. Munro).

The rainfall for the months from January to May in 1924 was as follows:—January, 1.93 inches; February, .05 inches; March, .10 inches; April, 1.09 inches; May, nil.

Yields in lbs. of seed cotton per acre—Season 1923-24.

—	6 Inches.	12 Inches.	18 Inches.	24 Inches.
3 feet 6 inches	199·1	385·82	609·85	696·97
4 feet	359·4	*217·8	544·5	*457·3
4 feet 6 inches	*280·7	755	*561·4	1006·7
5 feet	601·1	766·6	757·9	923·5

* Poor stand—irregular spacing.

These results, while rather low in some cases, show the value of the wider spacing both between the rows and the plants.

This is of great importance, as it verifies the general observations which have been made in the field that the amount of soil moisture which may be expected through the growing season, should, to a great extent, be the determining factor in spacing the plants in the row. Where the average rainfall is low and the growing season is characterised by droughts or heat waves, it appears necessary for the plants to have more soil surface from which to draw moisture and plant food.

If a good season generally is experienced in which rains occur at the critical stage of development of the plant, especially of the fruiting system, the best results may be obtained from closer spacing of the plants in the row. In Queensland this does not follow always, as the incidence of pests and boll rots may make a wider spacing necessary in order to allow sufficient light and air to penetrate to the lower portions of the plant.

The consensus of opinion amongst the farmers is that a spacing of 20 to 24 inches seems to have given the best results over the last three years, especially so in the dry areas and in some of the coastal areas.

The usual occurrence of rains in December and the first part of January makes cultivations between the rows necessary when the plants are of a good height. It has been found that 4½ feet seems to be the minimum width between the rows, since this allows a horse and scuffler to pass down the row without doing appreciable damage to the ends of the branches.

This has been accepted as the standard width in the dryer belts, as the plants seem to withstand the droughts and heat waves better than when the rows are spread 3½ to 4 feet apart.

In some sections of the coastal areas or on rich alluvial creek flats in the inland belt where good rainfalls may be experienced, it may be advantageous to space the rows 5 feet apart in order to avoid the over-lapping of the middles of the rows, and thus allow the light and air to penetrate to the lower parts of the plants.

It can be seen that the problem of spacing the rows and the plants is a very difficult one, and a system which gives the maximum results one season may be unsuitable entirely for the same soil under different climatic conditions. Each grower should experiment carefully to determine the distances which will give the best average yields over a series of years, rather than try to obtain a system which will give the maximum yields each season.

APPLES FOR BREAKFAST.

What is said to be a novel combination of fruit and cereal in the shape of a new breakfast food is soon to be placed on the Nova Scotian market. It is reported that the new food is composed of apples and wheat and was evolved as the result of a visit by a food expert of the Department of Colonisation Development of the Dominion Atlantic Railways to the Annapolis Valley with the object of investigating the manufacture of food products from the Valley resources. A series of experiments, it is said, culminated in the successful blending of apples and wheat in flake form. This is said to be the first time in the history of the cereal industry that such a combination has successfully been made.

The food is in the form of a golden flake resembling closely the better-known corn flake which is now on the market. The flavour of the new flake is that of the apple. The product is well dried and consequently is said to possess good keeping qualities in addition to being palatable and easily digested.

A SYSTEMATIC NOTE ON AN IMPORTED LUCERNE PEST, WITH DESCRIPTION OF TWO NEW ALLIED SPECIES.

By A. A. GIRAULT, B.Sc.

During the past year or so specimens of what appeared to be *Bruchophagus funebris* Howard, a small black hymenopteron of the Eurytomine chalcid-flies were shown to me by several officers of this Department, more especially Mr. Henry Tryon. Recently the writer had an opportunity of making examination of additional specimens, confirming the identity of the insect. The species was originally described from North America and hitherto had not been known to me as occurring in Australia. However, upon making inquiry, I found that its occurrence had already been recorded (Froggatt, 1910, 1919), and the writer takes this opportunity of pointing out its characteristics only and describing several allied native species of the same family.

Bruchophagus funebris Howard.

Aside from the generic characters already recorded in literature, but which I am certain will not hold in the face of the large variation in the genus *Eurytoma*, the species *funebris*, as compared with Australian species of *Eurytoma* and *Bruchophagus* is characterised by the structure of the propodeum, which bears neither a median channel nor a median basin, but is flat on the disk and there punctulate. This punctulate area is distinctly wider than long and occupies nearly the whole dorsal aspect.

The first definite record of Australian habitat is by Froggatt (1919).

Eurytoma larvicola new species.

This species is very similar to the preceding species, *funebris*, but the punctulate area on the propodeum is barely wider than long and does not occupy the whole dorsal aspect; moreover, segment 5 is distinctly longest. Abdomen ovate. Lateral ocelli barely closer to eye than to median. In a revised table of the genus this species runs to *australiensis* Ashmead and is grouped with *funebris*, *inconspicuus*, and the following new species. In this table *Bruchophagus* is included, as I have not been able to keep it distinct from *Eurytoma*. Reared from *Agromyza phaseoli* at Cairns, North Queensland, 1915, A. P. Dodd and received from Mr. E. Jarvis.

Eurytoma striatifacies new species.

Runs to *australiensis* but small, the abdomen distinctly compressed, elevated above at base, 6 only half as long as wide, 5 shorter, distinctly higher than long; propodeum with a punctulate median basin which is triangular and bears a median channel which narrows as it leaves base. Segment 6 half the length of 7. Face below antennæ long-striate. Otherwise as in the above species. Tibiæ black save apex. Reared from a braconid parasitic upon *Cirphis unipuncta*, Cairns, Nth. Qld., 1914, A. P. Dodd. Received from Mr. Edmund Jarvis.

Bruchophagus inconspicuus Girault.

This name is preoccupied by *Eurytoma inconspicua* Gir. and I here propose the new name *bruchophagoides* for it.

References.—Froggatt, W. W., Agric. Gaz. N.S. Wales, 1910, p. 544; 1919, p. 251.

Historical note:—

The Chalcid Lucerne Seed Fly.

The fact of the occurrence of the lucerne seed Chalcis (*Bruchophagus funebris* How.) in Queensland, associated with the plant whence it derives its popular name, was not established by the present writer until a comparatively recent date—1922.

In fact, in September of that year, having in view its probable occurrence here, he sought from, and was courteously accorded by, Mr. F. F. Coleman an opportunity of examining reserved samples of lucerne seed that the latter had previously tested for ascertaining its germinating qualities, &c., with the result that he then discovered chalcis-injured seed, still harbouring dead *Bruchophagus* adults that had emanated from two of these samples—one each from Bundaberg and Gladstone respectively.

It was, however, to be concluded at the time that these occurrences were merely afforded by seed being purveyed by the local seed merchant, and had no necessary reference to the existence, in either of the districts named, of the insects living at large endemic therein.

However, Victoria had recently encountered *Bruchophagus funebris* in lucerne seed on it having been received from the other States of the Commonwealth, and had issued regulations for safeguarding the condition of future consignments of the kind, requiring a certificate of freedom from the presence of the Chalcid Seed Fly to ensure their admission, and had asked Queensland to conform to this provision.

And very shortly after this, evidence was forthcoming of the definite occurrence of Bruchophagus in our lucerne fields, and not in one or more seed stores only.

Thus, on 13th February, 1923, the Local Producers' Association of Greymare, Warwick district, noticed that the seeds of lucerne were being destroyed by its small grubs, entire crops being thus injured; and already on 9th April Stock Inspector J. R. W. Munro reported to us that "the borers had destroyed several crops of lucerne seed," also in the Warwick district.

Further, an inquiry instituted by a local resident, Mr. H. L. Pentecost, resulted in tracing the existence of the "Lucerne Seed Chalcis" through different farms extending for 5 miles from Greymare to Rodgers Creek, whence had emanated the original seed from which the Bruchophagus-infected paddocks of the former area had been derived.

Samples of damaged lucerne seed-pods forwarded were found to exhibit numerous exit holes that had been made by the parasite, and to have had their seeds, in fact, generally eaten out by it, whilst they also yielded the insects themselves.

It is of interest, however, to note that, not only in its case but also in that of the lucerne seed originally found damaged by us in the previous year, another small chalcid of a metallic blue-green colour accompanied the black-coloured Bruchophagus, evidently being one of its parasites.

Having ascertained from the well-known Greymare lucerne growers, Messrs. A. J. W. Wickham and H. L. Pentecost, the former of whom has been growing lucerne seed for the last thirty years, that it was practicable to "burn off" lucerne paddocks without injury to the plants, except when the ground thereof was very dry, this procedure was advocated by us, since it presented the simplest method for in some measure controlling this redoubtable seed-destroyer; whilst examination of lucerne seed prior to its being purchased in order to ascertain that it was free from any that had been bored-into, that should always be regarded with suspicion, was stressed as an important safeguard.

It is of interest to learn that during the present month—October, 1925—the eminent authority on the Chalcididæ, A. A. Girault, has confirmed the correctness of our identification of the Queensland Lucerne Seed Chalcid with Howard's *Bruchophagus funebris*.—Henry Tyron, Government Entomologist.

QUEENSLAND SHOW DATES, 1926.

Stanthorpe : 3rd to 5th February.
Warwick: 9th to 11th February.
Allora: 17th and 18th February.
Clifton: 24th and 25th February.
Newcastle (N.S.W.): 23rd to 27th Feb.
Killarney: 10th and 11th March.
Milmerran: 31st March.
Sydney Royal: 29th Mar. to 7th April.
Herberton: 5th and 6th April.
Miles: 7th and 8th April.
Pittsworth: 8th April.
Chinchilla: 13th and 14th April.
Kingaroy: 15th and 16th April.
Toowoomba: 20th to 22nd April.
Nanango: 29th and 30th April.
Dalby: 29th and 30th April.
Taroom: 3rd to 5th May.
Oakey: 6th May.
Toogoolawah: 6th and 7th May.
Murgon: 6th and 7th May.
Goombungee: 13th May.
Boonah: 12th and 13th May.
Kilkivan: 12th and 13th May.
Roma: 19th and 20th May.
Wondai: 19th and 20th May.
Ipswich: 19th to 21st May.
Wallumbilla: 25th and 26th May.
Esk: 26th and 27th May.
Maryborough: 25th to 27th May.
Childers: 29th to 31st May and 1st June
Marburg: 2nd and 3rd June.
Bundaberg: 3rd to 5th June.
Gin Gin: 8th to 10th June.
Woombye: 16th and 17th June.
Lowood: 18th and 19th June.
Gatton: 30th June and 1st July.
Kilcoy: 1st and 2nd July.
Laidley: 7th and 8th July.
Biggenden: 1st and 2nd July.
Woodford: 8th and 9th July.
Wellington Point: 10th July.
Maleny: 21st and 22nd July.
Rosewood: 23rd and 24th July.
Royal National: 9th to 14th August.
Crow's Nest: 25th and 26th August.
Coorparoo: 28th August.
Wynnum: 3rd and 4th September.
Zillmere: 11th September.
Rocklea: 25th September.

RECORDS AND DESCRIPTIONS OF AUSTRALIAN OPHIONINAE (ICHNEUMON—FLIES).

A. A. GIRAULT, B.Sc., Virg. Polyt. Inst., Assistant Entomologist.

The following records and descriptions are based upon the joint collections of the Queensland Department of Agriculture and Stock and of the Queensland Museum, and are the result of preliminary studies directed toward the vast system of the Australian Ichneumonidæ, as yet very little known. A species of Pimplinæ is also included herein.

1. *Paniscus productus* Brullé.[1] *Paniscus contrarius* Morley.

The following locality records in Queensland:—

Brisbane, 28th June, 1915 (Tryon and Bridwell); January, 1901, April, 1903 (T. Batcheler); April, 1898 (A. H. Benson). Stannary Hills, March, September, 1909 (Dr. T. L. Bancroft). Deception Bay (Bancroft). Indooroopilly, from larva *Heliothis obsoleta*, E. Jarvis, 18th June, 1912. Mount Gravatt, 11th May, 10th June, 1916 (T. Batcheler). Mundubbera, in cotton, March 1924 (J. H. Simmonds). Guluguba, forest, 24th January, 1924.

The species *contrarius* Morley and *productus* Brullé are certainly the same; the areolet varies considerably, and in the above series I have been unable to draw a line between the two. The nervellus did not vary. In both sexes the stigma may vary to yellow and yet the areolet bear the produced arm very distinctly. This fact, therefore, throws doubt upon the validity of *testaceus* Grav.

The Queensland Museum has specimens from the following localities:—

Brisbane, 20th April, 1915; 17th March, 1913 (H. Haeker). National Park, Q., December, 1921 (Hacker). Mount Tambourine, Q., 2nd April, 1911 (Hacker). Charleville, Q., 12th September, 1925. Georgetown, 22nd November, 1915, and St. Patrick's River, Tasmania, 31st January, 1914 (F. M. Littler).

2. *Paniscus testaceus* Gravenhorst.

Brisbane, 8th September, 1915, and Caloundra, Q., 28th September, 1913 (H. Hacker). The several specimens did not differ from *productus* except in the yellow stigma and somewhat smaller size. It is a doubtful species.

3. *Paniscus gracilis* Morley.

Three females identified by Mr. Hacker and also collected by him at Brisbane, 1st October, 1918, and 23rd May, 1916. It is characterised by its very small size and very small (not elongate) areolet. The latter was subsessile in these specimens. Its colour appears stable. Otherwise as in *productus*.

4. *Henicospilus flavivenae* nov.

Runs in Morley's table to *antennatus* but corneus line is attached to the basal mark, elongate, extending distad around the smaller but not minute distal mark; and to *turneri* but entire venation is flavous. Corneous line nearly attaining radius. Differs from *melanospilus* mainly in colour of venation.

Flavus, antennæ red, nearly as long as body; legs, abdomen brown. Metathorax longitudinally, coarsely rugose. The distal mark of wing is large and inverse-triangular to the basal.

A female, Stannary Hills, T. L. Bancroft, September, 1909. The descriptions of New Guinea species have not been available.

5. *Henicospilus trinotatus* Morley.

These following specimens identified as such but Morley does not describe the marks of the wing. In the Department of Agriculture collection a female, Southport, Q., 21st September, 1915 (Perron), and two males, Lawnton, Q., 30th November, 1909 (E. Jarvis). The jaw teeth were equal in all.

The corneous marks of the wing are as in *turneri* but the line by being separated from the apex of the large basal mark for some distance makes three corneous marks. Sometimes one tooth of the jaw is twice the size of the other. Basal vein discontinuous. Discoidal vein slightly angled, the basal arm exceeding the distal. Metathorax rugulose. Costa at base, stigma, thorax, red, orbits only flavous. Venation mostly testaceous. The male is similar. These notes from specimens in Queensland Museum as follows:—

Brisbane, 20th, 24th, November, 1913; 24th December, 1912; 23rd April, 1916 (Hacker). Caloundra, 28th September, 1913 (Hacker). Stradbroke Island, 3rd December, 1912 (Hacker). Selby (15th April, 1918) and Beaconsfield (17th March, 1918), Victoria (F. E. Wilson).

In the female from Stradbroke Island the median basal cell was nonciliated, usually sparsely ciliated; and the basal corneous mark larger, the distal minute. In the Victorian specimens the propodeum was longitudinally rugulose. A female which flew into light at Gympie, 27th October, 1924, pricked me severely with its ovipositor when I caught it in my hand.

6. *Henicospilus trinotatus* Morley var.

In the above specimens a female with jaw teeth equal and the basal arm of discoidal nervure with a distinct sinuation beyond middle. I hesitate to name it. From Ebor, New South Wales, 3rd January, 1914 (A. J. Turner).

7. *Henicospilus ruskini* nov.

Runs to *amplipennis*. Antennæ nigrescent, red, black at base; scape, pedicel fuscous beneath; brown, head except clypeus and labrum pale yellow; abdomen beyond 2 black; mesonotum save distad, nigrescent. Veins, stigma black, latter with costa deep black. Basal corneous mark continued in a line to the minute distal but the line is clear near middle. Metathorax as in *flavivenæ*. Nervellus intercepted far below centre, the external vein parallel for its basal half with the vein cephalad of it. Antennæ somewhat exceeding body. A female, jungle, Montville, 14th to 15th June, 1924.

8. *Henicospilus longinotus* nov.

Male. Runs to *nigrinervis* but all red, head and stigma flavus, antennæ somewhat exceeding the body, the discoidal cell subrectangular below distad. The corneous mark is long-elliptical as in *coarctatus* and distal, its outer end projecting into the ciliation, axis longitudinal. Three dark vittæ indicated on scutum. Basal vein strongly discontinuous. Stannary Hills, Q., September, 1909 (T. L. Bancroft).

9. *Henicospilus coarctatus* Brullé.

A female, Brisbane, 14th March, 1913, H. Hacker (coll. Q.M.). Fits Morley's table. Stigma yellow. Corneous mark distad, elongate, spindle-shaped, distinct. The identification is more or less assumed because we do not know the shape of the corneous mark. The nervellus is nearer to base than to centre.

10. *Henicospilus sinuatus* nov.

Runs to *coarctatus* but deflection of radius doubly curved (sinuous) and thicker; corneous mark basal, triangular, and with a very long line extension quite around distal end of glabrous area. Propodeum foveolate. Nervellus somewhat higher, basal vein continuous (lower part nearer base in other). Antennæ dark. Orbits flavous, face red. The face may be flavous.

Brisbane, April, 23rd May, 1916 (Hacker); also April, May, September, October. St. Patrick's River, Tasmania, 31st January, 1914 (F. M. Littler). Glen Innes, New South Wales, 26th April, 1916 (Q.M.).

11. *Henicospilus turneri* Morley.

The following Queensland Museum records: Brisbane, 6th April, 1911; 30th March, 1913; 5th May, 1914; 23rd October, 1922. Mount Gravatt, 12th January, 1913, all by Hacker.

These were identified by Hacker and I have concurred in the identification after examining the specimens. They fit the table, but the basal corneous mark is rather large, triangular, as in *sinuatus*, the line is distinct and runs to the radius (or nearly) behind the outer mark. Antennæ red. The basal vein is subcontinuous; radial cell not restricted at base. The last three segments and apical half of the one preceding them are black, a characteristic. Trans-carina on metathorax strong, region longitudinally striate distad of it.

12. *Henicospilus melanospilus* Morley *rex* nov.

Two pairs which run to this species in the table, Brisbane, 26th April, 6th November, 1911; 28th April, 1914 (Hacker). These agree with the remarks made under the original description of the species, but the inner corneous mark is yellow

and scarcely half the size of that in *turneri*, the line is longer, narrower, the marks being distinctly more widely separated; the body is smaller, more slender, metanotum cross-rugulose, distal mark *far toward apex* first radial vein. A fifth female similar but metanotum longitudinally striate, stigma yellow, lower branch of basal vein somewhat proximad of the upper.

13. *Henicospilus consobrinus* nov.

As *coarctatus* but the corneous mark is a thin line somewhat curved proximad, propodeum with the transcarina and irregular rugæ very coarse (fine in other). General colour brown, head yellow, abdomen, antenna red. Antennæ a bit exceeding the body. Venation brown; discoidal nervure not forming a subsinuate bow as in other but distal arm straight, angled with the shorter proximal. Jaw teeth somewhat unequal.—Queensland.

14. *Exochilum scaposum* Morley.

The scape may be reddish or yellow. The following specimens agree with Morley's description otherwise (as corrected by Turner), but the flagellum is red, the metanotum bears a median sulcus, the submarginal nerve is interrupted somewhat below centre but sometimes at the centre. The male is similar. The red of the legs may vary to flavous and legs 1-2 may be all flavous. The scutum is impressed caudad at meson and there finely cross-lined. In one male from Murarrie the nervellus was intercepted far above centre. The following departmental records:—

Corinda, August, 1900, S. B. J. Skertchley. Deception Bay, T. L. Bancroft, parasite of *Heliothis obsoleta*. Murarrie, 26th September, 1908. Roma, associated with gall on narrow-leafed ironbark, 14th February, 1915 (H. Tryon). Brisbane, November, T. Batcheler. Mount Gravatt, June, T. Batcheler.

The Queensland Museum has a series collected at Brisbane, September, November, December, 1911; October, 1913; 26th February, 1916 (Coolangatta); 2nd April, 1917; March, December, 1918. Also Tambourine Mountain, 28th December, all by Hacker.

15. *Pristomerus bicinctus* nov.

Larger than *atriceps*. Wings nearly black. As *atriceps* but abdomen black except venter and sides of 1 at apex and all of 2; venters of 3-6 save a large, round black spot ventro-laterad, at base of each; apices of 3-5 (save at meson above of 5), these white, the 3 cincti running half way down sides. Leg 3 save coxa above at apex, also black, the other legs more or less infuscated. Areola half longer than wide, 5-sided, truncate at apex, subacute at base; petiolar and adjacent areæ laterad, cross-rugose, the petiolar area long-rectangular. Facial orbits and vertex behind ocelli, red. Scutellum with sparse pin-punctures. Basal area subtriangular, sides converging but not meeting at apex. Femur 3 at lateral apex more or less pale. Large tooth femur 3 at middle, followed to apex by 13 minute teeth. Apices segments 6-7 may be narrowly white. Mesopleurum glabrous widely in disk.

Male similar but frons narrower. Stradbroke Island, several of each sex, 2nd October, 1911 (Hacker).

16. *Ophion partithorax* nov.

Runs in Morley's (1912) table to *inutilis* Smith, but antennæ dark red, metapleurum normal, the other colouration as in *Exochilum scaposum*, which this species resembles. It is distinctly larger, however. Hind metatarsus black save apex, scutellum and postscutellum reddish-yellow. Scape and first (ring-like) flagellar joint all yellow, also the cheeks (continuously with the orbits and face). Last 3 abdominal segments, with claspers (but excluding base ventrad of the first segment) black. Tegulæ yellow. Scutellum sparsely punctate, with a median depression. Propodeum with a wide median cross-rugate groove, also a similar dorso-lateral one, the spiracle oval.

A long sulcus, followed by a hairy ridge, from near base wing 2 to coxa 2. Ocelli not large. Segment 2 above black. Antennæ somewhat shorter than body. Second recurrent nervure from apex first cubital cell, nearly continuous with submarginal whose lower branch is very short. Ramellus absent. Nervellus intercepted at middle. Stigma subflavous. Mesopleurum reddish just beneath tegula.

A male. Stannary Hills, T. L. Bancroft, September, 1909.

17. *Mesochorus australicus* nov.

In Morley's (1913) table of Indian species runs to *claristigmaticus* but differs notably in the wholly jet head and thorax and longer terebra (latter about twice the second segment).

Head, thorax, antennæ, ovipositor, coxa 3 except beneath, abdomen 1 at proximal half (more or less), jet; abdomen, legs brown, darker on segment 2 above and tarsus 3; jaws, scape and pedicel beneath, tegula, coxæ and trochanters 1-2, flavous; venation brown, stigma flavescent, often with a hyaline spot at base. Head, thorax punctulate, head more finely, both pilose. Scutellum convex. Basal area small, quadrate, areola and petiolar area continuous, at first triangular (to apex of external area), then rectangular to middle where for about proximal ½ of rest, the costulæ diverge and then converge to apex; on either side a large, semicircular external area and caudad of that, an elongate, triangular dentiparal-posterointermedial area with its base against the external area, apex at widest divergence of petiolar area.

Abdomen finely coriaceus, pilose distad of 2, 1 petiolate, somewhat exceeding 2, 3 somewhat longer than wide; propleurum cross-striate centrally.

A female, window, Brisbane, May, 1896; and 3 others (types) reared from dried apples infested with apparent larvæ of *Plodia interpunctella*, April, 1897, Brisbane. Both by H. Tryon.

18. *Charops pulchripes* nov.

Black, wings clear, stigma black; legs 1 save base of coxa and tarsal 5, 2 save coxæ and tarsals 4-5, tegulæ save at base, radix, base and apex narrowly of femur 3, base more widely tibia 3, flavous; abdomen beneath yellowish. Palpi pale. Jaws yellow. Segment 2 with a dark red spot laterad near apex, 3 and 4 each with another nearer middle.

Lateral ocelli closer to eye than to median. First joint flagellum over twice longer than wide; antennæ slenderer distad; median carinæ of metathorax diverged at base, converging and again gradually diverging nearly to apex; an oblique dorsolateral carina runs toward each distad. Mesopleurum cross-rugulose. Axis of spiracle oblique. Ovipositor distinctly shorter than 3 (first segment counted here as 2); segment 4 not quite half of 3. Second discoidal cell subquadrate and larger. Basal nervure subcontinuous. Closely pilose, metathorax without long hairs. Scutellum with a distinct wide discal impression, base to apex, the lateral margins ridged. Tarsal 1 in leg 3 nearly twice tarsal 2. Otherwise as *obscurus*. Hind tibial spurs flavous.

Two females, each reared from a tough, oval, grey cocoon with black poles and an encircling band of black spots toward each end; the cocoons are pediceled. On cotton, Queensland, F. G. Holdaway.

A third female from orange foliage, Montville, June, 1924. It was reared from a similar cocoon and lacked the red spots on lateral abdomen.

19. *Polysphincta glabrinotum* nov. (Pimplinæ).

Flavus; dorsad (except head), leg 3 embrowned, the deep, complete notauli and the propodeum distad, concolorous. Stigma, terebra, apex tibia 3 rather widely, ocellar area and a dot on each side meson apex propodeum jet. Antennæ dark, scape beneath flavus, flagellar 1 flavescent, twice the scape, elongate, much exceeding 2; last 5 or 6 flagellars flavescent, ultimate longer than penultimate. Wings subhyaline.

Clypeus entire cephalad, convex. Scutellum flavus, small, convex. Metathorax with a pair of separated median carinæ and from near each, about its middle caudodistad, a ridge-like elevation; apically these carinæ become acute and move toward coxa 3. Spiracle minute, round, lateral in aspect.

Segments except first and last, with a mound-like "tubercle" on each side meson, with wide, shallow cross-impressions behind each; punctate except hind margins, ultimate segment mostly and penultimate distad; hind margins more or less carinate, 1 with an oblique median sulcus, 2 quadrate, longer than 1, spiracles of latter before centre. Ovipositor about half abdomen. Cephalic tibial spur single, normal. A female, Yeronga, 3rd June, 1924. Forest.

SPINNING TESTS OF QUEENSLAND COTTON.

In the season 1923-24 arrangements were made at the request of the Government to carry out field tests between ratoon and annual cotton with a view to having proper comparisons made, and, if possible, for the arrangement of spinning tests.

It was asserted by the Government from the first that the real test as to the respective values of ratoon and annual cotton could only be ascertained after the cotton had been put through a spinning mill and worked up into the manufactured article. It was accordingly arranged to carry out definite trials on the Government farms with pure varieties of cotton on plots grown side by side under exactly equal conditions. It has naturally taken two years to get these results, because the first year's cotton had to wait over until the second year before it could be ratooned. These experiments have therefore been conducted in the past season and the cotton from each of the respective plots has been sent over to England for technical examination and spinning tests at the Shirley Institute, Manchester, which is probably the best equipped technical institute for work on cotton anywhere in the world. The results should be available in a few months time.

In the meantime, from the 1923-24 crop arrangements had been made with certain private growers who were interested in the problem to grow annual and ratoon cotton side by side, the seed being the ordinary Queensland Upland. Samples from three of these tests were sent over for valuation, and in each case the annual cotton was valued at from 1d. to 1½d. more in value than the ratoon. But it was felt that it would be necessary, in order to confirm these values, to arrange for a proper spinning test, and it was found possible to gin separately the cotton from one of these tests at the ginnery and to make up the crop into two bales, one of which was ratoon and the other annual. The test was carried out in the Stockyard Creek on land which was as nearly alluvial as it was possible to obtain, and the crops from which the bales were obtained were only separated from each other by a narrow road. The ratoon cotton had been cut down to the last node and a very good strike had been obtained. The owner, who is a good farmer, had taken the greatest care to keep the plot clean and properly cultivated. The test, therefore, was as fair a one as it was possible to arrange for outside a properly equipped experimental station.

The two bales were numbered No. 5041 annual and No. 5045 ratoon and were forwarded by the British Australian Cotton Association to Liverpool in the ordinary way, the agents at that end having been requested to place these two bales on one side, and they arranged with the British Cotton Growing Association for a spinning test to be carried out. A report has now been received from the British Cotton Growing Association that the results of these commercial tests, which were carried out at a certain mill, have now been received, and a copy of their report is as follows:—

29th September, 1925.

The British Cotton Growing Association, Manchester.

Dear Sirs,—We are sending under separate cover samples of cotton sliver and yarn from the Australian cotton which you asked us to test, and find there is a marked difference both in appearance and strength. They were put through exactly the same process, one coming out rough and irregular and the other nice and level in appearance. Below we give you tests:—

No. 1—Spl counts 43.93, 36.37 lb. pull per lea (annual).

No. 2—Spl counts 43.29, 34.50 lb. pull per lea (ratoon).

This report is of interest as it indicates that not only is the yarn produced from the ratoon cotton considerably weaker than that of the annual, but that the yarn itself is rough and irregular in appearance and therefore is not so valuable on this account.

The samples referred to will shortly arrive and will be kept in the office of the Government Cotton Classer of the Department of Agriculture and Stock.

These tests are, of course, only preliminary, and the further tests from the pure lots of ratoon and annual cotton which are now in England will be awaited with interest.

A SOUTH BURNETT SANCTUARY.

The property of Mrs. G. Hives, Sunday Creek, Wondai, has been declared a sanctuary in which it is unlawful to kill any animal or bird.

AGRICULTURE IN QUEENSLAND.*

INSTRUCTORS' REPORTS.

THE SOUTHERN DIVISION.

Mr. A. E. Gibson, Instructor in Agriculture, reports:—Climatic conditions in the course of the period under review were more favourable to the pastoralist than the agriculturist.

Late frosts, followed by excessive rainfall prior to and during the harvesting, were responsible for a considerable amount of damage to both hay and grain crops, and ultimately resulted in "weathering" and damage to the germinating qualities of the grain.

An excessively wet harvest was followed by a period of little rainfall, and the maize crop throughout the Darling Downs and other districts that had reached the tasselling stage between the latter part of January and up to the beginning of March failed for this reason. A considerable reduction on the estimated yield of grain was a consequence. Later maturing crops, on the other hand, in many instances were affected by excessive wet weather, culminating in floods.

A plague of mice has since been responsible for further damage to threshed and unthreshed grain stored in barns and in the field awaiting harvesting. Early sown wheat crops that have appeared above ground as the result of the late showers are in many instances so patchy as to necessitate resowing. This was due to the seed wheat being eaten by mice while lying in the ground prior to germination.

In spite of unfavourable conditions, much useful fieldwork was carried out, resulting in satisfactory supplies both as regards quantity and quality of seed maize and wheat for ultimate disposal to growers. Fodder trial plots were to some extent affected by weather conditions, rust being very prevalent in the winter cereals used in connection with the trials, while some of the plots lodged from excessive wet weather.

Fodder plots arranged for during the latter part of 1923-4 financial year were harvested and gave the following results:—

	T.	C.	Qr.	Lb.
	Per Acre.			
W. Beverley, Bunjurgen—				
Florence wheat and tares (harvested 16th July, 1924)	8	12	3	24
Patriot wheat and tares	10	6	1	24
Cape barley and tares	13	8	3	16
Skinless barley and tares	9	16	3	13
Algerian oats and tares	12	0	0	20
Ruakura oats and tares	14	9	2	20
Canary seed and tares	12	0	2	14
Florence wheat and peas	11	5	2	29
Patriot wheat and peas	12	19	1	4
Balance of plots not harvested.				
C. B. Mouatt, Kilcoy—				
Skinless barley and vetches	11	17	2	0
Cape barley and vetches	14	0	3	16
Patriot wheat and vetches	8	2	0	6
Florence wheat and vetches	7	16	2	7
Skinless barley and peas	16	4	0	12
Cape barley and peas	16	4	0	12
Patriot wheat and peas	11	6	3	14
Florence wheat and peas	11	6	3	14
Rape	17	5	2	24
Purple top swedes	34	11	1	20
Elephant swedes	25	18	2	8
Other plot weights not available.				

* From the Annual Report of the Under Secretary (Mr. E. Graham) to the Minister (Hon. W. Forgan Smith) for presentation to Parliament.

D. E. GREGGERY, MOUNT LAWLESS—	T.	C.	Qr.	Lb.
	Per Acre.			
Canary seed and vetches	10	16	0	8
Ruakura oats and vetches	11	10	1	25
Algerian oats and vetches	12	9	3	14
Skinless oats and vetches		*		
Cape barley oats and vetches	†7	4	0	5
Patriot wheat and vetches	†5	15	0	26
Florence wheat and vetches	†5	0	3	9
Canary seed and peas	5	15	0	26
Rape	12	11	0	20
Purple top swede	32	8	0	24
Elephant swede	34	0	2	14
Silver beet	25	2	1	13
Kale	22	13	3	0

* Too mature. † Rather too mature for fodder weight.

An extension of the winter dairy fodder plots was made early in the present year in the Brisbane Valley and Southern Burnett districts, areas being arranged for at Toogoolawah and Boat Mountain. Conditions being favourable for sowing, the following mixtures of winter cereals and legumes were made on the farm of Mr. J. B. Coleman on 31st March, 1925:—

Florence wheat and peas
Florence wheat and tares
Cape barley and peas
Cape barley and tares
Skinless barley and peas
Skinless barley and tares
Rye and peas
Rye and tares
Algerian oats and peas
Algerian oats and tares
Canary seed and peas
Canary seed and tares.

Owing to the lack of preparations of the plot arranged for at Boat Mountain, the sowing of this area was delayed until 12th May, 1925. Conditions on that date were favourable for rapid germination.

The two areas referred to are centrally situated in good dairying districts, and considerable local interest has been taken in the effort to bring under the notice of dairymen the combination of cereals with legumes calculated to provide a fodder having the nature of a balanced ration.

For the purpose of introducing to the notice of the farmers in the Murgon district a crop of which they have previously had little experience, and at the same time securing supplies of pure seed for distribution to growers of broom fibre, a seed propagation plot of 1 acre was established on the farm of Mr. F. Gustafson, who has an area of volcanic soil a short distance from Murgon township.

The crop was sown in November according to instructions given, and results indicate that climate and soil of this locality in the Southern Burnett is capable of producing fibre of high quality. Heavy rain was responsible for the discolouring of late harvested fibre.

A consignment of "hurl" forwarded to Brisbane realised top price and inquiries were directed to the grower for further supplies. Unfortunately, from the cause mentioned, the later cutting was considerably discoloured and not equal to No. 1 grade. Sufficient (cleaned and graded) seed was obtained from this plot to sow an area of 60 acres, and this is held for disposal in the coming season.

During particularly busy periods the services of all the available officers of this branch were requisitioned for purposes of seed selection of maize from the departmental seed propagation plots established in the Southern Division. This seed has since been cleaned and graded, and is available for distribution in the next season.

Inspections were made and reports submitted on the school farm at Ziilmere and Soldiers' Convalescent Farm at Mount Gravatt, for the Department of Public Instruction and Home Secretary's Department respectively.

Inspections were also made and reports supplied on the condition and equipment of the Government Poultry Farms established in connection with the Soldiers' Settlements at Mount Gravatt and Enoggera.

Following on the construction of a dip at Cadarga in connection with the tick-cleansing work carried out in the areas adjacent to the Darling Downs, estimates were submitted by the Public Works Department for the supply and erection of a pumping plant at Cadarga together with a residence for the officer in charge, also a residence for the stock inspector, whom it is proposed to establish at Boondooma. These being considerably in excess of the amount anticipated, the Department asked to be allowed to carry out the work on its own responsibility and was granted the concession.

The supply and installation of the pumping plant and erection of the residence at Cadarga were supervised. This work entailed the survey of the site and the taking of the necessary levels between the source of supply and point of discharge, followed by a complete estimate of cost of the plant and residence and erection thereof, together with the cost of cartage from railhead at Jandowae to Cadarga, a distance of 53 miles by road.

The material arrived at the site on the 30th November, and the completed plant and residence were handed over to the officer in charge on 24th December.

A dwelling on the Soldier Settlement at Burrandowan and afterwards forfeited to the Lands Department was purchased, dismantled, and re-erected on the dip reserve at Boondooma, about 40 miles distant. The whole of the work was carried out at a price considerably under the estimate.

Crops obtained from departmental wheat propagation plots were in the first instance forwarded to Hermitage State Farm, for cleaning and grading, and a total of 18 tons 6 cwt. 3 qr. 26 lb., equivalent to 685 bushels, were treated. Owing to the danger of infestation by weevils, lack of facilities for fumigating, and to the fact that the mice plague was very much in evidence, the whole of the graded grain, the bulk of which has since been disposed of to wheatgrowers, was forwarded to the departmental seed stores. Throughout the recognised wheat belt seed was sold at a flat rate of 9s. per bushel, freight paid to the applicant's nearest railway station. This seed has been distributed over a wide area and has given universal satisfaction.

The past season was so favourable to pastoralists that the question of fodder conservation was not a particularly live one, but at the same time a considerable amount of correspondence pertaining to silage and fodder was dealt with. In addition visits were made to country centres for the purpose of giving information on this subject.

Instruction.

In addition to instructional visits to different districts, I have to report that great activity has been shown by the large number of new and established settlers who have consulted this office in respect to a great variety of subjects, in connection with which much correspondence was also entailed.

Taking all things into consideration, I am of the opinion that the farming community generally is looking for first-hand advice on its every-day problems, and the appreciative letters which reach this office indicate that the efforts of departmental officers in this direction are being more generally recognised as a factor in elucidating the problems of the man on the land.

Universal fodder conservation by owners of live stock is still a matter of grave importance, and while a percentage of these may, in seasons of plenty, visualise prospective leaner years, which must of necessity be provided for, a greater number, by reason of apathy or indifference, fail to make provision for them.

Brisbane National Exhibition.

Activities in connection with the show necessitated close attention on the part of the instructional staff. A special effort was made to illustrate the extent and value of fieldwork.

The departmental exhibits were of a very high standard, and the information made available to producers should be invaluable in advancing the agricultural industries of the State.

CENTRAL DIVISION.

Mr. G. Brookes, Instructor in Agriculture, reports:—During the greater portion of the year I was absent from the State—one period from June to November on extended leave in the United Kingdom, another from the middle of April to the latter end of June, 1925, when a visit was made to Java in connection with cassava-growing.

Assistant Instructor Clydesdale took over the duties attached to this office when I was in Britain, but had to leave for the Southern district some time prior to my return. A change was made in the field staff, Field Assistant Hamilton exchanging positions with the Northern Field Assistant, Mr. Straughan.

Shortly after Mr. Straughan's arrival he was transferred for two months to the position of acting manager, Warren State Farm.

Climatic Conditions.

The rainfall for the Rockhampton district was somewhat over the average. The total for the year amounted to 43.84 inches—the average for fifty years being 38.01 inches. Although the wet season was a comparatively short one and the following April and May very dry, the rainfall was on the whole fairly well distributed. Some apprehension was felt in regard to the outlook for the winter and spring, but the situation was relieved by widespread, useful rains falling during the middle of June.

The monthly rainfalls for Rockhampton were as follows:—July, 2.20; August, 7.1; September, 1.83; October, 1.84; November, 3.83; December, 7.57; January, 7.62; February, 3.72; March, 2.00; April, .19; May, .89; June, 5.05. Total, 43.84.

A considerable amount of harm was occasioned to growing crops by a visitation of a heat-wave during the first fortnight of February. Maize, sorghum, and particularly the cotton crops, suffered severely.

Winter Fodder Demonstration Plots.

It has been found that one of the best methods of convincing the farmer as to the benefits to be derived from making provision for his herd, by growing fodder crops, is by actual demonstration, more particularly when the work is carried out by a practical farmer, and in his own particular district. Recently a letter was received from a farmer in the Rosedale district, in which he says: "I have planted a few acres of rust-resistant wheat every season since I first grew the experimental plot for your department." Similar reports have come to hand from the Dawson Valley. Another farmer in the Marlborough district who co-operated with the department some years ago states that he was so impressed with the growth made by rape under adverse climatic conditions that he has put in an area from 10 to 20 acres every winter.

Until recently one of the greatest drawbacks to the raising of fodder crops, by the majority of dairymen, was the lack of implements to cultivate the land. The advent of the cotton industry overcame this difficulty. Practically every dairy farmer rushed into the growing of cotton, many unfortunately to the extent of neglecting their herds. Expensive and up-to-date machinery was purchased, quite a large number of tractors coming into the Central district as a result of the boom.

It would appear that a reaction is setting in. Many who gave up dairying are now building up their herds again, and are making inquiries as to the growing of both summer and winter fodders.

Demonstration Plots.

Practical demonstrations in regard to the best fodder to grow for dairying and the most suitable crops for pig-raising purposes were arranged for in all the principal farming districts. The objective was to show the practicability of providing a continuous supply of feed for both dairy stock and pigs, for an extended period, by planting varieties when conditions of soil were suitable that would mature at different times.

In regard to winter fodders the following varieties were chosen for the purpose (area, 2 acres):—

Wheat (two varieties).
Cape barley.
Skinless barley.
Algerian oats.
Ruakura oats.
Grey field peas and Florence wheat.
Blue field peas and Florence wheat.

The districts selected for the plots are—

The Caves; grower, F. Ferguson.
Ambrose; grower, H. E. Wolff.
Mount Larcom; grower, F. Huntley.
Rosedale; grower, J. G. Hales.
Dawson Valley; grower, A. E. Barnard.
Marlborough; grower, A. Rake.
Callide Valley; grower, E. Edwards.
Alton Downs; grower, S. G. Hoare.

On account of the dry weather conditions prevailing during April and May, planting was delayed until the latter end of June, when useful rains of a widespread nature fell over the whole of the Central agricultural areas.

Experimental Tests at Ubobo.

The experimental work carried out in the farm of Mr. A. J. Turner, Ubobo, Boyne Valley, is proving of considerable interest to the farming community. Applications made to the department to extend this work to other districts is receiving attention. Particulars in regard to the results obtained from last season winter fodder and fertiliser trials have already been supplied to head office, and I believe appeared in the "Agricultural Journal." These tests are being continued during the ensuing year.

Demonstration Plots—Pig-Raising Crops.

The varieties were chosen to give a supply of material from June to December and to mature in the order given. Rape, silver beet, yellow Aberdeen turnip, sugar beet, khol-rabi, Swede turnip, cattle cabbage, globe mangold, long red mangold. The farmers co-operating with the department in this work are as follows:—

J. A. A. Ross, Ambrose.
F. E. Sturm, Mount Larcom.
T. Ferguson, The Caves.
S. Larson, Miriam Vale.
H. Young, Dawson Valley.
A. Rake, Marlborough.
T. F. McRae, Callide Valley.

For reasons similar to that mentioned in connection with the fodder crops, planting was delayed until the latter end of June.

Fodder Conservation.

Further effort was made to encourage dairy farmers in the various districts to provide a plentiful supply of feed for their herds during the winter months and dry periods, by supplying seed of heavy yielding succulent varieties of sorghum, and giving practical demonstrations as to the best methods of conserving the resultant material in the form of silage. Demonstrations in connection with such were given in the Mount Larcom, Wowan, Buneru, Rosedale, and Ambrose districts.

The growing of sorghum during the latter end of summer, and allowing the crop to stand over for winter use, is being strongly recommended as being suitable to conditions obtaining in Central Queensland.

The question of silo construction is being gone into with the Dawson Valley farmers, and a big forward movement in this direction is likely to eventuate in the near future.

Sorghum Experiment Plots.

A number of farmers co-operated with the department in the raising of seed of a number of grains and other sorghums, some of which were of recent introduction. The stud plots were located as follows:—

Ambrose (C. King)—Feterita.
Ambrose (A. McDonald)—No. 61.
Gracemere (E. Seierup)—White Dwarf Kaffir.
Archer (Pritchard and Wannop)—White African.
Mount Larcom (J. C. E. Jacobsen)—White Dwarf African.
Mount Larcom (J. Coase)—Early Amber Cane.
Marlborough (A. Skewes)—Red Kaffir.
Rosedale (J. G. Hales)—No. 61.
Marlborough (G. Ambrey)—Kaoliang.
Marlborough (C. Collins)—No. 61.
Dululu (A. S. Narracott)—Feterita.

Most of the above varieties made good growth; sufficient seed to meet the department's requirements was secured. This has not yet been threshed out, consequently yields have not been determined.

Onions.

Previous experiments carried out in the growing of onions were so promising that further trials have been arranged for.

The object of the tests is to ascertain the most suitable varieties for Central Queensland conditions, and also the districts in which they could be most profitably grown. The tests are being conducted in the following localities:—Tanby, Jones Bros.; Ambrose, J. Sinclair; Dawson Valley, A. E. G. Barnard; Callide Valley, J. R. Adsett.

The planting was carried out rather late (June) on account of the dry conditions that prevailed during the previous two months.

Advantage was taken when on extended leave to visit the research and experiment stations in the United Kingdom, including Rothamstead in England, and the plant-breeding and seed-testing stations in Scotland. Much information was secured in regard to the latest methods of conducting agricultural research. A lengthy report was furnished to the department, giving an outline of the work in progress at the respective stations.

Acting under instructions, I proceeded to Java—leaving Brisbane on 17th April—and made investigations in regard to the cassava industry. A full report dealing with this matter was submitted to you. During my stay on the island I visited the various branches of the Agricultural Department and the experiment stations.

Arrangements were made for obtaining a supply of various crops that would be likely to prove suitable to Queensland conditions.

THE NORTHERN DIVISION.

Mr. N. A. R. Pollock, Northern Instructor in Agriculture, reports:—

During the period under review, seasonal conditions, except for part of April and the whole of May, which were very dry, were excellent all over the Northern Division, the rainfall (over average in many parts) being better distributed throughout the year, with no heavy floods in any of the streams. In August an over-average precipitation occurred in the whole of the division, which gave the pasture an excellent start. Favourable rains in the ensuing months provided an abundance throughout the year.

Fat cattle were plentiful much earlier than for many years past, thus allowing the several meatworks to start sooner than usual with a much longer killing season ahead. Cattle prices offered by the meatworks, though slightly better than in the previous year, are still disappointing to pastoralists, more especially in the Etheridge and Gilbert River districts, from which cattle have been railed past Biboohra to Townsville and Brisbane.

In dairying, production on the Atherton Tableland greatly increased, as also in the Mount Molloy and Daintree River districts. Prices paid by the Tableland Co-operative Butter Company for cream based on the commercial butter equivalent were, owing to the necessity of export of the surplus for sale overseas, lower than for many years past. To compensate in a measure for the low net return from export, local prices were kept at as high a level as possible, which was a distinct advantage to those small factories that sold their whole output locally. Under a compulsory pool no supplier to a small or large factory would have an undue advantage over another.

The favourable season coupled with an increased area under crop has resulted in an exceptionally heavy tonnage of sugar-cane. It is indicative of the unique position occupied by cane, as a profitable crop, that no suggestions are made to divert any of the lands now under sugar to other crops. Where an industry such as the sugar industry is so fostered as to become of over-average prosperity it cannot be expected that attention will be given to crops not so favoured; further, when, on account of average prosperity, an award giving a higher rate of wages is made in that industry, it indirectly operates as an award in all other industries of like nature, rendering them less attractive to investment.

If, when an industry is above average prosperity, an amount were collected and awarded to industries under average prosperity, a more equable status would prevail, and crops not now considered in North Queensland would receive some or more of the attention that they merit.

Natural Pasturage.

It is remarked frequently by graziers that the native pasturage is not what it was in the early years of occupation, when despite dry seasons fat cattle in numbers were obtainable in all months of the year. While the pasturage on the Western Downs, mainly of Mitchell and Flinders grasses, has suffered little deterioration except in the disappearance of legumes, that experience is very true unfortunately in other parts, especially on the eastern coastal slopes. It is evident that when stock are more or less depastured closely the more valuable grasses, which are usually the most palatable, are grazed more closely than inferior sorts, thus allowing a greater reproduction of the latter to the serious detriment of the carrying capacity. This is especially noticeable near towns, where the original grasses, such as kangaroo (*Anthistiria ciliata*) have been replaced to a large extent by bunch spear (*Heteropogon contortus*) and awned spear grasses (Aristida and Eriachne spp.) as well as sundry useless if not noxious weeds.

When questioned on the prevalence of native legumes such as species of Rhyncosia, Glycine, Atylosia, &c., many of which are very nutritious and palatable to stock, graziers of early experience admit that growths of this description were once plentiful on areas where they are now non-existent.

Improvement of Native Pasture.

That the native pasture is deteriorating in many localities is beyond doubt, yet no effort is made to improve it or to keep it from further depreciation, the almost universal reason being given that the cost would be too great and that prices realisable for stock will not warrant it.

Much could be done by subdividing holdings into smaller paddocks, which could be alternately rested and seeded with grasses and legumes of value, and kept quite free of stock until these growths had matured and seeded.

Possibly, conditions in leases of Crown lands, providing for improvements to be effected in this direction and allowing a reduction in rental consequent on the yearly storage of prescribed quantities of fodder, might act as an incentive towards the adoption of practices that would induce greater production.

Artificial Pasturage.

The areas of pasturage laid down in North Queensland are limited almost wholly to the Atherton Tableland and districts where, after burning off the fallen scrub, the seed may be sown without further preparation of the land. The grasses in most favour are *Paspalum dilatatum*, Para (*Panicum muticum*), Kikuyu (*Pennisetum clandestinum*), couch grass (*Cynodon dactylon*), and Rhodes grass (*Chloris Gayana*), all of excellent fodder value.

Complaint is made of the decadence of artificial pastures on the tableland, especially of paspalum, which have been laid down for upwards of seven years. Where in the first few years of growth a beast to the acre could be carried with ease, now two or even three acres are required.

The habit of paspalum when kept eaten down is to multiply the root system in an endeavour to cope with the demand made on the leaf supply. Roots close to the soil surface become matted, tending to strangle one another, and are impeded in performing their full functions, the result being a lower and lower supply of feed until even more than three acres are required for one animal. It is obvious that a breaking up of the pasture is necessary, and where this has been done the new growth has been much the same as when it was originally seeded.

It is also noted that where the matted roots have been destroyed by fire as in 1923, or by the caterpillar of *Oncepera Mitocera* alluded to in my last annual report, the subsequent growth has been remarkable.

Many settlers contend that the ploughing of their areas is extremely difficult, if not impossible, owing to steep hills, gullies, stumps, and logs, and desire experiments in top-dressing with fertilisers, with a view to finding something easy in revitalising their pastures. Soil on which the pasturage is grazed does not become appreciably depleted of fertilising elements, and the tableland soils which have been under pasturage only are considered still so rich in plant food that the application of fertilisers is unnecessary, and that if applied to a pasturage unable to take advantage of them would give a negligible result. Some good might be done by excluding stock from a pasture for a considerable period to allow growth to go on unchecked, when there would be a possibility of the decay of much of the impeding root system, under damp or shaded conditions, occurring. The loss of the use of this pasturage would have to be set against the cost of breaking up

the pasture, while the injurious set of conditions, causative of the trouble, could be expected to recur sooner there than on the broken-up pasture. Very little of the tableland is so steep as to be impracticable for it to be broken up with a single-furrow plough, even when it is only possible for ploughing to be done on the down grade.

Rototiller.

A self-propelled machine called a Rototiller suggests itself as likely to be of value in breaking up these pastures in situations of difficulty for horse traction. They do not take up the space of an ordinary plough and can be turned in their own length, and are propelled by an engine worked on petrol or kerosene, which also drives the machinery to break up or cultivate the soil. This machinery consists of a shaft around which are springs to which tines of sorts, including knives, can be affixed and which is called the "miller." The work is performed by the rapid revolutions of the "miller" causing the tines or knives to bite into the soil in a forward movement. The depth of operation in the soil can be regulated, while there are two speeds in the travel of the machine, the maximum being 1½ miles per hour. The rapid revolution of this miller with knives attached should effectively destroy the matted roots of any paspalum paddocks. The cost, however, of something like £250 will act as a deterrent, unless by practical demonstration a farmer or syndicate of farmers were fully satisfied with its efficiency.

Stylosanthes.

About twenty years ago a legume appeared in Townsville, probably being unwittingly imported from overseas in packing or other material, which has transformed an indifferent pasturage to one of value. The plant commonly known as wild lucerne, though it cannot be said to resemble lucerne in appearance, was identified many years ago by the Government Botanist as *Stylosanthes mucronata*. At the same time an analysis by the Agricultural Chemist denoted its feeding value as very little short of the true lucerne. The plant is of annual habit and seeds profusely. The seeds germinate more quickly on well-packed soil than in loose soil, and it spreads rapidly through natural pastures on the coast and Atherton Tableland, where so long as there is sufficient rainfall it provides an abundance of fodder. A defect in Northern pasturage, both native and introduced, is the absence of a legume to take the place of the clovers and the trefoils of the more temperate Southern parts.

Seed of Stylosanthes was distributed several years ago to all districts where it was thought likely to succeed, while it has also been carried by stock and other agencies such as railway trains, which have spread it over most of the lines connected with Townsville. It has been noticed in parts all along the coastal areas from Proserpine to Princess Charlotte Bay, at Mareeba and Atherton; so that it may be expected shortly to become universal in the pasturages there and to spread into the drier areas. This plant is considered a very valuable addition to Northern pasturage.

Black Medic.

The paspalum pasturage so popular on the dairying areas of the tableland has always been wanting in a legume to take the place of the clovers and trefoils of other climes, which in combination provide a more balanced ration and consequent greater production. Practically all the clovers and trefoils of which seed was procurable have been tried experimentally by this department without any encouraging results. The appearance of a legume growing and reproducing itself in a paspalum pasture at McGeehan Bros.'s farm near Kairi this year gives hope that, with Stylosanthes, the difficulty in finding suitable legumes has been overcome. This legume was identified by the Government Botanist as *Medicago lupulina*, commonly known as Black Medic, an annual plant, native of the Mediterranean region, but now cultivated or appearing in pastures in different parts of the world. It is new to Queensland, and Mr. McGeehan infers that the seed arrived on his farm with some Southern compressed fodder, purchased to feed a stud bull in the dry season, since it appeared only in the bull paddock. It is anticipated that seeds of this and other Medics will be secured for distribution and further trial.

Fodder Conservation.

During the extremely dry period in 1923 all stock owners were fully seized with the advantages of a store of conserved fodder to meet periods of shortage, just as they were in 1915 and 1919, and doubtless promised themselves that a future drought would not catch them unprepared. Notwithstanding the excellent

season, which has provided an unusually heavy supply of grass, these promises in nearly every case are not being kept, or with customary procrastination are being put off until next year. It is pleasing to note, however, that a little interest is being displayed by some of the newer selectors in the rolling downs country beyond Hughenden.

Silage.

With storage as silage, the advance, if slow, is steady among the dairy farmers around Charters Towers and on the tableland, many new pits being put down. The type of pit silo originally recommended by the department in soils where seepage of water is unlikely is most in favour. This type consists of a cylindrical pit the first four or six feet of which, only, is collared with a lining of corrugated iron bent to the circle and bolted or riveted, and which is plastered with a cement compo of 2 or 3 sand to 1 of cement, to a little more than is necessary to fill up the corrugations in the iron. This collar prevents the fretting away of the surface soil, while that below the collar remains firm. The actual cost of this form of silo is very little more than that of excavation.

While, on the tableland maize is the best and general crop grown, at Charters Towers, following departmental advice, most of the farmers are growing saccharine sorghum for their silage in place of the maize they grew formerly.

Cassava *(Manihot sp.)* and Power Alcohol.

A good deal of attention has been directed to this crop as an auxiliary to molasses in the production of alcohol for power purposes. The crop could be grown to perfection in the north coastal districts of heaviest average annual rainfall, such as obtains from the Herbert River to Mossman. It is erroneous to suppose, however, as many do, that the crop will be very successful on poor land, or that the cost of growing and harvesting a crop under equal wages will be much lower than sugar-cane. The commercial possibility of the crop will depend on the value of the resultant product and its relation to the yield per acre with growing and harvesting costs.

In addition to the value of the crop for power alcohol, there might be some extra profit in the manufacture of tapioca for Australian requirements with the prevailing duty of 1d. per lb., or in the production of cassava flour or starch for use industrially, in which overhead costs would be lessened where power alcohol was also manufactured.

According to published statements attributed to Mr. Board, of the International Sugar and Alcohol Company, cassava roots compare in value for alcohol production with sweet potatoes, or arrowroot, as 20s. to 18s. per ton delivered at the distillery; this disparity, I am of opinion, would be more than compensated for by the lessened cost of production in sweet potatoes and arrowroot, both of which in North Queensland have yielded upwards of 20 tons per acre, and in the case of arrowroot upwards of 30 tons on the Atherton Tableland. The statement that sweet potatoes must be harvested as soon as ripe is contrary to Northern experience, since, with many varieties, the roots may be kept in the soil for upwards of a year, though, as is the case with cassava roots, the fibrous matter increases.

Much investigation is being made in the Cairns-Innisfail districts into the possibility of utilising the juices of surplus cane or the inferior grades of sugar in the manufacture with molasses of power alcohol under a bonus.

The over-production of sugar may be regarded as temporary, since as population increases the consumption may be expected to overtake the output on the east coast of the State, while, if the distillation of power alcohol is a success with cassava, sweet potatoes, or arrowroot supplementing molasses, there will be room for the cultivation of such crops over a collectively large area. In addition the growth of these root crops will be useful in a rotation with a legume in minimising disease and in keeping the soil in a better condition.

Instruction.

It is considered advisable in instructional matters to keep the department, as far as possible, in touch with settlers by personal visits to them on their holdings, when advice on the spot is of more value than correspondence. While the use of the horse, where hiring is possible, is insisted upon, locomotion in any district will necessarily be very slow, and will not allow of isolated settlers, or those at any distance from the various centres, being visited. These isolated settlers really require more attention, since they are unable to profit by the example of neighbours as is the case in more settled areas. Early in the year Mr. Hassell, Field Assistant

on the tableland, resigned his appointment to take up a more lucrative position outside the department, while Field Assistant Straughan after a period of illness was transferred to the Central district. The time elapsing between their respective departures and the arrivals of their successors, as well as that of initiating the newcomers in their work, took up a good deal of time, so that visits of instruction were much curtailed.

It is pointed out that if the instructor were provided with a motor car he would be enabled to travel round more expeditiously and do half as much work again as under present conditions.

CROPS, EXPERIMENTAL PLOTS, &c.

Cigar Leaf.

A greatly increased acreage was expected to be put under cigar leaf this season in the Bowen and Proserpine districts. Attacks of blue mould in the seed-beds at Euri Creek had a serious effect in greatly diminishing the areas under crop in that locality, while in other parts, though seed had been secured and the intention to plant expressed, very little was sown, for various reasons, chiefly on account of the good prices anticipated for sugar-cane. With a protective duty of 2s. 6d. per lb. on cigar leaf it is thought that a price in excess of this amount should be obtained, yet many growers report lower realisations with odd instances of a higher, but not in excess of 3s. per lb.

With a finer leaf and a better cure the price paid by manufacturers would no doubt be increased. At present the grower prefers a heavy yielding variety such as the Zimmer Spanish to other varieties, arguing that he will not receive any higher price for the leaf of another variety. This contention was proved some years ago when this department supplied seed of many varieties. With a better cure in the marketed leaf and the production of wrapper quality much higher prices should be realised.

At a price of 2s. per lb. growers at Bowen secure a good profitable return, for with plant and ratoon leaf the marketed yield is often upwards of 1,500 lb. per acre. Mr. H. Teitzel, Mount Dangar, Upper Don River, near Bowen, assures me of a return of £175 from three-quarters of an acre of plant and ratoon leaf.

While sugar-cane maintains its high price, and farmers as at Proserpine are not reduced in area, the cigar leaf will not meet the attention there that it warrants, except from those settlers who have to cart their produce a considerable distance. When a load of sugar-cane will represent a value of perhaps £4 and the same weight of cigar leaf upwards of £400, it will readily be seen that transport costs will greatly favour the latter.

In the Cardwell district it is thought cigar leaf can be grown of a good burning quality, which is the first essential. In this district, owing to limited milling capacity, cane-growing will be restricted, thus forcing settlers to turn their attention to other crops, among which cigar leaf is recommended strongly.

Green Fodder Crops.

The growth of fodder crops on dairy farms, to supplement the pasturage and to promote a greater flow of milk by feeding off in the young stages when the nutritive ratio is better balanced, has created a degree of interest that is gratifying. On many farms in the several districts, plots in summer and winter green feeds were planted as demonstration areas, giving very fine results where reasonable care and attention had been bestowed.

On the tableland under the extra humid conditions—there were 10 fine days out of the first 106 days of 1925—some rust was evident in some of the crops, but not to a very damaging extent.

Pearl Millet (*Penicillaria Spicata*).

Pearl Millet (*Penicillaria spicata*), condemned as a fodder by some people with insufficient experience, has proved its excellence in the young growth, when it is very palatable, at Charters Towers and the tableland, by greatly promoting the flow of milk. The yields of greenstuff are very high, one trial at Malanda, 55 days after sowing the seed, yielding 14 tons 9 cwt. per acre and the second growth after 36 days 12 tons 17 cwt., a total of 27 tons 6 cwt. in 13 weeks from sowing the seed, which is in excess of 2 tons per acre per week. Another trial at Kulara 45 days after sowing the seed yielded 9 tons 12 cwt. 3 qr., and a second growth from the same area cut 34 days after yielding 13 tons 13 cwt. 1 qr., a total of 23 tons 6 cwt. of greenstuff over 11 weeks, which is also in excess of 2 tons per week.

Teosinte *(Euchloena Luxurians)*.

Owing to defective seed which failed to germinate this was again a failure. Past experience points to this crop as being of equal if not greater value than pearl millet.

Liberty Millet (*Setaria Italica*).

Under warm conditions this is a very quick crop, yielding well in several districts in the North. At Charters Towers, a crop sown on 8th December and cut on 16th January yielded 10 tons 6 cwt.; the second cut on 10th February yielded 13 tons 6 cwt., a total of 23 tons 12 cwt. greenstuff for nine weeks' growth. This growth, however, was under exceptionally favourable conditions. On the tableland the growth was not heavy, on account of so much rain.

Giant White Panicum.

Giant White Panicum suffered more from rust on the tableland than other crops, and with Japanese millet, its close relation, is considered to be of more value in districts of lesser rainfall.

Cow Peas.

Exceptionally heavy yields were obtained from the new varieties of cow peas—Groit, Brabham, and Victor—introduced last year. These varieties produce a much heavier growth than the varieties Black, Clay, &c., commonly grown, and occupy the ground for a longer period. Their value is very great as a green feed and as a roughage when cured as hay, to be fed in conjunction with ensilage to dairy cows. The following yields, it is thought, eclipse all previous records in the State:—

Groit Variety.—O. T. M. Hansen's farm, Carbeen, sown 28th November and estimated 10th February to yield 16 tons 11 cwt. greenstuff in 74 days from sowing, and on 17th April 22 tons 10 cwt. greenstuff in 140 days from sowing.

Victor Variety.

W. S. Allen's farm, Tolga, sown on 23rd January, yielded on 1st May 19 tons 5 cwt. 2 qr. 24 lb. greenstuff per acre 97 days from sowing.

Brabham Variety.

W. S. Allen's farm, Tolga, sown 23rd January, yielded on 1st May 18 tons 19 cwt. 1 qr. 4 lb. greenstuff per acre 97 days after sowing.

Velvet Beans.

Owing to heavy rains falling on the crop at Tolga last season when the pods were mature, very little seed was saved, and consequently areas under crop this year were not as large as anticipated, and were devoted to seed supply. The growth in all these plots is wonderfully good. It is anticipated that quantities of seed of three varieties will be secured for an extension of areas next year.

Horse Gram *(Dolichos Uniflorus)*.

A small quantity of this legume, largely grown in India as a stable pulse, was secured from Ceylon and sown to secure further supplies of seed. It is fine in the vine, and gives promise of being a useful addition to Northern legumes.

Mung Bean *(Phaseolus Mungi)*.

Seed of a variety of this bean, extolled in America as a wonderful producer of green forage, was secured, but has been very disappointing in the North, the yield being negligible.

Winter Feeds.

The crops sown in trials for winter green feeds in various centres of the tableland, Mount Molloy, Charters Towers, and Bowen districts did very well, as the following results of those estimated show:—

Ravenshoe. Farm of W. G. McKay. Sown, 15th May. Estimated, 4th September.

	T.	C.	Qr.	Lb.
Soutter's Early x Warren wheat	7	7	3	12
Warrior wheat	7	9	1	24
Florence wheat	9	3	0	24
Warrior wheat and vetches	7	17	2	0
Warrior wheat and field peas	7	1	1	20
Dun field peas	9	17	2	20

EVELYN. FARM OF W. G. THOMAS. SOWN, 5TH MAY. ESTIMATED, 6TH SEPTEMBER.

Gem wheat	7	17	2	0
Bunge wheat	6	5	1	12
S. E. and Warren wheat	6	11	3	4
C. C. C. wheat	5	19	3	8
Warrior wheat	6	11	3	4
Florence wheat	7	17	2	0
Warrior and vetches	6	18	0	24
Dun field peas	16	11	0	0

MT. MOLLOY. FARM OF J. MCDOUGALL. SOWN, 15TH MAY. ESTIMATED, 30TH AUGUST.

Florence wheat	5	3	per acre
Warrior wheat	3	11	"
C. C. C. wheat	3	14	"
Gem wheat	4	0	"
S. E. and Warren wheat	3	11	"

CHARTERS TOWERS. FARM OF DUTTON AND WATSON.

Warrior wheat and vetches	2	6	2	16
Florence wheat and peas	2	9	3	8
S. E. and Warrior wheat	1	10	2	4
C. C. C. wheat	2	3	1	16

NOTE.—No rain fell while this crop was growing.

BOWEN. FARM OF V. BOULTER. SOWN, 20TH MAY. ESTIMATED, 8TH SEPTEMBER.

S. E. and Warren wheat	4	0	1	12
C. C. C. wheat	3	10	2	24
Florence wheat	3	1	0	8
Warrior wheat	3	4	1	4
Florence wheat and peas	3	13	3	20
Warrior wheat and vetches	3	1	0	6
Golden vetches	4	0	1	12

Maize.

The growth of maize as a commercial crop in North Queensland is practically confined to the tableland, where a total area of from 15,000 to 20,000 acres is usually planted. This season from various causes, but chiefly owing to the lower price realised for the previous year's crop, a lower acreage than usual was cropped in the Atherton, Tolga, and Kairi centres, while many of the areas were sown so late that only a poor return from them may be expected. While the total acreage sown to maize during the season 1923-4 was greater than in any previous year, and a crop of approximately 20,000 tons obtained, of which some 18,500 tons was sold through the pool, it is anticipated that through the decrease in the area planted, as well as through late sowings, the output this year will be very much lower. An estimate made by an official of the Maize Pool Board places the crop as about 14,000 tons, but I am inclined to regard these figures as too optimistic.

As mentioned in my last annual report, the quality of the tableland maize has deteriorated from the interpollination of the many varieties, chiefly of the Dent type, introduced by newcomers.

Tableland conditions are very different from those obtaining in any other part of Australia, since the planting season occurs with the first storms of the wet season, in November and December, when, under a heated soil and humid conditions, a very rapid growth of plant follows, stalks frequently reaching a height of 14 feet; after the heaviest rains have fallen persistent light rains and mists prevail frequently until June or July, preventing a drying of the ripened grain and inducing moulds, with a consequent delay in harvest and damage to the quality of the grain. The forcing conditions operating to produce the tall stalk also induce the formation of a coarse pithy cob, which is also retentive of moisture and contributes to the difficulty in the drying of the grain.

It is obvious that the Dent types of maize, which are usually soft in nature and deep in grain, are entirely unsuitable under these conditions; in fact, these varieties when grown in an ordinary wet season produce a grain which, if not affected with mould, is chaffy in appearance and light in weight, it being frequently impossible to place 160 lb. in a corn-sack, even when well rammed.

A variety of Flint type is considered to be more suitable and has so been proved in past years.

The difficulty confronting the Department in introducing a suitable variety is the impossibility of keeping it pure unless it can be grown on a farm so isolated

that distance precludes all risk of interpollination. An endeavour to improve what was known as the Atherton maize variety by selection and "ear to row" tests proved futile, owing to the impossibility of preventing cross-fertilisation from other crops growing near-by. An instance was noted where a crop of a white-grained maize crossed with a yellow-grained maize at a distance of half a mile.

Given an isolated farm, under direct departmental supervision, where a chosen variety could be grown and kept pure, seed could be supplied to supplant the impure unsuitable strains now grown on the farms close at hand and then on those further away, until the whole area ultimately becomes seeded with the one pure and suitable variety. At the same time a higher yielding strain of this variety could be evolved by "ear to row" tests; fertiliser trials in series could also be undertaken.

Bare Patches.

On many of the tableland farms, where scrub originally grew, so-called "bare patches" occur varying in extent from a few square yards to an eighth of an acre, but rarely greater in extent, on which maize or other crops make little growth. Soils from one of these patches and from near-by, where crop growth was satisfactory, when analysed by the Agricultural Chemist, were found by him to be fertile soils, his opinion being that the soils of the bare patches appeared the better of the two. The analysis of the soil on the bare patch did not reveal the presence of a sufficient amount of a deleterious salt such as manganese oxide to cause damage, or any reason to advance in explanation of the poor growth thereon. An experiment was arranged on a farm at Tolga, where fertilisers including farmyard manure were to be applied: the various fertilisers were supplied by the Department and applied, but unfortunately the farmer did not fulfil his promise to supply the farmyard manure. On the plots under various mixtures of commercial fertilisers the result was negative, no improvement in growth being noticeable. It is thought that the "bare patches" are caused by the baking of the soil under the great heat engendered when big logs lay close together in burning off, after the scrub was felled, since on each of the patches much white ash is still noticeable and the analysis reveals more lime and magnesia than on the normal soil near-by. Possibly the destruction of the soil bacteria by this baking or the prevention of their multiplication by these ashes may be the cause of the trouble. It is a coincidence that on the forest soils where big piles of logs, almost wholly of eucalypts, are burned, crops grow to greater perfection in the first year or so than on the soil near-by. It is unfortunate that the farmyard manure was not applied to the plot as arranged, as this would have proved or disproved the theory regarding bacterial action being wanting.

Cotton.

The season as compared with those of the two previous years was much more favourable to the growth of cotton, while the damage sustained by insect attack was, except on one farm, practically negligible.

The areas under cotton during the past season were fewer in number than in previous years, but averaged a larger individual acreage and in general have given encouraging results in both yield and quality.

At Charters Towers the 70-acre crop of the Charters Towers Cotton Growing Company, which was planted late in last season and alluded to in my last annual report as having fair prospects if the winter were favourable, was visited with a severe frost before maturity was reached, resulting in a total loss of the crop. Although their capital was exhausted, the directors of the company with commendable perseverance collected their resources and with a small loan from the State carried on, ratooning some 60 acres of the frosted crop and planting about 30 acres additional. The ratoon crop started to mature cotton before the end of the year, picking being practically continuous from December onward. The quality of the ratoon cotton, from samples submitted to the Director of Cotton Culture, was returned as good and considerably above the average. To the end of May over 16 tons of seed cotton, which was estimated at about half the crop, had been sent away.

Extreme difficulty is being experienced by this company in harvesting the balance of this crop, owing to an unsatisfactory supply of suitable labour.

On the Lower Burdekin the Yturriaga Company had approximately 45 acres under crop on sandy soil regarded as too poor for sugar-cane. The quality of the cotton and yield of the crop, which had good cultivation under a fair season, directly confirms the oft-repeated statement that cotton, in common with other crops, cannot be profitably grown on poor land.

At Bowen a small area showed cotton of good quality, which would have been much improved in yield had better cultural methods been adopted.

In the Mareeba district at Emerald Creek the boll-worm caused damage to the young bolls and squares, resulting in a half crop; but at Carbeen little damage was

done, and a satisfactory yield obtained from a ratooned crop with equal promise from the plant crop.

On the Gilbert River an excellent showing was made with a crop of Durango both in yield and quality, which indicates that district with its thousands of acres of suitable soil as one admirably adapted for the production of large quantities of cotton when better means of communication are established.

In the coastal districts of heaviest annual rainfall, cotton has not been grown with much success when sown in November, December, or January, owing to damage to the ripening bolls by the rain. At Cardwell sowings have been made in April, May, and June of this year which will allow of the crop ripening during the drier part of the year.

Potatoes.

The experiments carried out by this Department during past years have demonstrated that potatoes can be grown profitably in the North during the season suited to the several districts. On the tableland, at an altitude of 2,000 feet and upwards, the crop can be grown most successfully during the height of summer, which corresponds with the wet season. On lower altitudes and on coastal areas the best success is met with planting from March to July, the later plantings being only possible in frost-free situations. Difficulty is experienced in obtaining satisfactory seed from Southern localities for these plantings, as well as in carrying seed over from one crop to another.

On the tableland the rains rarely fall before November and more frequently not before December. The best seed potatoes are unobtainable in these months, and if obtained earlier deteriorate under ordinary conditions to a large extent. When the soil is very dry, as in the tableland volcanic soils on the forest areas, it has been found advantageous to plant the seed in late August or September after it has well shot; the tubers then keep well and make a certain root growth but do not make growth above the surface until rain falls. The danger in this practice lies in the possibility of a fall of rain occurring to bring the growth above ground without sufficient following rain. This, however, is very rare, occurring only once there in the course of the last twenty years.

On the coast for March planting, selected seed of the quality offering in June and July is unobtainable, the practice being to obtain "smalls" from the commercial lots secured by merchants. The quality of this seed leaves room for much improvement, as Rhizoctonia, bacterial rot, &c., and leaf diseases are common on crops from this class of seed, while on selected seed, secured in July from reputable seedsmen, disease of any kind is infrequently met with.

With a view to improving the seed supply, experiments are being undertaken to see if it is possible to provide seed from the tableland crops for the coast and *vice versâ*. Under ordinary conditions immature potatoes could be dug on the tableland as early as late January that would be shot ready for planting on the coast in March, while seed from the crops on the coast could be dug as late as August which would keep in good condition until planted on the tableland in October or early November.

Seed of ten varieties grown under comparative trial this season at Tolga and Carbeen has been planted at Pentland, Woodstock, and Proserpine, where the crops are giving promise, but will not be ready to harvest until too late for recording in this report. Seed from these latter crops will be sown later on the tableland.

The yields of the varieties on the tableland grown at W. S. Allen's farm, Tolga, and O. T. M. Hansen's farm at Carbeen on forest volcanic soil, where the previous crop was a legume, were, per acre—

Variety.	Allen's Farm.								Hansen's Farm.							
	Saleable.				Small.				Saleable.				Small.			
	T.	C.	Qr.	Lb.	T.	C.	Qr.	Lb.	T.	C.	Qr.	Lb.	T.	C.	Qr.	Lb.
Carmen No. 1	4	9	3	20	—	9	3	8	3	10	2	24	—	7	3	12
Up-to-Date	4	3	1	16	—	14	3	8	4	16	1	0	—	9	3	8
Clark's Main Crop ..	3	19	1	24	—	14	3	8	1	3	2	8	—	13	3	0
Carmen No. 3	4	1	2	12	—	9	3	8	5	12	3	12	—	11	3	4
Victory	3	10	2	24	—	7	3	12	4	10	1	12	—	13	3	0
Scottish Triumph ..	2	7	0	22	1	9	2	0	Failure				..			
Coronation	2	13	0	4	—	17	2	0	3	8	3	0	—	15	2	24
Early Rose	2	1	1	0	—	8	3	8	—	8	0	24	—	11	3	4
Manistee	1	9	1	24	—	17	2	20	2	11	0	12	—	7	3	12
Sussex Red	Failure				..				2	7	0	24	—	11	3	4

At Hansen's farm the yield of some of the varieties was lessened through the depredations of vermin.

In previous comparative trials on the tableland the white-skinned varieties have invariably done best, Up-to-date and Carmen being consistently the best croppers.

Peanuts.

Due to the low price offering, the acreage under this crop has very greatly diminished. A duty of 4d. per lb. is operative on peanuts imported for purposes other than for oil extraction, yet the price offered the Northern growers has, as a rule, not been in excess of the duty but frequently under it. An inquiry into the amount of oil extracted from peanuts and the amount of peanuts imported for that purpose free of duty into the Commonwealth would appear to be justified in view of these low prices offered.

Plant Diseases.

Due probably to the favourable season promoting a vigorous growth—thus rendering the plants resistant to disease—the crops in the North on the whole were remarkably free from disease causing loss.

Sorosporium Reilianum.

Sorosporium Reilianum, or Head Smut, was prevalent on the farms where the affection was noted in the previous year, but not in all cases to the same extent, and must be expected there until rotation of crops is practised.

Blue Mould.

Blue Mould on Cigar Leaf was again in evidence in the Euri Creek district. This affection appears to be most prevalent during the wet season and is evidently induced by weather conditions. An experiment is to be undertaken this coming year by planting seed-beds at regular intervals, at the same time noting meteorological conditions in order to determine if possible causative agencies.

Urophlyctis Alfalfae or Crown Warts on Lucerne.

An instance of the spread of this malady by mechanical agency was noted on the tableland, where the knife-bar of a mowing machine dragging along a slight ridge in the field had carried the soil along and distributed the disease along the length of the ridge, while in other portions of the field the affected spots had not increased in size.

Insect Pests.

As is usually the case in a season favourable to growth, insect pests were not greatly in evidence.

Nematodes.

Cases of plants affected with this minute eel-worm, which causes galls or malformations on the roots of several species of plants, are not infrequent in tomato, potato, and other crops in the North, serious damage having been done to a few crops at Bowen and on the tableland this year. It is intended to carry out some experiments on affected land during the coming year.

LEVY ON HOMEBUSH SUGAR GROWERS.

Regulations have been issued under the Primary Producers' Organisation Acts in connection with a proposed levy to be made on producers of sugar-cane in the Homebush area, at the rate of 7d. per ton of sugar-cane delivered from the Homebush area to the Farleigh and North Eton Mills. Growers are given the opportunity of objecting to the making of this levy. If, on or before the 21st December, 1925, a petition is received by the Minister for Agriculture, signed by 100 or more growers of sugar in the Homebush area asking for a poll to be taken as to whether the levy should be made, a poll will be held, and if the majority of votes is against the levy, the levy will not be made.

The proceeds of the levy will be utilised for the purpose of defraying the cost of diverting cane from the Farleigh to North Eton Mill. The levy, if imposed, will be deducted by the managers of Farleigh and/or North Eton Central Mills from the final cane payment due by such mills to the sugar-cane growers concerned.

THE BANANA WEEVIL BORER.

(*Cosmopilites Sordidus* Chev.)

JOHN L. FROGGATT, B.Sc., Entomologist.

INTRODUCTION.

The Banana Weevil Borer problem is one of very serious import to the banana industry in Queensland, and hence special attention has been paid to economic entomological research into this problem, as a result of which a considerable amount of work has been carried out. Reports on the investigations have been published in the "Queensland Agricultural Journal" from time to time since 1921, but as the records are becoming rather scattered, it is purposed to bring together the information obtained to date from all sources in the following pages; some of it will be new, other portions will be a revision of matter already published.

As the literature and data available when these investigations were instituted was extremely meagre, the work had to be started from the beginning. The first matter for study was necessarily the development and habits of the insect, to ascertain whether it was more vulnerable to treatment, or natural enemies, at any one period more than another, and the conditions under which control measures might be expected to yield the best results.

Our knowledge of the distribution of the pest in 1920 was very slight, and is still far from complete, which is unfortunate, because too strong an emphasis cannot be laid on the fact that a knowledge of the exact limits of distribution is vital to any measures launched to combat the borer. It is too big a task, under existing conditions, for even a large body of men, and still more hopeless for isolated individuals, to examine every banana plantation in the State within a reasonable time, in order to determine whether the borer is present or not in each place. The greatest difficulty is frequently met with in any endeavour to ascertain from growers if the pest is present in their plantations; rather will they deny its existence in the neighbourhood, preferring the short-sighted policy of "hush-it-up."

We cannot shut our eyes to the fact that if the pest is not controlled, it will rapidly reduce the productivity of a plantation to a point at which it ceases to be profitable, and before this land can be replanted with bananas, all the old stools will have to be dug out and destroyed, measures will have to be taken to kill as many of the beetles as possible in the soil, and the area will have to be given a considerable spell, or placed under other crops often less profitable than bananas.

If this industry is to maintain its great position in the public life of the State the weevil borer will have to be coped with, and the longer the practical handling of the problem is delayed the greater will be the

difficulties that will have to be surmounted in its control. Not only will the area of dispersion and degree of infestation be greater, but the increase in the amount of plant material that will have to be cleaned out will be so tremendous as to be staggering; even one year's total will be enormous.

The general apathy that is shown towards this pest by the majority of growers is astonishing, the lack of interest in the weevil borer arising largely because, in the majority of cases, its depredations are looked upon as an unavoidable evil, and, moreover, one which will not do any great harm. There are, however, other growers who are striving to do their utmost to bring about its control, and of this minority there are many who have given invaluable help in testing out ideas under field conditions that the scientific investigator was unable to do owing to a complete lack of facilities for doing the work.

It behoves the growers, as a body, to do what they can to help rather than hamper the investigations, by co-operating, either individually or through their associations, instead of standing aloof.

One other note of warning should be sounded. Many intending growers set out on their way without even endeavouring to ascertain what pests they may have to guard against; the result is that later on very many come with a tale of woe after the borer, in particular, has become established in the young plantation. In many cases, at least, this could have been obviated if a little information had been sought before embarking on their venture.

Once this pest obtains a footing in an area, it is by no means a simple problem to master; only by constant vigilance and unremitting attention can it be brought down to a minimum, and, by sustained effort, be kept at that point. Control measures cannot be carried out for a short period and then be allowed to lapse if lasting benefit is to result, but must be continuous and thorough to be effective. The fact that there are two periods of the year when the beetles are comparatively inactive is of great assistance in this connection.

With adverse climatic conditions wreaking their devastating effects on the plantations, and decreasing, so seriously, the vigour of the plants, the effect of banana weevil borer infestation has recently come to be rather more generally recognised and appraised at its true value. The grubs working in the heart of the corm, which is the storehouse for the plant and whence its food is distributed, undermine still further the vitality of the plant and cause a more or less complete breakdown of the stool. In spite of repeated warnings, most of those vitally concerned have been content to delegate any application of the most important matter of control to some indefinite future period. Last year, however, the fallacy of this action was demonstrated in so striking a fashion that the consideration of this matter could no longer be left in abeyance, and a considerable amount of useful work was carried out.

In the prospects of good seasons, however, lurks a grave risk of public opinion swinging around again and allowing matters to drift back to where they were before. This should be guarded against in every way possible, because if it does occur, the results will be disastrous.

PART I.

Life-Cycle Stages of Borer.

The following illustrations and short descriptions of the different stages of the life-cycle of the banana weevil borer should help a grower who is, as yet, unfamiliar with it, to determine whether any insect he finds about the stools is this dreaded pest or not. Should any doubt arise as to the identity of beetles found on the plantations, and the specimens are sent in to the Department, the fullest possible information will be readily supplied.

The imago (or adult) is barely half an inch long, and when mature, is black in colour and very hard. The thorax is covered with fine punctures, and the elytra (or wing covers) are striated longitudinally, and also finely punctated. In front of the head there is projected a fairly long rostrum (or trunk) and behind, the elytra do not quite cover the whole of the abdomen, leaving a small portion bare. The beetle is sluggish in movement, and feigns death on being disturbed. During this stage of the life-cycle no damage is done to the banana plant, the function of the adult being purely reproductive.

The egg is very rarely seen in the field, and a special search is required to find it. It is about one-twelfth of an inch long, and is elongate, oval, and pure white, thus harmonising with the plant tissue in which it is embedded, rendering it very hard to detect.

The larva (or grub) when fully grown is slightly more than half an inch in length; the body is creamy white and slightly curved; it is a stout, fleshy, legless grub with the middle to hind portion presenting a swollen appearance; the head is reddish-brown.

The pupa (or chrysalis) is a complete resting stage, during which the change into the beetle takes place. It is white and barely half an inch long; all the external parts of the beetle, legs, trunk, wings, &c., are plainly visible.

LIFE HISTORY AND HABITS.

The Egg.

The eggs are always deposited singly, and generally in the plant at about ground level, in a small burrow, slightly curved. The dying of the tissue surrounding the orifice to the egg chamber causes it to shrivel and flatten, the combined effect of these two factors being to practically completely close the orifice. The egg thus lies just beneath the surface in what is, virtually, a sealed chamber.

Very occasionally an egg has been found in the side of an old larval tunnel, or lying loose amongst the decaying leaf bases at the crown of the corm, or in a crack in a similar situation.

The greatest activity in oviposition is shown during the spring and autumn; September to November, and March to May being, as a general rule, the months during which the number of eggs deposited gradually increases (maximum in October and April) and then decreases as the extremes of temperature are approached. It does not absolutely cease at any time of the year, but the effect of the climatic conditions of winter appears to bring it to a lower rate than those of summer.

* *Vide* Plates 140 and 141.

Fig. 1.

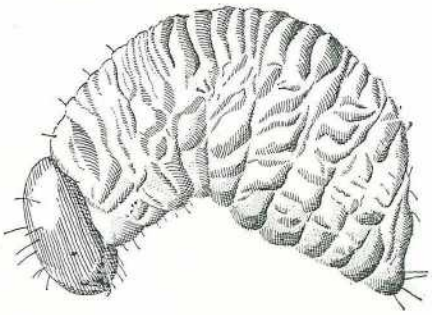

Fig. 2.

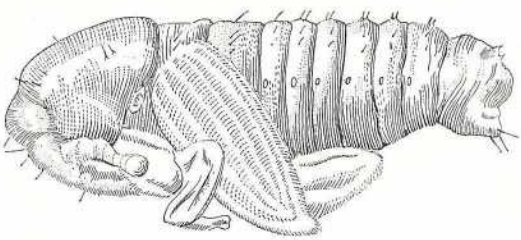

Fig 3.

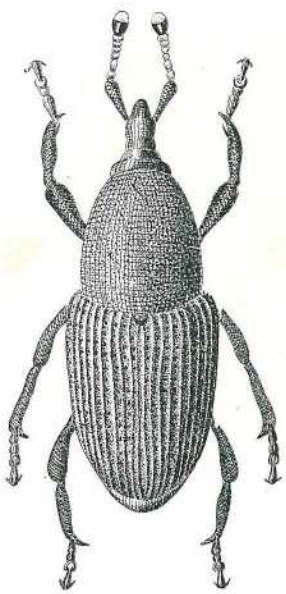

Fig. 4.

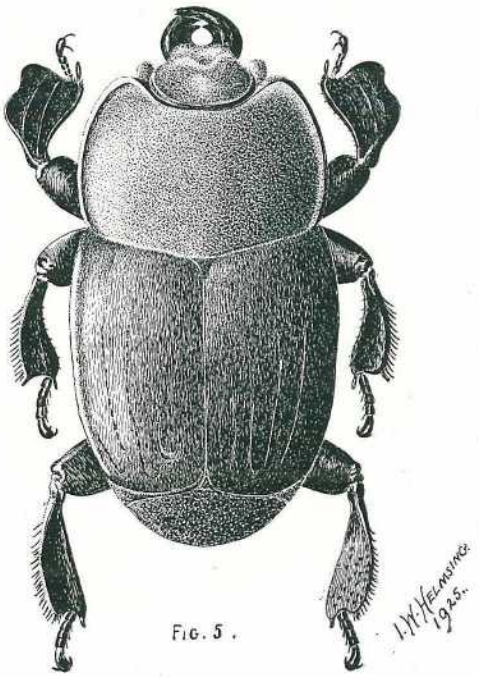

Fig. 5.

Plate 140.

Fig. 1.—Egg of Borer. Fig. 2.—Larva of Borer. Fig. 3.—Pupa of Borer. Fig. 4.—Adult Borer. Fig. 5.—Adult of *Plæsius javanus*, predator on the Borer. Magnified 4 diameters.

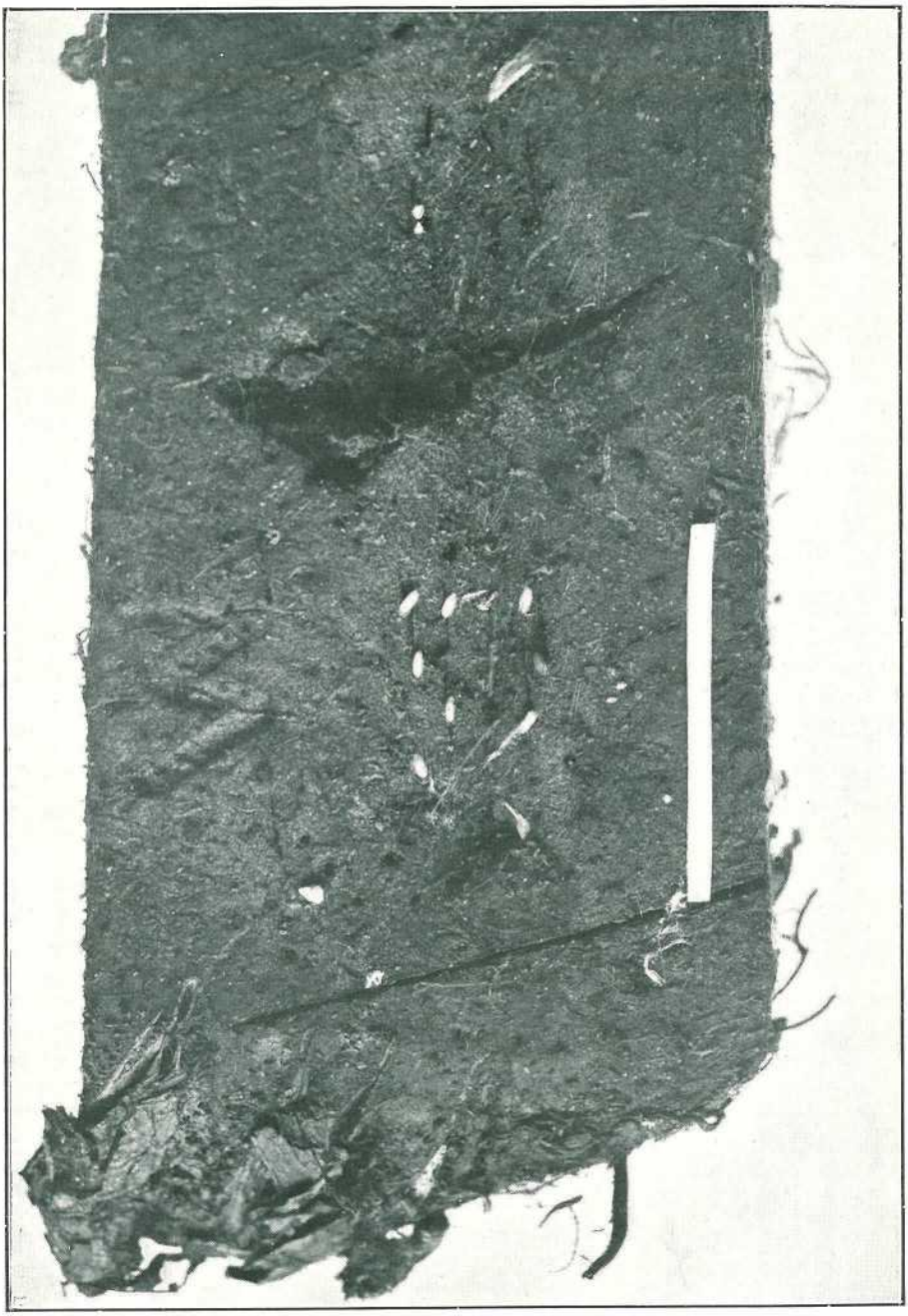

PLATE 141.—EGGS OF BANANA WEEVIL BORER TRANSFERRED FOR OBSERVATION.

The female, after selecting the site for the egg-burrow, eats out a hollow in the plant by means of the jaws in the tip of the trunk (or proboscis) in front of the head. She then turns round and through the ovipositor (a slender retractile tube situated in the tip of the abdomen) drops the egg into the chamber prepared for its reception.

The time that elapses between the deposition of the egg and the emergence of the larva shows wide variations under different climatic conditions such as are experienced with the changing seasons. From spring to autumn the average is about eight days, but the period has been extended in winter to over thirty days, and in some cases has fallen to about four days in the summer (*vide* Table A).

The development of eggs in the ovaries appears to proceed continuously rather than to occur in batches at intervals. This is best exemplified during periods of maximum activity, as the slower rate of development during the remainder of the year is liable to obscure this fact.

With the beetles under continuous observation, no sudden cessation, increase, or decrease in the number of eggs deposited has been noted, as should have occurred if batch development took place.

Deposition of eggs is continued practically till the death of the female, but the numbers appear to be greater in early than in later life.

From field observations on stems lying amongst the stools or between the rows, deposition of eggs was generally made within twelve to eighteen inches of the basal end and in the part resting on the ground. If any corm was attached to the stem, oviposition took place in the majority of cases approximately at the crown of the corm.

Eggs have not been found in the field in any plant portions showing decay, and in cases in which the larvæ cannot mature before the material in which they are breeding becomes rotten, they usually die; neither does the virility of the plant at any given time exercise any influence on the deposition of eggs in its tissue.

When deposited, the eggs are pearly white; after a time, varying with the period of the year, the apical (head) end becomes hyaline (clear), this ultimately extending to about one-third of the length of the egg. Shortly after this commences, the anal (tail) end also begins to turn hyaline, but this does not extend to quite the same distance towards the central point as occurs from the apical end. The clear anal area becomes opaque again, and the apical section turns cloudy. The next sign is the appearance of two very fine brown lines in the tip of the latter, representing the mandibles, these later being flexed into the normal position. Then the chitinisation of the other mouth parts appears, and later the plates of the head.

The Larva (or Grub).

When the grub is ready to emerge it cuts the egg envelope by means of its jaws, and, working itself free, begins to eat its way into the bulb. At first the tunnels are very small, but as the grub develops they gradually increase in diameter until they are about as thick as a lead-pencil; they are perfectly circular.

As the larva grows in size there comes a time when its skin has been stretched to the maximum, and it is thus prevented from increasing in

bulk. It then lies comatose for a short period, after which the old skin splits along the back (a new and larger one having formed underneath) and the larva is free to pass on a stage farther in its growth. This is termed a "moult" of which there are several before full development is reached. Throughout its life, it is a voracious feeder, devouring an amount of tissue equal to many times its own bulk.

It is during the grub stage that all the damage is done to the plant. Portion of its life is passed in the heart of the corm, the remainder being spent in the outer section. In both cases an enormous quantity of tissue is destroyed, representing in the former, food-storage capacity; in the latter, many root-origins are either damaged or cut through, causing the affected roots to die out. Not only does this lessen the amount of material obtained from the soil, which is built up in the leaves with other constituents into food for the plant, but also may, and does, in many cases, so weaken the hold of the plant in the soil as to cause it to fall out of the stool. Furthermore, in order to send out fresh roots, stored food has to be drawn on, and used up, to provide the necessary material for such development to take place. Thus by preventing the plant forming and storing the amount of nutriment required, not only to maintain the plant in full vigour but also to produce the best quality and the greatest quantity of fruit possible per bunch, this pest causes a very considerable reduction of profits to the growers. In one case recorded, some plants in an old abandoned area were endeavouring to throw a bunch, but had only sufficient vigour to develop half the first hand, and, in odd cases, one or two fingers on the second. The grubs of the banana weevil borer had riddled the butts, and travelled two to three feet up the stems in many of these plants. Although it is a remarkable example of the vitality of the latter, it is a striking condemnation of allowing plantations to ever arrive at such a pitch of neglect, and illustrates further what havoc the borer will do if allowed to increase unhampered.

The attack of the grub may even bring about the complete loss of the plant before it has thrown a bunch. Decay of the plant tissue often develops along, and spreads out, from the larval tunnels, thus bringing about still further destruction of the corm.

During protracted dry weather, when the plants are striving against adverse growing conditions, the effect of the borer undermining the remaining vitality of the plant brings about a more or less complete breakdown of the stool far more rapidly than would occur in a normal, or good season, while a plant in poor vigour shows the effects of infestation far more rapidly than one in strong growth.

In badly infested plantations, it is by no means uncommon to find very few suckers coming away, those that are produced being poor and weedy. This is another serious effect of the borer, as the continued prosperity of a plantation depends on the growth of good healthy plants.

Suckers have been found in badly infested plantations that, when pulled, snapped off about three inches above the ground, often exposing a grub and exhibiting a complete internal girdling. In other cases it has been observed that the larvæ have traversed the central core of the sucker from the bulb to the unfolding leaf, causing the complete destruction of the plants so affected. It will also often be noticed that larvæ have tunnelled from the parent corm into that of the sucker given off from it.

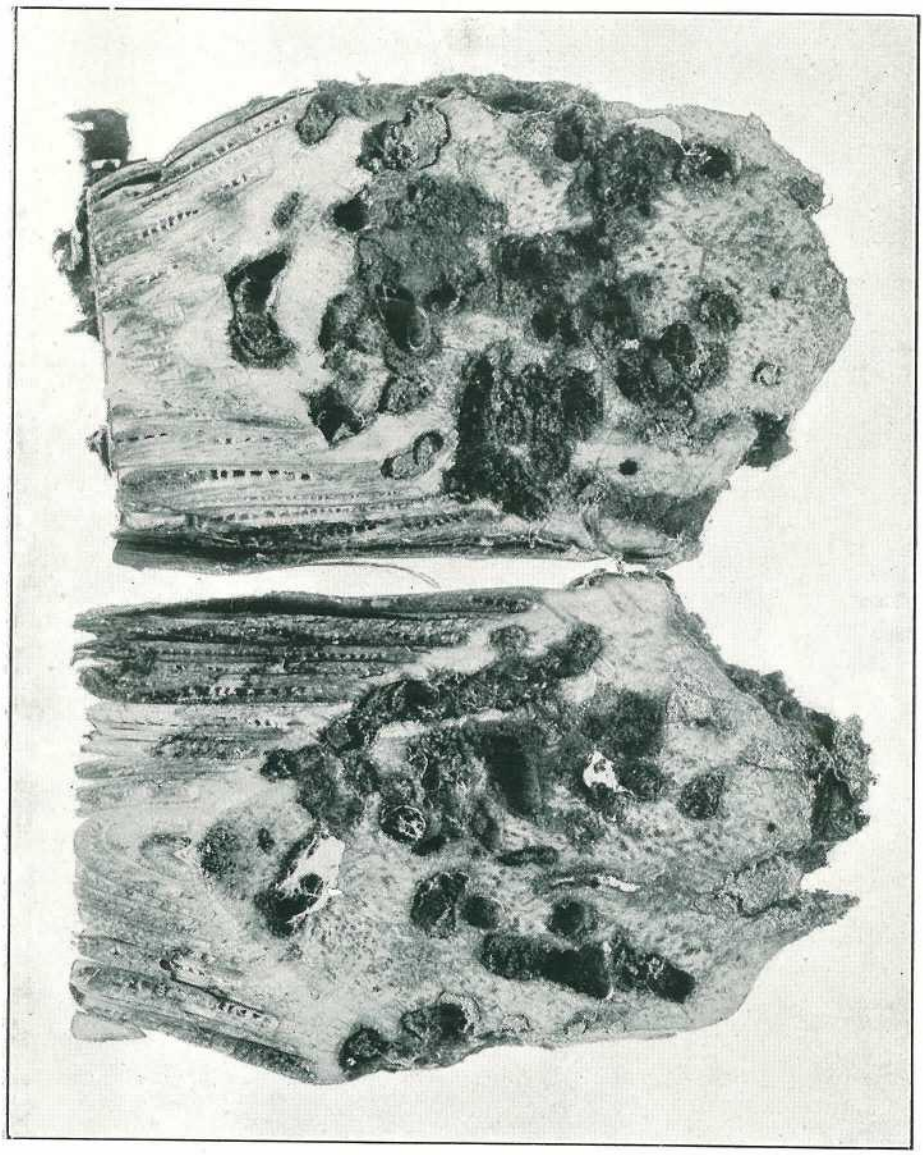

PLATE 142.—BANANA SUCKER, ABOUT 3 MONTHS' OLD, SHOWING SEVERE INFESTATION BY BORER.

PLATE 143.—INFESTED BUTT OF BANANA PLANT, SCALE 2 CENTIMETRES (2·5 CENTIMETRES = 1 INCH).

Note 1.—Tunnelling in outer and inner portion of corm.
Note 2.—Plant decay spreading from grub tunnels in heart of corm.
Note 3.—Destruction of central core of plant by grubs.

In Queensland, the Cavendish, Sugar, Lady's Finger, Plantain, Gros Michiel and Dacca varieties of banana plants have all been found to suffer from the attacks of the banana weevil borer. The Dacca especially, and to a somewhat less extent, the Gros Michiel, are rarely met with, and the Sugar variety is becoming scarcer, owing to its susceptibility to "Panama" disease; the Cavendish is the principal one grown. Comparatively speaking, all these varieties appear to be affected with the same relative frequency.

The question of relative injury to the different varieties is rather difficult to determine, as they do not all flourish under similar conditions. It can, however, be stated that the destruction wrought by this pest in all of them is considerable, and where two or more are growing together, there does not appear to be any appreciable difference in the amount of destruction caused by the borer in the different varieties.

A knowledge of the plants in which this pest will breed is of the utmost importance. So far, in Queensland, it has never been found developing in any plant other than some species of banana (Musa), although in Fiji it has been reported to have been found in sugar-cane. This matter of hosts other than banana is receiving careful attention.

The effect of climate, or geographical location, does not appear to affect the depredations of this pest. It occurs through the tropics well down into the sub-tropical regions, and is as prevalent and destructive on mountain ranges as on lowlands, both at a distance from and along the seaboard.

Although, as a general rule, the grub of the borer does not extend its tunnels more than a few inches at most above ground level in a growing plant, soon after the bunch has been cut, if the old stem is left standing in the stool, they will very often travel well up into it if not along its whole length. The numbers met with in these cases are often large. It is the central core (*i.e.*, the bunch-stem) that is particularly traversed, but they will also often tunnel through the leaf bases comprising the remainder of the pseudo-stem.

Old corms in the stools will sometimes be more heavily infested than the standing plants, and are therefore acting as select breeding grounds (which are generally never interfered with) for the pest to multiply in; by these means, the beetle population is greatly augmented in the very spot that it is desired to keep as free as possible from the pest—namely, the heart of the stool.

The actual monetary loss due to weevil borer is, under present conditions, at any rate, impossible to put down in figures, as it depends on factors each of which is individually so difficult to estimate.

Firstly the period over which a plantation will remain commercially productive, quite apart from any consideration of pests, is very greatly influenced by conditions of soil and rainfall, both of which are so extremely variable. Secondly, the actual reduction in the number of fruit per bunch directly attributable to borer infestation is more often than not in the nature of a more or less gradual, rather than a sudden decrease, due to the slow but steady undermining of the vitality of the parent plants. Thirdly, the actual diminution in the quality of the fruit produced is influenced in a similar manner to the second factor.

Although an approximation might be arrived at, it would take a great deal of careful study, and the expenditure of a considerable amount of time, to obtain sufficient data from which conclusions might be drawn and figures obtained.

It is virtually an impossibility to determine the actual amount of damage that can be ascribed to a single larva under laboratory conditions with the extremely limited facilities available. In the field, determination of this point is complicated by two principal factors. Firstly, there are generally two or more larvæ, mostly in different stages of development, present in the bulb or stem. Secondly, in some cases, the grubs remain more or less in one part of the bulb, virtually eating that section out, while, in others, they wander in all directions.

A general idea may be obtained on this point in an indirect way. As many as thirty-five larvæ have been taken from a single corm about 9 inches by 13 inches in size, that was virtually honeycombed by their borings.

One peculiar habit of the larva only recently recorded is worthy of note. On three separate occasions occurring in the months of December, May, and June, larvæ have been found burrowing in the stalk of the bunch outside the plant. It was evident that they had not tunnelled through from the heart of the plant. This is certainly exceptional, and any information on other such occurrences known to growers would be welcomed.

As the grub moves forward, the tunnel behind it becomes more or less tightly packed with waste fibre and excreta; on account of this barrier, any control by natural enemies is very seriously hampered, and from the observations to date, natural enemies, either animal or plant (fungus) do not appear to play more than, at most, a very insignificant part in checking the increase of the pest in this State.

As the grub approaches maturity, its tunnelling turns towards the outer surface of the bulb, and, when full fed, it comes to rest in the end of the tunnel, lying with only a very thin layer of corm between it and the soil.

The period passed in the grub stage shows wide variations under different climatic conditions. During the spring and autumn it is about forty days, whereas under winter conditions it is extended to well over 100 days, and in summer it has fallen to as low a figure as twenty-five days (*vide* Table B).

When the larva is full fed, it lies comatose in the end of its tunnel, the body becoming flaccid and elongated and the thoracic segments showing up more prominently. This dormant or pre-pupal period lasts for from one to three days (*vide* Table C), when the larval skin is cast exposing the pupa.

The Pupa (or Chrysalis).

The pupal chamber in the corms has always been found situated below ground level and just underneath the surface of the bulb. In cut stems the site varies considerably; although it is generally close to the outside layer, it has been observed as far as two inches in from the surface in cases of very heavy infestation.

No cocoon is formed, but occasionally a few strands of fibre have been noted in the tunnel end of the chamber; this is, however, exceptional and generally occurs in rather dry material, or where pupation takes place in the tissue of the leaf bases.

The period passed in this stage, although variations have been found to occur, has fluctuated very little from an average of about eight days (*vide* Table B).

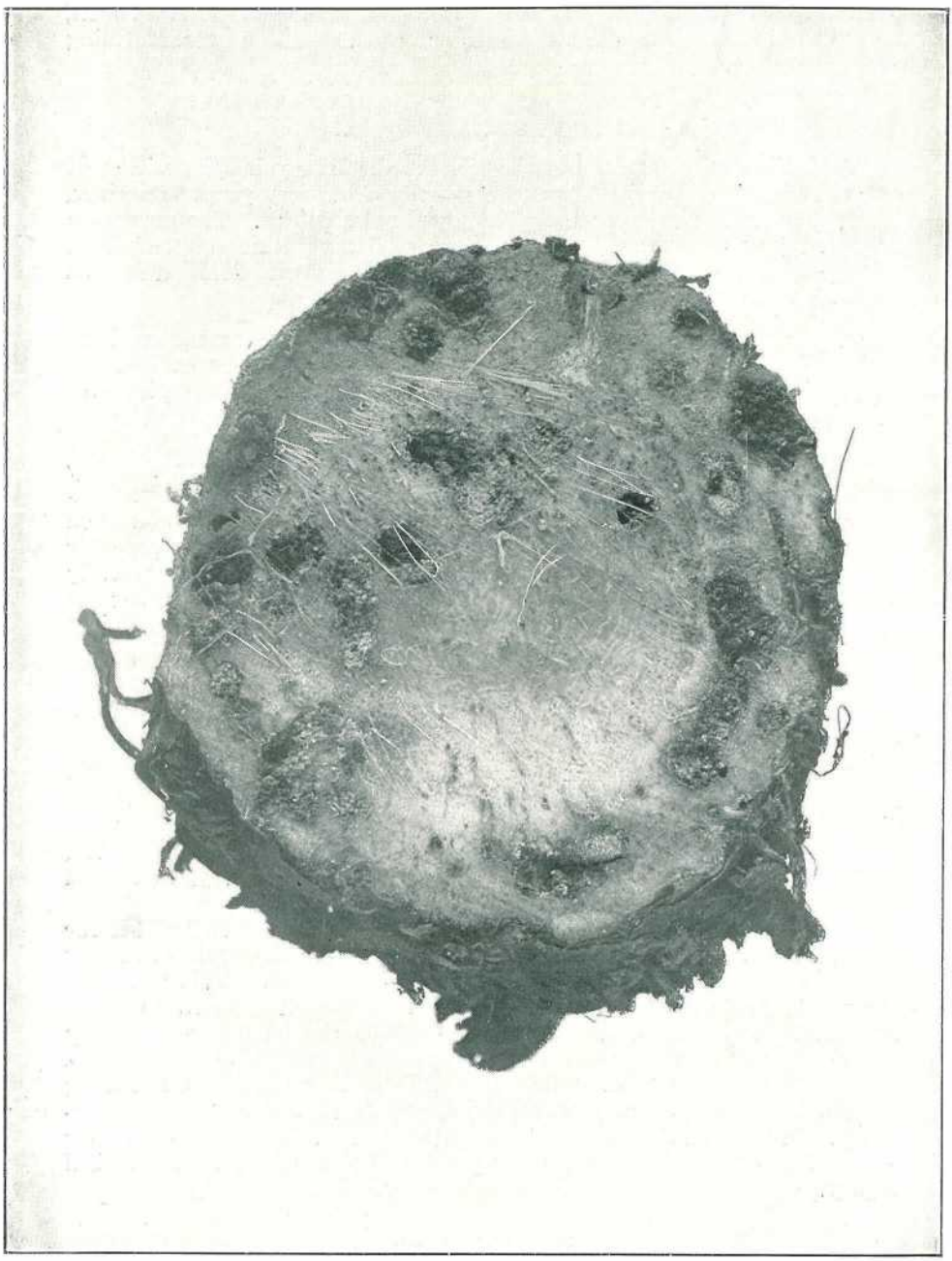

Plate 144.—Infested Banana Corm, showing Grub Tunnels.

About one to two days before the completion of the pupal period a faint colouring of the joints of the legs is first noticed, followed a little later by a similar darkening in the plates of the head. This gradually spreads and deepens in tint until the whole body is of a lemon, or light reddish-brown which is the colour of the beetle on transforming from the pupa.

Duration of Life-Cycle.

The time taken for the completion of the life-cycle (deposition of egg to emergence of beetle) must necessarily show very great variations, being shortest in the summer and longest in the winter. The maximum recorded is 180 days, with a minimum of twenty-nine days, and an average of forty-seven days. The figures in Table B give detailed records extending over portions of just over three years.

The data from which the figures in Tables A, B, and C have been compiled were obtained from a long series of observations carried out in the laboratory. The eggs were obtained by paring the pieces of corm on which beetles had been feeding for a known time, and transferring those that were exposed undamaged to incisions made in larger portions where they could be kept under closer observation. They were covered over with thin layers of plant material, renewed periodically. The larvæ, as soon as possible after emergence, were placed in small holes made in slices of corm, which were then set aside in separate tins and the food changed as required. By this means comparatively close observation could be kept on the larvæ throughout their lives. A very large number died, through a variety of causes, but a sufficient number matured to enable a fair series of records to be made.

The Imago (or Adult).

After transforming from the pupa the beetle is very soft, and remains quiescent in the pupal chamber for several days; during this time the body hardens and darkens. The time passed in this more or less comatose condition in the plantation can only be arrived at indirectly, and probably more or less approximately, owing to the variation from normal in the laboratory conditions. It has thus been found that, after emergence, the weevils do not show any marked inclination to feed for about a week, but do not attain their full colour for an average of about fourteen days. This latter period is, however, variable, having in some cases extended over thirty days, and in others been reduced to about six days. When ready to commence activity the beetle eats its way through the thin coating of corm and enters the soil, in which it passes the major part if not the whole of its life. It may, and often does, pass into rotting banana plant material, but does not re-enter the standing plants except under special circumstances, and then only for shelter where a cavity has been formed by previous borer attack or mechanical injury.

Periods of Emergence.

The greatest emergence of imagines probably occurs in May and November, but pupæ have been collected in the field in practically every month of the year, so that these two months cannot be considered as the only times during which beetles are breeding out.

Longevity.

Observations on the length of life of the imagines prove conclusively that it is a long-lived beetle, but the effect, if any, of annual or seasonal variations of climatic conditions on this matter cannot yet be definitely stated. Beetles collected in the field have shown a life period of as long as seventeen months when fed continuously. Table D gives a summary of the records of observations. As the age of the beetles when collected was indeterminate, great differences may naturally be expected, and these (average) figures can ony be considered a minimum.

The averages for beetles bred in the laboratory are given in Table E, which shows that individual records have gone as high as 748 days. A very high rate of mortality has occurred throughout this series, death often ensuing within a few days of emergence. The beetles, after leaving the pupæ, were supplied with food continuously, and in most cases were kept singly. This rate of mortality was at its maximum under moist conditions; the beetles were, of course, under most unnatural conditions when newly emerged, especially as the corm at times developed moulds soon after the slices were placed in the tins with the weevils. The highest death rate amongst the beetles collected in the field, and kept in the laboratory, occurred between January and April, being more particularly marked in March and April.

The beetles succumb very quickly when exposed to heat in such a way that they are unable to escape. Exposed on a piece of tin with upturned sides to the heat even of the sun in the hotter portions of the year, the weevils will turn over on their backs almost at once, and, after waving their legs about for a few seconds expire.

Under starvation conditions, the length of life is short when the soil is dry, being only a few days; when the soil is kept damp, however, it may extend to about six months (*vide* Table F). This point will require further investigation in order to determine what divergences, if any, occur at different periods of the year.

Tests have been instituted to ascertain whether the starvation of the imagines over varying periods of time has any influence on the development of eggs and the rate of oviposition, but this work has not yet progressed far enough to warrant any deductions from the data obtained.

The period over which the beetles may live under conditions of starvation, and also of submergence in water, may be influenced by their age. As all the tests were carried out on beetles collected in the field, the age of which was, of course, unknown, the influence of this factor can only be inferred from other observations, but how it would react is problematical.

Emergence to Oviposition.

The period from emergence to mating and thence to oviposition has been found to vary enormously. The reason for this has not always been apparent, but a factor that does seem to exercise some influence is the time of year at which the imagines emerge, regarding as to whether this occurs just prior to or early in an active period, or late in an active period or early in an inactive one. Further data are required to determine the extent of the variations and the influencing factors. Some results of observations are given showing dates and periods in Table G.

Powers of Movement.

The beetles move normally over the soil and in the air only at night, but they move beneath the soil even by day. In dull weather, immediately after rain, it has been recorded that the beetles have been seen crawling on the surface by day: from the data in hand it would seem that this is not of general occurrence.

Effect of Light.

A considerable amount of work was done on the effect of light on the adult beetles. A twenty candle-power electric bulb connected with a small accumulator was used as the source of light. The bulb was set in a closed container fitted with a reflector, and a narrow beam of light was passed through a glass vessel containing coloured fluid. A number of different colours were tested. The beetles were exposed within the arc of light and their movements closely observed. By their actions it was readily seen that they were most strongly abhorrent of light, particularly a bright one. It was only under such a feeble beam as to be almost too dark to see the weevils clearly that they manifested any inclination to stray in the light, and then only for a short time, ultimately crawling away into the dark. Where they were exposed on soil, they burrowed down rather than crawled away.

Flight.

It has now been definitely proved that the beetles fly, but to what extent this method of migration is exercised still remains to be ascertained. So far, no instance has been recorded in which two or more beetles have been observed in flight together, and in every instance normal flight has occurred on warm muggy nights, shortly after dusk for the most part, between the latter part of November and the first half of April.

The difficulty of collecting information on this matter is one of the greatest experienced in the whole course of the investigations, and it is most earnestly desired that any growers observing the beetles actually in flight, or even in such a position as would lead to the natural supposition of flight, would send in details of what they saw—especially time, date, weather conditions, distance from banana stools, whether these would lay uphill or downhill, &c., and whenever possible, the beetles themselves in a small tin. Any such assistance would be greatly appreciated.

Submergence in Water.

The possibility of utilising excessively wet conditions as an aid to the destruction of the mature beetles is discountenanced by the results of a series of tests carried out by totally submerging the beetles in tap water. Eleven days under such conditions had practically no effect, 90 per cent. to 100 per cent. coming through alive. This, though surprising at first, is not so remarkable when it is remembered in what very wet situations they are found in rotting butts and stems in the plantations.

Food of Beetle.

The food of the adult weevil is undoubtedly the substance of the banana plant. In one instance an odd beetle was found feeding on a

potato tuber, and also on a bulb of the "arrowroot" plant (*Canna edulis* Edw.). In both cases the crops had been growing alongside infested banana plantations, and had been dug out, odd tubers and bulbs lying about the field.

Egg Development.

The seasonal effect on the development of eggs is very marked indeed. On the approach of summer, within three or four days of the first hot spell there is a sudden diminution in the number of eggs laid, and in the height of summer oviposition may almost cease. As soon as milder climatic conditions are experienced, a gradual, but appreciable increase in egg laying is observed, which reaches its maximum usually in the beginning or middle of April, decreasing as cooler conditions prevail until it again almost ceases, and if the winter be a severe one may do so completely. Following very closely on the first few consecutive warm days in the latter end of August, a steady increase commences, and reaches its maximum in late September or early October. If a few cool days occur together in summer, or a few warm ones in winter, a slight temporary rise may occur. From field observations made by certain growers, the laboratory records have been proved to approximate very closely indeed to the conditions occurring in the plantations.

Reaction to Baits.

The reaction of the beetles to "baits" in the field follows very closely their activities regarding oviposition. During the periods when this rate is high, imagines, often in considerable numbers, are to be found under any piece of banana plant lying on the ground. During the height of summer and more particularly the depths of winter very few beetles are to be obtained in this way.

As a result of field tests with "baits," it has been found that the number of beetles caught in and immediately around the stool is far greater than those trapped further away; this is more particularly in cases where old plant material is kept cleaned up. Where there is plenty of shelter in rotting material all through the plantation, the imagines will naturally be far more generally scattered throughout the area.

It has been noted on many occasions that immediately after heavy rain or general wet weather, the number of beetles found under baits shows a very marked decrease, but rises again usually about two days later. Where they disappear to during this time is not known.

Abnormal Oviposition Site.

That the females may, under certain ill-defined conditions, burrow well down below ground level to deposit eggs in the plant is evidenced by the fact that occasionally infestation will be found only in the lower portion of the corm, and be absent towards the crown. This is, however, much more the exception than the rule. On steep hillsides, where erosion has often more or less exposed the bulbs for a considerable distance down, a great enticement is offered for low oviposition, but it is not invariably found to occur in such situations, and has also been observed on flat country.

Breeding in Old Plant Material.

The beetles breed freely in stems cut off and left lying on the ground, as also in old corms in the stools. They shelter and probably feed in any rotting banana plant material, both that lying on the ground or standing in the stools, as long as it is moist. Decaying butts are especially favoured, as many as thirty-nine beetles having been taken from a sngle one, and as many as 100 grubs, pupæ, and imagines have been taken from a cut stem lying on the ground.

Natural Enemies.

The matter of ascertaining and, whenever possible, developing natural enemies has so far not met with any appreciable success.

An Elaterid ("Skipjack" or "Click-beetle") larva was found by H. Tryon in a district along the North Coast, and again met with in the same locality in 1921 by the writer, when a single larva was found in an old corm after a considerable amount of searching, with a partially consumed imago of *C. sordidus* in its jaws. This predaceous larva does not appear to be in frequent association with the banana weevil borer, and most likely does not confine its attention to this host. As there does not appear to be any noticeable diminution of the pest in this area, it cannot be claimed that, so far, this predator is doing any great amount of good.

An Histerid (*Plaesius javanus*) was found by Muir to be a natural enemy of the banana borer in Java in 1908. In 1922 a small lot of these beetles (304 alive on arrival) were imported to this State; in 1923, four other consignments, totalling 750 live imagines, were introduced and liberated in a small plantation in which the borer was very prevalent. So far there is no evidence to prove that these beetles have become established in Queensland. It is a rather flat, black, shiny beetle, somewhat oval in outline; the jaws are very prominent, projecting forwards, and the wing-covers do not reach quite to the tip of the body. It is about half an inch long, and about one-third of an inch in width. It is hoped to proceed further with the liberation of these predators in order to test thoroughly their possibilities as a control factor.

Reaction to Attractants and Deterrents.

Although a large series of tests have been carried out with various chemicals with the object of ascertaining whether any of them showed attractant properties towards the beetles, no positive result at all was obtained.

From the point of view of deterrents, a few essential oils were found to act as such for a short period of time and over a very limited distance. Oil of peppermint showed the strongest action of those tested. Limonene also gave similar reaction, but to a lesser extent; in no case was this power sufficiently strongly developed to enable it to be applied in the field. The only substance tested to date that in any degree fulfilled such essential conditions is paradichlorobenzene ("Dichlor"). Laboratory experiments have shown that when a few grains of this chemical were sprinkled on the bottom of a tin, and covered with soil to a depth of four inches, beetles buried three inches down appeared on the surface within two to three hours, whereas under similar conditions without the chemical there was no appearance of the weevils on the surface within eight hours

Plate 145.—Old Butt of Banana Plant showing Severe Infestation by Banana Weevil Borer.

PLATE 146.—CUT STEM (CROSS SECTION) OF BANANA PLANT SHOWING MARKED INFESTATION BY BANANA WEEVIL BORER.

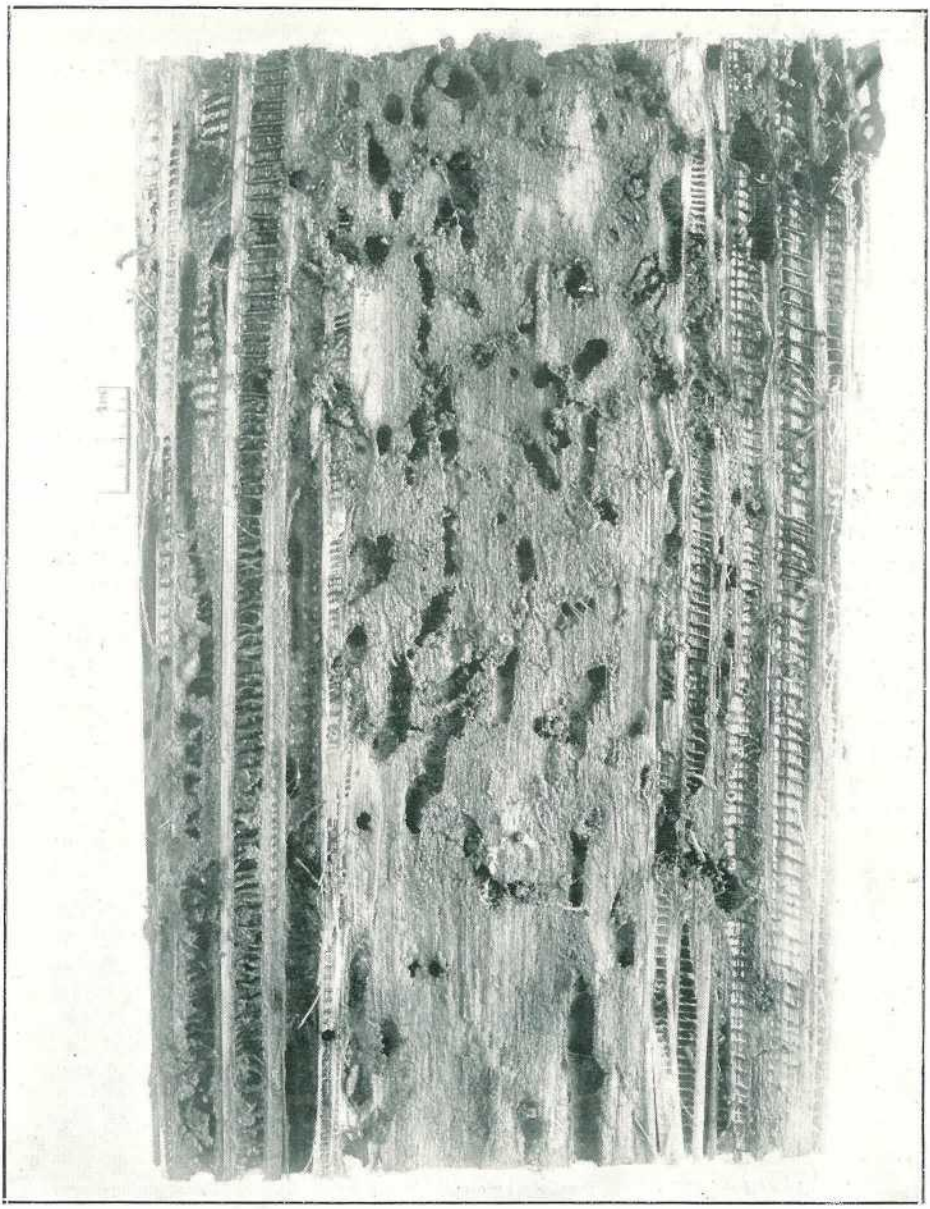

Plate 147.—Cut Stem (Longitudinal Section) of Banana Plant showing marked infestation by Banana Weevil Borer.

after the commencement of the tests. It thus, at a very low concentration, even with an upward diffusion, rapidly drives them out of a confined area. The odour was quite noticeable in the dry soil fourteen days after treatment. In a closed space the vapours of this chemical are deadly on both the imagines and the larvæ of *C. sordidus*—on the former within thirty-six hours, and on the latter, in thin slices of corm, in about twelve hours.

Other experiments with this chemical show that the downward rate of diffusion is much more rapid than that upward.

Reaction to Poisons.

A large amount of research work has been done on the lines of the effect of poisons on the adult weevils using banana corm as the means of conveying the chemical to the beetle.

It has been found that the time of year exercises a great influence on the lethal action of the chemical used, the rate of mortality resulting from poisoning being less in the winter than the summer, and being highest during the periods of spring and autumn.

Both solutions and dry powders were used, all the former and most of the latter tested to date proving unsatisfactory.

Paris Green and Sodium arsenite (powder) have, however, given highly satisfactory results, and Borax, Arsenic trioxide, and Calcium arsenate have killed a large percentage of the weevils exposed to their action. Paris Green has proved to exercise the greatest lethal action over the shorter periods of time, Sodium arsenite being next in order. By reference to Table H it will be seen that in the laboratory experiments with the former, over 97 per cent. of the beetles exposed for a period of three to twenty-four hours to the material treated with this chemical were killed, while 74 per cent. were killed when Sodium arsenite (powder) was used over the same time.

With the solutions, it appeared that the low rate of mortality was due to lack of a sufficiently high concentration of the poison on the surface. With the dry powders, on the other hand, this reason cannot be ascribed for the results obtained.

The procedure used in the laboratory was as follows:—Small pieces of corm were steeped in the solutions, or shaken up in the dry powders, for from 1 to 20 minutes with the former, and from 5 to 20 minutes with the latter, and placed in separate tins over sifted soil. An equal number of weevils were then placed in each tin and left with the poisoned material for varying periods of time, at the termination of which fresh, untreated, corm was substituted for the treated portions. Observations were made from day to day to ascertain the number alive. Small tins, 4 in. by 3 in. by 2 in. were used for this work. The diluent mixed with the dry powders was in every case wheaten flour.

As already indicated Paris Green has proved to be the most active poison tested to date, followed by Sodium arsenite. When one part of Paris Green was mixed with six parts of flour it was found that the percentage of beetles killed so closely approximated that obtained by using the pure poison, although it was slightly less, that for working conditions the saving in cost by using the mixture far outweighed other considerations.

Tests have been started with mixed poisons to ascertain whether any differences occur in their action compared with that of the simple substances, and, if so, whether the former have advantages over the latter or not. So far the results do not show any such advantage, although much yet remains to be done before the work is complete. A summary of the main results is given in Table II.

The value of a suitable poison in the scheme of control is enormous, if only in the saving of time and labour necessary to examine untreated baits. The best indication of this is given by the large number of growers that are now using "baits" treated with Paris Green.

Modes of Dispersion.

It is often extremely difficult to obtain the absolute facts of the distribution of this pest. Odd instances, generally quite localised, present features which can apparently only be explained by either flight, or mechanical or accidental transportation, other than by suckers.

The dispersion of the pest may be brought about in one or more of several ways.

1. By transportation of suckers from an infested area. By far the greatest number of the occurrences of the pest are directly traceable to this means, which is a very difficult one to obviate under present conditions.

It is, of course, highly desirable that suckers should be obtained from an area which is free from the pest. When this is not done, certain precautions must be taken. Plants showing any signs of borer attack should not be taken for planting under any considerations whatsoever.

2. By crawling from an old infested area, more particularly when the supplies of food and breeding material dwindle; this is more applicable where the areas are adjacent. This matter is referred to later.

3. By flying. The information on this mode of migration is extremely scanty. Although it must be taken into serious account in this connection, the degree to which it will influence such rate cannot be determined until our knowledge of the conditions governing flight, the distance over which the beetles can and do travel by such means, and other factors affecting the case are ascertained. From the information to hand on the question generally, it would appear not to be a major factor in the spread of the pest, especially in comparison with its transportation in suckers.

4. By wash down gullies, and steep slopes. Many of our best banana areas are situated well up on the hillsides, and, under the often torrential downpours of rain experienced, infested plant material, and possibly also beetles in the soil, will be carried down from high to low levels.

It has been noted, in some instances where infested material has been washed down in this way into creeks, that it has been carried a considerable distance from its point of origin before becoming stranded with the subsidence of the waters.

This is another reason why old abandoned areas, in such situations especially, constitute so grave a menace to the neighbourhood.

Method of Detection.

The presence of the banana weevil borer at any stage beyond that of the egg, is most readily detected by making an examination of the old butts in the stools, and in stems or old corms lying on the ground. By cutting these open the pest, if present, is evidenced by the tunnels made by the grubs, which will generally be themselves found if the borings are followed up; beetles, or pupæ, may also be met with. Suckers often, though not always, may give an indication, by presenting an unhealthy appearance, particularly noticeable in the leaves; on being removed and cut up, if infested, the tunnels will be seen.

PART 2.

A.—REMEDIAL MEASURES.

Control Measures.

The fallacy of treating the banana weevil borer problem lightly cannot be too strongly emphasised. Those who have paid attention to the toll of this pest realise full well the necessity of taking the most stringent measures to bring it under control. In districts where three or four years ago, and even less, it was not easy to find the pest (and consequently no notice was taken of it) it has now become so prevalent as to give rise to grave anxiety.

In commencing a campaign for combating any pest, the initial work is necessarily that of eliminating, as far as possible, the feeding and breeding grounds. In the case in point, it is not possible, for obvious reasons, to carry out this principle in its entirety and still grow bananas, but there is a great deal that can be done along those lines by cutting up old butts and corms into small pieces, and splitting in halves stems after they have been cut down or fallen out of the stools; in this way natural decay and drying up will be greatly accelerated. They can then be either chipped in or burnt, thus no longer constituting a menace as breeding grounds for the pest.

It is often argued that there is no necessity for destroying this material because the borer does not breed in it; this has not been the writer's experience.

Direct destruction of the pest, however, presents many extremely difficult features. Owing to the whole of the developmental stages of this weevil being passed inside the plant, safely protected from the action of sprays, &c., all such methods of control of insect pests which constitute general economic entomological practice are rendered useless. The introduction of chemicals into the plant to destroy the grubs brings in complications in the risk of affecting both plant and fruit which cannot be lightly disregarded, quite apart from the psychological effect on the mind of the consumer arising out of knowledge that such treatment is being carried out. Very carefully conducted and regulated experiments are required to elucidate this matter; but, unfortunately, suitable facilities for carrying out this and other lines of research have not been available. Facts bearing on this matter will be given later in another connection.

Poison Baits.

Attention has, therefore, had to be concentrated on a combination of the destruction of the beetles, and prevention, or minimisation, of infestation of the plant. In regard to the former, the utility of poisons naturally presents itself as a primary consideration. The work carried out on these lines has already been referred to.

The main points that have to be considered from an economic point of view are—

1. That the poison must be as cheap as possible, and yet be efficient, and that it is readily obtainable in quantity.
2. That it must kill the beetles after feeding on the treated material for a comparatively short time.

Paris Green has so far proved to be the most satisfactory poison for practical purposes, and for field application one part of Paris Green is thoroughly mixed with six parts of flour; this is best done in a large tightly-closed tin. A portion of the mixture can then be transferred to a smaller tin with a finely perforated lid, which can be easily carried around.

The poison mixture is dusted over the freshly-cut surfaces of pieces of corm or cut stem, the former being preferable, which are then laid face down on the bare ground inside, or just outside, the infested stool. They are then covered with a little trash or similar material, thereby not only hindering too rapid a drying of the bait but also rendering the immediate vicinity darker, a condition preferred by the beetles. When a stem is cut down close to the ground a little of this poison mixture dusted over the freshly-cut surface of the butt will also assist in destroying beetles; it is advisable to cover it also with trash.

Utility of Old Butts as Baits.

It has been brought under notice that some growers are boring out a cone in the old bulbs by means of the sucker-pruning blade and dusting in Paris Green, after which the plug is returned to the hole, a pebble being inserted to prevent it falling right in. In one instance in particular good results followed this practice, which was also used when the centre of a sucker bulb was cut out. If this procedure is followed it is advisable to dust the poison around the hole on top of the bulb as well. In some cases wood ashes have been substituted for the flour. Here, however, a note of caution must be sounded, as certain chemicals present in the ash may react with the Paris Green, and render it less effective. Investigations will have to be made to determine the extent to which this is liable to take place, and whether the action is sufficiently great to deleteriously affect the utility of the poison.

Setting out unpoisoned "baits" can be done in a similar manner to that already referred to, but these must be examined at least every other day, and all beetles found on the under surface or in the soil beneath must be collected and destroyed.

Periods for Baiting.

The periods of year when "baiting" will bring about the destruction of the greatest number of beetles are during spring and autumn, and lesser numbers may be destroyed during the summer, or in a mild

winter. Baits require to be renewed about every fortnight, when the old ones should be destroyed. It may be possible at times to cut a slice off the face of the "bait" so as to expose a moister surface which could then be either dusted with the poison mixture or not as desired.

The point has been raised on several occasions that fewer beetles are found under the poisoned than the unpoisoned "baits." This is, in many instances, quite true, but is due apparently to the weevils leaving the former before they die, possibly when the poison begins to take effect. Dead imagines with the green powder on the legs and body have been found as far as 3 feet away from the nearest poison bait, and numbers have been found at a distance of 6 inches or more.

Numbers Caught by Baiting.

Figures obtained in the field of the number of beetles caught in a definite area may be illuminative of what can be done by "baiting" to reduce the beetle population. Unpoisoned baits were used.

1. From slightly less than 2 acres, 30,000 beetles were collected between February and July, 1922; over 5,000 were caught in one round, and one stool yielded a total of 150.

In August of the same year, 1,222 beetles were again caught from this area, and from the 1st to 16th September, 1,472 imagines were destroyed from about half the plantation. The latter total indicates the beginning of the spring increase of beetle activities.

2. From three-quarters of an acre, 4,000 beetles were taken in a few weeks; as many as 800 were collected in one day.

3. From one stool standing close to a heap of old stems, &c., over 300 weevil borers were taken in two months. Many of these must have passed from the rubbish into the stool; this clearly shows what a dangerous practice, not uncommonly met with, it is to stack old corms, &c., in the plantation.

Experiments with Paradichlorobenzene.

As has already been stated, an experimental search for an artifiical attractant has so far proved a failure. If, however, a deterrent could be obtained at a reasonable cost, and in quantity, which would prevent the beetles from approaching the plant to deposit eggs, even for a period, or even minimise this, a very big step forward would be gained. Reference has already been made in this connection to the work being carried on with paradichlorobenzene, the field tests on which have two main objects in view, namely, to ascertain—

1. Whether by burying a fixed dose of the chemical in the bottom of the hole at the time of, or at a period subsequent to the planting the sucker, a protective barrier can be placed around the plant by means of which infestation can be prevented or even minimised.

2. By burying a definite amount of the "dichlor" in or outside an infested stool the beetles can, even to a certain extent, be driven out and prevented totally or in part from returning, and thus at least minimise reinfestation.

If any result is obtained from these tests it will be necessary by further experimentation to determine—

1. How long a single treatment remains effective.
2. How often such must be repeated to obtain the maximum of efficiency.
3. What amount of the chemical is required for each treatment.
4. What are the best period or periods of the year to carry out such treatment.

It is too early yet, however, to form any conclusions, but when sufficient information has been gathered proving conslusively either that it is effective or not, more details can be given on its application, &c.

It can, however, be stated that from the information to hand from growers who have been carrying out the tests, it appears to be yielding very promising results.

There are a number of chemicals and mixtures to be tested in the field from this point of view, but for this work to be done greater facilities are required than are at present obtainable.

Use of Carbon Bisulphide and Potassium Cyanide.

It is often asked why either Carbon bisulphide or Potassium cyanide cannot be used to kill out the banana borer. A brief note on this matter may, perhaps, not be out of place.

Carbon bisulphide has been tested and found to be ineffective. It is, moreover, expensive, dangerous to handle owing to the explosively inflammable nature, when mixed with air, of the vapours given off—even a red hot coal is sufficient to cause ignition; and if great care is not exercised in putting the dose into the soil around the stool the plants may be very seriously affected if not killed.

Potassium cyanide depends, for its killing properties, on the fumes of Hydrocyanic (or Prussic) acid given off when brought in contact with acids. This gas is given off so rapidly, and is so volatile, that unless it is used in a confined gas-proof space it will disperse so quickly that its lethal action is lost. This was the case in tests carried out in the field.

Necessity for Destruction of Uncultivated Plantations.

One of, if not the greatest, factor militating against any effective check on the pest is the absolute apathy shown to the question of the destruction of banana plantations once they are allowed to go out of cultivation. There are many hundreds of acres in Queensland on which banana plants are still existing—it can be called nothing else—producing no fruit worth picking (if any at all), and in which pests are breeding unhampered at an alarming rate.

It is all very well to say that it will not pay to do anything with them. This may be true in one way, but will it pay to breed pests which will spread into the new areas or adjoining plantations? Once the borer becomes established in a plantation it will take a considerable expenditure of time and personal labour, if not of hard cash, to obtain and maintain supremacy over it. If the pest is let go, the life of the productive bearing capacity of the area will be greatly shortened.

Growers who have had a large experience of this pest have stated on a number of ocasions that in an infested plantation, in which measures of control are not undertaken or neglected, the economic bearing capacity will be terminated within two years.

Even if this extreme is not reached in all places, an approximation to it will come, in many of them at least, unless the matter is taken very seriously in hand from the start.

Where stock are available they can be turned into such areas and will soon reduce them to such a condition that there is very little left to destroy. In many deserted plantations to-day the borer, combined with lack of attention, has left barely a plant to a stool, with a few old corms in odd places to be destroyed.

Moreover, such areas as these exercise a fatal fascination over many men as being places from which suckers may generally be obtained for the carting away. But when it is considered that the risk of obtaining a large proportion of infested stock thereby is enormously greater than from even a known infested plantation that is kept in a good state of cultivation, suckers obtained in this way may, and probably will, prove to be dear at a gift.

Cultural Methods.

Where this pest is present in a plantation, all badly-infested stools should be dug out; in lightly-infested ones, old corms should be removed, the stems split in half, and the remainder chopped into small pieces. By this means the fullest use is made of natural decay, and the effect of the sun's heat in drying out the moisture in order to render all this material unsuitable for breeding grounds or harbourage, while larvæ, present in the pieces, are prevented from developing to a stage where they could turn into pupæ.

If the "stems," after removal of the bunches, are left standing in stools in which the borer is present, they will prove a source of prolific breeding-grounds for the pest. For this reason, all such should be cut off as near the ground as possible, and split open as already recommended. Later, when the "followers" have become well established, the old corms should be dug out and treated as above and the hollows filled in with soil.

If cut off a foot or more above the ground, the remains of the "stem," as the tissues decay, form a site greatly favoured by the beetle for sheltering in, hence the reason for cutting them off low down.

Old butts and "stems" removed from the stools and left lying whole on the ground will remain moist for months, and thus aggravate the trouble by increasing the numbers of the pest and providing shelter and feeding sites unless they are either treated as above, or in other ways rendered unsuitable for such purposes.

Poisoning Cut Stems, &c.

Information has recently been received from a grower who has been carrying out a number of field experiments on the control of this pest, that good results have been obtained by poisoning the old "stems" after they have been cut down while lying on the ground; two or more holes are made in the "stem," and a small quantity of a strong solution of

arsenite of soda poured into them. This opens up possibilities of other methods being employed, and would, if consistently successful, obviate the necessity of splitting up this material.

Attention is being paid to experiments carried out by a grower on the treatment of old butts with a soluble poison. Further information has yet to be obtained before it can be definitely decided whether such treatment will render the old (treated) plant material unfit to act as breeding grounds, and yet have no ill-effect on the offshoots or the bunch obtained from them.

In some cases where treatment with a 2 per cent. solution of arsenic has been tried, the effect of the poison on the followers has been very quickly shown, first by a yellowing and wilting of the leaves, often followed by the dying off of the plant.

The greatest care has, therefore, to be taken with the introduction of a poisonous substance into banana plants, the product of which is for human consumption.

Where it is desired merely to kill out the plants completely this method might be used with very good effect, as a strong dose of poison could be used which would probably kill grubs, if not beetles, present in the corms.

Burning.

It must not be thought from any statements made that the burning of old stems, corms, &c., is deprecated, for this is by no means the case. It is fully recognised as the most complete method of destruction possible and is advocated as such. In very many instances, however, the amount of wood necessary for the purpose is not available, and then, further, the objection so often raised to burning is the loss of humus to the soil resulting by this means of disposing of the plant material.

The necessity of keeping a plantation as free as possible of old stems, &c., cannot be too strongly stressed, for it is only by this being thoroughly carried out that the pest can be prevented from increasing at an abnormal rate and that the beetles can be forced to come under the full effect of the poison baits.

B.—PREVENTIVE MEASURES.

Distribution.

As greater attention is paid to this pest, it is being found that the borer is, with but few exceptions, fairly generally distributed throughout the banana-growing districts of Queensland, so that the area from which suckers reasonably free from the risk of infestation can be obtained is limited. It is, of course, most desirable to plant suckers which are absolutely free from infestation, and the only way to do this is to obtain them from an area free from the borer. For various reasons, however, growers more often turn for their requirements to local plantations in which the beetle may be known or suspected to be present.

Precautions in Obtaining Suckers.

To ensure the minimum of risk of carting away infested stock, the following precautions should be followed out as closely as possible:—

1. Only dig one day what can be planted the next.

2. When dug, cut a thin slice off the whole corm as far up as possible without damaging the eye or otherwise impairing its growing qualities. This is to remove as completely as possible any eggs that may have been deposited in it before being dug, and should also reveal the presence of the borer in any infested corms. All bulbs showing the presence of the pest should be discarded and destroyed. All trash should also be removed, as beetles sometimes shelter in the bases of the leaf stalks around the corms.

3. Then put them straight into a cart or slide (or if such cannot be used, a sack); as soon as a load is ready it should be carted right out of the plantation and, if possible, direct to where the bulbs are to be planted. If this is not possible, they should be stacked on a stand well off the ground and at a distance from any banana stools. As the beetles normally move about at night, all suckers or bulbs dug during the day should be carted away before nightfall. Many cases have been met with where plants have been dug, and even pared, but have been left lying on the ground in the plantation, sometimes overnight, or even longer. While they are left in this situation, they are acting as baits, to which the beetles will come to feed, and may, and often do, deposit eggs.

By taking the above precautions this danger is most decidedly considerably lessened, and in instances where this procedure has been followed highly satisfactory results have been obtained.

Many growers prefer to secure butts and plant the eyes. Whenever this is done they should at least be split in halves and examined for borer before being trenched in. All infested butts should be discarded and destroyed.

Before obtaining suckers, it is advisable wherever possible to make a personal examination of the plantation from which they are to be taken, in order to determine whether the place is infested or is apparently free, or if the former, how strong a hold the pest has on the stools.

Although to some it may appear strange, instances have been noted where infested suckers have been dug out and a new one set in the hole from which the old one had been removed, without endeavouring in any way to destroy the beetles that are in the soil in the immediate vicinity. In other cases, planting of suckers has been done in rows in between badly infested standing stools, presumably with the idea of having the new plants in bearing before the old ones were dug out. Either procedure is suicidal; in the former the sucker will be infested in a very short time, and in the latter beetles will soon migrate to the new plants and deposit eggs.

Selection of Site.

In selecting a site for a new plantation, one should never be taken up adjacent to an infested area, unless unavoidably forced to do so. In this latter case, rows of baits should be laid between the old and the new areas, so as to stop as many beetles as possible from crawling in after fresh food. Where old infested and abandoned areas lie alongside, or adjacent to, one or more worked plantations, it is to the grower's own interests to dig such out whenever opportunity offers, or otherwise destroy the stools, and as far as possible the beetles.

It has been stated that if the corms are soaked in water for a number of hours the beetles in them would be killed. From the results obtained by submerging the imagines under water this is evidently a fallacy, more especially when it is realised that the conditions of the tests were the most rigorous it was possible to obtain.

The longevity of the beetles without food has a particular bearing on the question of replanting bananas on land from which infested stools have been dug out. Though it may seem to many that such a condition would not arise, it must not be forgotten that many of the holdings on which this fruit is grown are small in area, and this very question has been raised on a number of occasions. It is evident, from the results obtained in the course of the experiments previously quoted, that provided every portion of banana plant has been dug out, and destroyed at once, six months at least should be allowed to lapse before any replanting is undertaken. Since it is quite possible that under natural conditions the beetles may live longer than has been recorded in confinement, and further that small portions of plant material may easily be left behind on which weevils could subsist for a time, a full year should be allowed from the time of destruction of the material removed before replanting.

It is a common practice to allow a plantation going out of cultivation to become overrun with lantana without first digging out the plants. This is bad policy, for it will take a long while for the stools to die out even when completely overgrown, and during this time the pest, increasing in numbers while the amount of food available is steadily decreasing, will, naturally, spread out further afield. And even after the corms have completely rotted away, a further period will have to be allowed to lapse before the beetles left behind will have succumbed. If the plants are first rooted out and chopped up, by far the greater loss of time will be obviated, and measures can at that time be adopted to at least enormously reduce the weevil population within the area.

PART 3.

Other Insects Mistaken for the Banana Weevil Borer.

There are two other weevils which are commonly mistaken for the one infesting bananas, and a short note together with an illustration may help to point out the differences. They are—

1. The Macrozamia ("Wild pineapple") Borer (*Tranes internatus* Pascoe), and
2. The Sugar-cane Borer (*Rhabdocnemis obscurus*).

1. It is often stated that the banana borer has been found breeding in the butts of the "wild pineapple" plants. This is not correct, however, although grubs may be found in them, together with beetles, that may rather resemble the banana species at a casual glance. In both the grub and the adult stages there are marked differences, even from the layman's point of view, between the two. The grubs of the banana weevil have the middle to hind part of the body very much swollen, whereas those of the Macrozamia species are practically the same thickness throughout their whole length.

The two beetles present several dissimilar features. The body of the former is comparatively slim in proportion to its length, whereas the latter is more squarely built. The former is sluggish and feigns death when disturbed, whereas the latter is very lively and moves away quickly.

The trunk of the 'zamia weevil projects nearly straight down underneath the head, whereas with the banana weevil borer it is projected very decidedly forwards in front of the body.

2. This certainly somewhat resembles the banana weevil, but is slightly larger, and, though dark in colour, is not uniformly jet black, but is a very dark reddish brown, with a dark spot on the outer side of each wing cover and a dark streak on the thorax.

One very marked difference between the banana weevil on the one hand and the cane and 'zamia weevils on the other, which can be readily seen with an ordinary magnifying lens, is that in the first species the ridges on the wing covers are comparatively narrow and the hollow interspaces large, while in the other two the ridges are broad and the interspaces small. The illustration shows diagramatically these external differences between the adults of the three species.

FINAL REMARKS.

It is only by a comparison of observations spread over a long period that any conclusions can be drawn, as it is impossible to obtain an insight into inevitable variations in any other way. Conditions vary so greatly in even succeeding years that divergences must occur in the results of observations made on living matter which is so greatly influenced by such changes. Without this knowledge it is impossible to arrive at any averages, on which alone generalisations can be made. Effective methods of control must embrace all contingencies that may arise over wide variations of local conditions, and yet allow for them wherever necessary.

A variety of unavoidable causes have combined to leave many gaps in the records of observations, lack of facilities and assistance being the greatest contributing factors, and much work yet remains to be done to fill them in. The results to date, however, show that although a considerable amount of investigational work has still to be carried out, both in the laboratory and in the field, it should be more than possible, with concerted action, to control this pest. Future work will, in all probability, show means for improvement upon the present methods employed, and reduce the time and labour that has now to be expended.

The official figures for 1923-1924 gave the total area under banana culture in Queensland as 11,668 acres, yielding 1,953,761 bunches. The value of the fruit alone was approximately £1,000,000 sterling, without taking into consideration the capital invested in the plantations and in trading connected with the industry. There is a large new field reopening in the North to the culture of this fruit, so the industry should attain an even greater value than it has at present to the State.

It is, therefore, obviously a branch of agriculture meriting the greatest consideration and protection, especially as it is a small-holding proposition thus aiding closer settlement.

In conclusion, it is desired to express indebtedness to those growers who have so freely assisted in carrying out experiments and in supplying information on their work and observations. Names and districts have been omitted for obvious reasons.

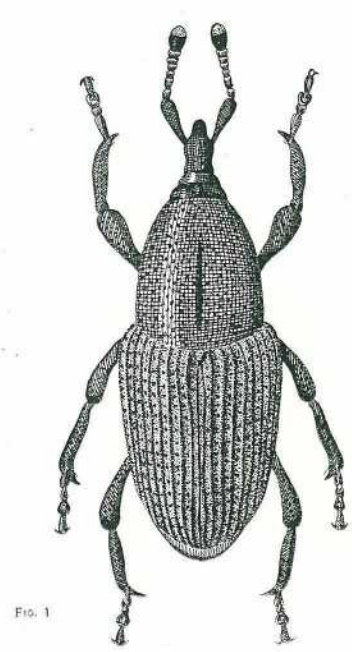

Fig. 1

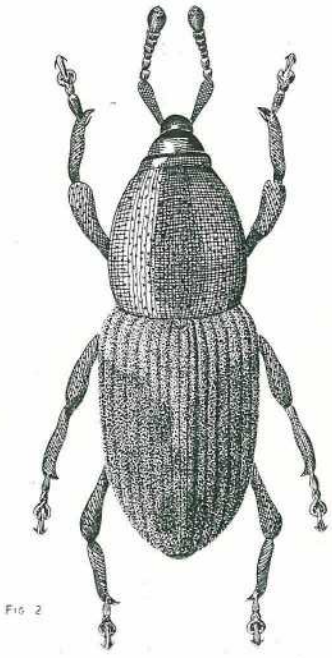

Fig. 2

Fig. 3

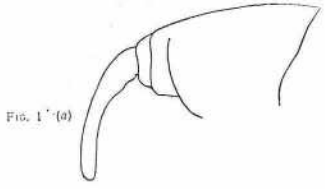

Fig. 1 (a)

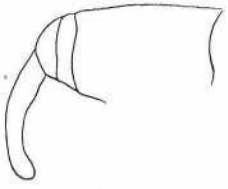

Fig. 2 (a)

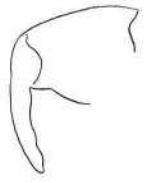

Fig. 3 (a)

I.M. Helming 1925.

PLATE 148.—SHOWING DIAGRAMMATICALLY THE DIFFERENCES BETWEEN THE BANANA WEEVIL BORER (No. 1), THE SUGAR-CANE WEEVIL BORER (No. 2), AND THE MACROZAMIA WEEVIL BORER (No. 3). MAGNIFIED FOUR DIAMETERS.

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APPENDIX.

TABLE A.

(FIGURES IN DAYS.)

Eggs Laid.	1921.			1922.			1923.			1924.			1925.		
	Avge.	Max.	Min.	Avge.	Max.	Min.	Avge.	Max.	Min.	Avge.	Max.	Min.	Avge.	Max.	Min.
January ..	No	record	ds.	5·5	6	4·5	5	5·5	4	No	record	ds.	No	record	ds.
February	No	record	ds.	7	9·5	4·5	No	record	ds.	No	record	ds.	No	record	ds.
March ..	No	record	ds.	7·5	9	6	No	record	ds.	8	9·5	7	No	record	ds.
April ..	No	record	ds.	10	11	9	11	16·5	10·5	12·5	17·5	10	No	record	ds.
May ..	No	record	ds.	29·5	30·5	27	16·5	22	15	21·5	28	16·5	17	23·5	10·5
June ..	19	21·5	14	32	32	..	No	record	ds.	No	record	ds.	..	..	..
July ..	27·5	36	20·5	No	record	ds.	No	record	ds.	No	record	ds.	..	..	..
August ..	25·5	33	19·5	No	record	ds.	No	record	ds.	No	record	ds.	..	..	..
September	13	18	10	17·5	22·5	14·5	16	21·5	13·5	15	18	13	..	..	..
October ..	11·5	15	9	10	12	8·5	9	12	8	10	13·5	7·5	..	..	..
November	7·5	8	6·5	7	8	6·5	7·5	8·5	7	8	9	7	..	..	..
December	7	9	5·5	6·5	8	5·5	6·5	7	6	8	9	7·5	..	..	..

NOTE.—The figures given in this table cover a far wider range of observations than those given in Table B.

TABLE B.

(AVERAGES IN DAYS.)

Eggs Laid.	Egg Period.			Larval Period.			Pupal Period.			Life Cycle.		
	Avge.	Max.	Min.	Avge.	Max.	Min.	Avge.	Max.	Min.	Avge.	Max.	Min.
1922.												
September ..	16	19·5	11	41·5	48·5	36	7	9·5	6	65·5	72·5	57·5
October ..	9·5	12	7·5	43	59	36·5	7	8·5	5·5	58·5	72·5	47
November ..	5·5	8·5	4·5	44·5	46·5	30	7	8·5	5·5	56·5	57·5	42·5
December ..	7	8·5	6	33	41	24·5	7	8·5	6·5	46·5	54	36
1923.												
May ..	17	18	16·5	126	131·5	117	15	21	10	156·5	162	151·5
September ..	17·5	18	15	40·5	43	38·5	9	10·5	8	65·5	69	64
October ..	11·5	14	6	37·5	49·5	25·5	8	9	7	51·5	66·5	41
November ..	7·5	13	4·5	36·5	47·5	21·5	7	9	5·5	54	60	34·5
1924.												
March ..	6·5	7·5	6	123·5	165·5	50	15	22	9·5	177·5	180	79·5
April ..	11	17	8	136·5	147·5	126·5	11·5	12	11	161	167·5	155
May ..	18·5	22·5	14·5	117·5	130	105·5	9·5	12	7	137·5	139	136
September ..	15	22·5	13	45	83	38·5	9	11·5	6·5	68	114	59
October ..	9	11·5	4·5	40·5	51	30	7	14·5	5	53	68	40·5
November ..	8	12·5	5·5	39	63·5	16·5	8	11	4	52	82	29
December ..	4·5	7	2	19	24	14	9·5	14	5	33	36	30
1925.												
April (one observation	14	..	..	41·5	45	38	16	..	..	65	72	58

NOTE.—The egg periods in this table refer only to those cases in which the life-cycle was completed.

TABLE C.

Eggs Laid.	Prepupal Period in Days.	Occurring in—
1922—		
September	2–3	November
October	2–3	December
November	1–3	December–January, 1923
December	1–2	January, 1923
1923—		
May	3–5	October
September	1–2	November
October	1–2	November
November	1–3	December
1924—		
March	3–4	May–August
April	3–4	September
September	1–2	October–November
October	1	November–December
November	1–2	January, 1925
1925	3–4	June

TABLE D.

Collected.	Life in Days (Average).	Life in Terms of—			Maximum in Days.	Minimum in Days.
		Lunar Months.	Weeks.	Days.		
1921—						
January ..	409	14	2	3	413	406
February ..	411	14	2	5	450	372
April	396	14	0	4	400	392
May	466	16	2	4	482	453
June	480	17	0	0	482	478
July	448	16	0	0	449	445
August ..	426	15	0	6	428	424
September ..	334	11	3	5	347	320
1922—						
February ..	334	11	3	5	381	287
March	177	6	1	2	181	172
May	200	7	0	4	203	198
July	384	13	2	6	391	376
August ..	384	13	2	6	391	377
September ..	376	13	1	5	392	370
October ..	295	10	2	1	301	273
November ..	310	11	0	2	313	306
1923—						
April	265	9	1	6	270	259
July	196	7	0	0	210	190
September ..	306	10	3	5	314	298
October ..	144	5	0	4	147	141
November ..	94	3	1	3	96	91
1924—						
January ..	409	14	2	3	428	350
March	361	12	3	4	369	353
April	311	11	0	4	317	306
June	264	9	1	5	272	261
July	244	8	2	6	253	236
August ..	203	7	1	0	205	199
September ..	185	6	2	3	194	176
October ..	154	5	2	0	166	143
November ..	128	4	2	2	137	120
December ..	93	3	1	1	98	88

TABLE E.

Fred.	Life in Days.	Life in Terms of—			Maximum in Days.	Minimum in Days.
		Lunar Months.	Weeks.	Days.		
1921—						
April	480	17	0	4	488	471
June	367	13	0	3	368	365
October ..	144	5	0	4	153	134
November ..	235	8	1	4	343	126
December ..	198	7	0	2	210	186
1922—						
January ..	132	4	2	6	133	130
October ..	19	0	2	5	33	12
November ..	72	2	2	2	458	3
December ..	178	6	1	3	748	4
1923—						
January ..	21	0	3	0	52	1
October ..	22	0	3	1	34	7
November ..	10	0	1	3	15	6
December ..	26	0	3	5	73	5
1924—						
January ..	5	0	0	5	7	3
March	103	3	2	5	108	99
September ..	25	0	3	4	50	12
November ..	63	2	1	0	145	1
December ..	*87	3	0	3	Over 186*	6
1925—						
January ..	22	0	3	1	105	1

* Incomplete.

TABLE F.

Date Started.	Number of Beetles taken in each Lot.	Time run to death of last Beetle in Dry Soil.	Time run to death of last Beetle in Damp Soil.	Percentage of Control Alive at end of Test.
10th April, 1923	20	4–6	104–106	5
22nd May, 1923	20	4–6	120–121	30
24th August, 1923 ..	20	6–7	81–89	0
19th September, 1923 ..	20	5–6	52–55*	5*
4th October, 1923	20	4–6	66–69	15
18th October, 1923	20	9–11	94–106	5
15th November, 1923 ..	20	Under 6	99–105	0
8th December, 1923	20	4–5	45–51	15
22nd March, 1924	20	5–6	112–119	95
7th May, 1924	20	6–8	178–185	55
19th July, 1924	20	6–12	112–128	55
2nd September, 1924 ..	20	4–7	50–66	60
5th November, 1924 ..	20	..	35–41	55
24th November, 1924 ..	20	..	28	40

* Series interfered with and not completed. 20 per cent. alive in damp soil.

TABLE G.

Eggs Laid.	Imagines Emerged.	Eggs Laid.	Oviposition to Oviposition in Days.	Emergence to Oviposition in Days.
..	24–27/4/21	11–13/7/21	..	75–80
8/6/21–1/7/21	11–27/10/21	14–17/11/21	136–161	28–47
22/9/21–5/10/21	15–24/11/21	18–19/1/22	105–118	55–65
5–8/10/21	25–28/11/21	25–27/1/22	109–114	59–64
22/9/21–5/10/21	2–9/12/21	23–25/1/22	110–124	45–54
18/10/21–4/11/21	2–12/12/21	18–19/1/22	75–92	37–48
5–18/10/21	1–12/12/21	7–10/3/22	140–156	85–99
1–13/3/22	16–20/4/22	20/5/22–2/6/22	68–83	30–47
18–22/9/22	1–4/12/22	6–9/1/23	106–113	33–36
12–16/10/22	1–4/12/22	6–9/1/23	82–89	33–36

TABLE H.

Poison.	How Used.	Dilution.	Period of Year Tested.	Exposure to Poison in Hours.	Percentage Killed.	Control percentage Alive.
Barium Chloride	In solution	5 per cent.	Nov.	18–48	2	100
	ditto	2 per cent.	Nov.	18–48	6	100
	ditto	1 per cent.	Nov.	18–48	1	100
Mercuric Chloride	ditto	·1 per cent.	Nov.	18–48	2·5	100
	ditto	·06 per cent.	Nov.	18–48	2·5	100
	ditto	·05 per cent.	Nov.	18–48	2	100
Sodium Arsenite	ditto	2 per cent.	Oct.	18–48	10·5	100
	ditto	1 per cent.	Oct.	18–48	1·5	100
	ditto	·5 per cent.	Oct.	18–48	2	100
	Powder	1 to 3	June	18–54	92·5	100
	ditto	1 to 3	Sept.	18–42	100	100
	ditto	1 to 6	Sept.	18–42	98	100
	ditto	1 to 3	Sept.	3–24	74·4	100
	ditto	1 to 6	Sept.	3–24	69·4	90
Arsenic Trioxide	ditto	1 to 3	Oct.	18–72	88·1	90
Borax	ditto	1 to 3	June	18–60	80	100
	ditto	Pure	July	18–58	85	90
	ditto	Pure	Sept.	18–66	94·4	100
	ditto	Pure	Nov.	3–24	43·8	90
	ditto	Pure	Sept.	18–48	95	100
Calcium Arsenate	ditto	Pure	April	18–48	71·3	100
	ditto	1 to 6	April	19–48	63·1	100
Lead Arsenate	ditto	1 to 6	May	19–92	20	100
Paris Green	ditto	Pure	Feb.	18–48	99·4	100
	ditto	1 to 6	March	18–48	96·9	100
	ditto	1 to 6	March	3–24	97·5	80
	ditto	1 to 6	April	½–3	56·9	90
	Suspension in weak flour paste	..	Feb.	18–48	80·6	100
Barium Sulphate	Powder	1 to 6	Jan.	18–48	14·4	100
Copper Resinate	ditto	1 to 6	April	18–48	2·5	100
Copper Sulphate	ditto	2 to 3	May	18–48	2·5	100
Sodium Acetate	Solution	Concentrated	Dec.	18–66	27·8	100
Sodium Arsenite and Arsenic Trioxide (1 : 1)	Powder	1 of mixture to 3 of flour	March to April	3–7	75	100
				24–27	87·6	
Sodium Arsenite and Paris Green (1 : 1)	ditto	ditto	March to April	3–7	72·5	100
				24–27	100	
Sodium Arsenite and Borax (equal parts)	ditto	2 of mixture to 3 of flour	April	3–5	55	100
				24–28	95	
Paris Green and Borax (equal parts)	ditto	ditto	April	3–5	95	100
				24–28	100	
Calcium Arsenate and Paris Green (2 : 1)	ditto	1 of mixture to 3 of flour	Oct.	5–7	65	70
				24–48	90	
Calcium Arsenate and Sodium Arsenite (2 : 1)	ditto	ditto	Oct.	5–7	90	80
				24–48	95	

EGG-LAYING COMPETITIONS.

MOUNT GRAVATT.

In October two deaths occurred in Section 2, and broodiness was also prevalent. Eggs laid numbered 5,669, an average of 21 eggs per bird. Individual scores :—

SECTION 1.

White Leghorns.

Competitor.	A.	B.	C.	D.	E.	F.	Total.
W. E. Woodward	134	155	158	137	158	133	875
John J. McLachlan	141	156	150	135	158	116	856
Eclipse Poultry Farm	161	151	125	144	139	121	841
E. J. Stilton	139	141	136	158	154	100	828
S. L. Grenier	162	154	161	93	122	124	816
M. F. Marsden	129	145	131	122	139	148	814
B. Driver	151	123	98	138	144	152	806
R. C. J. Turner	139	128	138	150	111	133	799
W. Wakefield	146	154	119	138	127	95	779
Geo. Marks	106	149	122	119	155	122	773
N. F. Newberry	101	130	156	139	120	112	758
J. Harrington	94	127	95	157	134	148	755
I. W. Cox	97	114	149	143	129	111	743
T. H. Craig	105	142	119	126	119	130	741
J. E. G. Parnell	132	102	126	150	113	96	719
Chris. A. Goos	150	95	109	131	98	128	711
Mrs. Clarke	98	145	123	115	139	89	709
A. S. Walters	129	117	103	118	77	138	682
T. W. Honeywell	110	2	139	123	123	110	607
W. D. Melrose	149	122	53	15	129	15	483

SECTION 2.

Black Orpingtons (except where stated).

Competitor.	A.	B.	C.	D.	E.	F.	Total.
E. Ward	152	137	143	133	142	126	833
Jas. Potter	154	132	129	125	134	131	805
W. and G. W. Hindes	168	107	110	97	131	155	768
G. E. Rodgers	131	148	145	111	146	86	767
Carinya Poultry Farm	141	143	90	103	145	126	748
R. Burns	133	103	121	129	115	96	697
J. Pryde (R. I. Reds)	120	117	89	142	101	124	693
Thos. Hindley	164	80	139	85	122	94	684
C. Dennis	123	115	147	131	54	89	659
A. E. Walters	60	77	121	117	132	110	617
J. Hutton	130	118	83	66	60	114	571

The following are the scores of pens which failed to obtain the average weight of 24 ounces to the dozen.

SECTION 1.

W. and G. W. Hindes	161	156	154	166	166	175	978
Mrs. R. E. Hodge	146	148	137	165	125	141	862
Mrs. C. E. Lindley	123	101	100	150	129	126	729
H. Fraser	94	147	150	152	144	119	806
Jas. Hutton	141	120	161	108	114	128	772
Jas. Earl	139	145	102	145	124	143	798
H. P. Clarke	118	146	109	126	114	146	759
L. Bird	136	102	115	111	164	114	742
E. Anderson	73	109	115	113	141	154	705

SECTION 2.

Eclipse Poultry Farm	154	134	149	164	131	159	891
H. Cutcliffe	153	137	146	133	157	152	878
Mrs. A. E. Gallagher	142	134	152	116	137	164	845
E. C. Stead	50	72	95	82	86	88	473

N.U.P.B.A. TOOWOOMBA SUB-BRANCH.

Single Test Egg-laying Competition—Scores to 31st October, 1925.

White Leghorns.

Pen No.	Name.	Oct.	Total.
42	D. H. Dipple ..	27	158
52	R. B. Howard ..	24	156
41	D. H. Dipple ..	27	152
39	R. C. Cole	26	151
8	H. S. Wagner ..	21	142
21	G. E. Rogers ..	25	139
50	C. A. Keen	20	136
40	R. C. Cole	20	136
9	A. C. Horne ..	17	135
33	H. J. Manning ..	21	134
27	J. W. Short	22	127
28	J. W. Short	22	127
29	J. H. Jones	17	127
32	J. Newport	19	125
30	J. H. Jones	24	124
54	E. W. Howe ..	25	124
11	Jas. Hutton ..	22	122
26	W. G. Harper ..	26	121
19	H. Dibbs	19	121
49	C. A. Keen	19	120
60	M. Murphy	21	116
35	R. C. J. Turner ..	23	114
51	R. B. Howard ..	20	113
38	P. J. Fallon	15	112
2	Jas. Taylor	20	107
48	G. Stilton	23	106
61	Jas. Goggins ..	20	106
56	J. F. Dahlheimer ..	17	105
3	E. Parker	18	102
1	Jas. Taylor	18	101
59	M. Murphy	20	100
62	Jas. Goggins ..	21	98
20	H. Dibbs	22	97
46	M. J. Frawley ..	15	95
37	P. J. Fallon ..	20	92
10	A. C. Horne ..	23	91
13	J. E. King	20	90
25	W. G. Harper ..	21	90
45	M. J. Frawley ..	18	89
5	G. Maurer	21	86
17	W. D. Williams ..	6	83
6	G. Maurer	22	83
4	E. Parker	20	81
12	Jas. Hutton ..	18	76
44	S. B. V. Sharkey ..	5	68
55	J. F. Dahlheimer ..	13	66
22	G. E. Rogers ..	—	60
43	S. B. V. Sharkey ..	13	35
53	E. W. Howe ..	*23	142
57	S. Chapman	*20	133
14	J. E. King	*18	122
58	S. Chapman	*20	121
7	H. S. Wagner ..	*18	120
23	Everlay P. Farm ..	*19	120
24	Everlay P. Farm ..	*19	94
36	R. C. J. Turner ..	*18	87
15	W. Grant	*15	84
16	W. Grant	*13	81
47	G. Stilton	*17	67
18	W. D. Williams ..	*20	65
34	H. J. Manning ..	*20	64
31	J. Newport	*19	54

Other Varieties.

71	H. Dibbs (Lang.) ..	26	147
75	W. G. Badcock (R.I.R.)	20	123
64	S. Chapman (B.L.)	10	105
65	Mrs. K. O'Connor (B.L.)	20	105
69	W. G. Badcock (Lang.)	13	94
73	A. W. Le Pla (R.I.R.)	7	89
68	E. Parker (B.L.) ..	15	85
72	H. Dibbs (Lang.) ..	21	81
70	W. G. Badcock (Lang.)	15	71
74	A. W. Le Pla (R.I.R.)	18	66
67	E. Parker (B.L.) ..	11	61
81	V. Brand (B.L.) ..	10	59
80	Everlay P. Farm (W. W'dotte) ..	*24	127
77	L. Maund (Col. W'dotte) ..	*23	116
66	Mrs. K. O'Connor (B.L.)	*24	115
82	V. Brand (B.L.) ..	*13	111
79	Everlay P. Farm (W. W'dotte) ..	*15	90
76	W. G. Badcock (R.I.R.)	*12	75
63	S. Chapman (B.L.) ..	*5	74
78	L. Maund (Col. W'dotte) ..	*—	59

Black Orpingtons.

117	T. Hindley	24	154
89	A. W. Le Pla ..	20	152
120	Jas. Hutton	16	151
99	A. R. Petty	18	151
132	G. E. Rogers ..	19	147
119	Jas. Hutton	21	144
128	J. W. Short	16	137
105	L. Maund	13	137
121	E. W. Brock ..	11	133
106	L. Maund	21	133
96	R. Burns	21	131
118	T. Hindley	26	130

* Signifies bird laying under-weight eggs.

N.U.P.B.A. TOOWOOMBA SUB-BRANCH—*continued.*

BLACK ORPINGTONS—*continued.*

Pen No.	Name.	Sept.	Total.
107	C. Graham	16	128
126	H. B. Stephens ..	23	120
114	D. W. Williams ..	17	120
97	V. J. Rye	13	120
98	V. J. Rye	19	116
100	A. R. Petty	11	116
88	J. Head	20	115
111	E. Walters	14	115
90	A. W. Le Pla ..	21	114
86	—. Kelly	21	107
109	S. McBean	13	104
83	W. R. Wilson ..	26	101
108	C. Graham	17	100
102	T. J. Carr	14	99
113	D. W. Williams ..	16	91
92	K. Macfarlane ..	22	89
84	W. R. Wilson ..	13	89
85	—. Kelly	3	88
112	E. Walters	7	87
103	W. S. Adams ..	14	86
115	Everlay P. Farm ..	18	81
122	E. W. Brock ..	22	80
110	S. McBean	14	72
95	R. Burns (dead) ..	—	71
123	P. Hopkins	—	70
125	H. B. Stephens ..	7	51
87	J. Head	0	46
131	G. E. Rogers (replaced)	22	27
130	R. Neil	*14	158
127	J. W. Short	*26	151
116	Everlay P. Farm ..	*21	140
94	T. C. Ollier	*21	94
124	P. Hopkins	*3	93
91	K. Macfarlane ..	*17	87
104	W. S. Adams ..	*17	81
101	T. J. Carr	*25	76
129	R. Neil (dead) ..	*10	74
93	T. C. Ollier (replaced)	*20	67

* Signifies bird laying under-weight eggs.

JOSEPH GARNER, Government Supervisor.

N.U.P.B.A., ZILLMERE.

The White Leghorn section averaged 21.8 eggs per bird for October, but the other sections have not been laying so well. Black Orpingtons produced 17.3, and other varieties 15.5 eggs each. The average for the whole competition was 20 eggs. Two deaths occurred—No. 93 White Leghorn and No. 158 Langshan.

WHITE LEGHORNS.

Pen No.	Name.	Oct.	Total.
82	G. W. Cox	25	182
35	S. L. Grenier ..	24	175
8	R. C. Cole	24	174
27	J. J. McLachlan ..	27	173
95	S. A. Doman ..	24	170
86	H. T. Pember ..	19	165
81	R. Marshall ..	22	164
39	R. Duff	21	154
85	H. T. Pember ..	20	151
36	S. L. Grenier ..	25	150
65	A. S. Walters ..	22	149
79	R. Marshall ..	21	149
15	R. C. J. Turner ..	20	146
43	J. R. Wilson ..	24	146
59	J. Hutton	25	146
45	J. R. Wilson ..	23	145
14	R. C. J. Turner ..	25	144
83	G. W. Cox	25	144
19	J. L. Chapman ..	21	143
96	S. A. Doman ..	29	143
51	F. J. Williams ..	25	142
92	C. Quesnell ..	17	142
6	W. J. Berry ..	25	141
78	A. Hodge	19	141
23	H. Pearce	28	138
53	E. C. Raymond ..	22	138
17	J. T. Webster ..	17	137
10	J. Fordyce ..	20	136
42	S. A. Chapman ..	22	136
16	J. T. Webster ..	24	135
13	R. C. J. Turner ..	24	132
67	W. H. Forsyth ..	16	131
50	F. J. Williams ..	23	130
33	W. E. Woodward ..	24	129
29	M. F. Newberry ..	29	126
41	S. A. Chapman ..	23	126
12	J. Fordyce ..	26	125
47	G. E. Rogers ..	20	125
18	J. T. Webster ..	24	123
70	S. Lloyd	20	121
40	S. A. Chapman ..	19	120
11	J. Fordyce ..	18	119
84	G. W. Cox	12	118
99	A. Anderson ..	12	117
3	J. Earl	28	116
52	E. C. Raymond ..	22	116
22	H. Pearce	22	115
89	R. H. Woodcock ..	24	114
1	J. Earl	22	112
62	W. Wakefield ..	24	111
61	W. Wakefield ..	21	110
48	G. E. Rogers ..	20	109
38	R. Duff	19	108
77	A. Hodge	18	108
58	J. Hutton	26	107
75	J. E. G. Purnell ..	23	107
80	R. Marshall ..	22	107
69	W. H. Forsyth ..	20	104
98	A. Anderson ..	21	103

N.U.P.B.A. ZILLMERE—*continued.*

White Leghorns—*continued.*

Pen No.	Name.	Oct.	Total.
34	S. L. Grenier (replaced 14-4-25)	29	102
28	M. F. Newberry ..	22	101
21	J. L. Chapman ..	10	100
2	J. Earl	23	98
7	R. C. Cole	22	98
71	S. Lloyd	21	97
20	J. L. Chapman ..	19	94
54	E. C. Raymond ..	19	89
24	H. Pearce	4	85
72	S. Lloyd	23	75
49	F. J. Williams ..	17	75
91	C. Quesnell ..	16	74
97	A. Anderson (replaced 26-6-25)	20	71
37	R. Duff (replaced 18-8-25) ..	24	52
73	J. E. G. Purnell (replaced 14-9-25)	23	34
25	J. J. McLachlan ..	23	U189
31	W. E. Woodward..	26	U183
87	H. T. Pember ..	23	U183
26	J. J. McLachlan ..	25	U182
30	M. F. Newberry ..	26	U181
64	A. S. Walters ..	21	U176
44	J. R. Wilson ..	25	U170
46	G. E. Rogers ..	25	U163
66	A. S. Walters ..	21	U163
60	J. Hutton	23	U159
90	R. H. Woodcock ..	22	U156
57	J. P. Marshman ..	24	U150
55	J. P. Marshman ..	25	U140
9	R. C. Cole	17	U139
32	W. E. Woodward..	24	U137
88	R. H. Woodcock ..	25	U137
68	W. H. Forsyth ..	27	U135
74	J. E. G. Purnell ..	28	U132
4	W. J. Berry ..	20	U128
76	A. Hodge	8	U126
94	S. A. Doman ..	6	U124
63	W. Wakefield ..	24	U104

Black Orpingtons.

124	H. M. Chaille ..	27	180
110	G. E. Rogers ..	22	176
148	J. Potter	26	175
102	J. Hutton	18	172
139	T. Hindley ..	23	172
122	W. H. West ..	15	171
125	H. M. Chaille ..	19	171
140	T. Hindley ..	17	169
103	C. C. Dennis ..	19	168
143	J. Pryde	23	164
128	E. C. Raymond ..	21	156
101	J. Hutton	24	153
138	W. D. Melrose ..	7	150
109	G. E. Rogers ..	16	147
142	J. Pryde	23	137
144	J. Pryde	17	136
132	T. C. Ollier ..	18	131
126	H. M. Chaille ..	16	130
100	J. Hutton	11	125
149	J. Potter	16	123
147	E. Walters ..	7	121
112	W. R. Wilson ..	27	118
141	T. Hindley ..	16	118
113	W. R. Wilson ..	24	109
135	R. Burns	20	107
134	R. Burns	16	102
127	E. C. Raymond ..	17	100
133	R. Burns (replaced 25-4-25) ..	15	99
104	C. C. Dennis ..	19	97
121	W. H. West ..	0	23
146	E. Walters ..	19	U168
130	T. C. Ollier ..	17	U164
108	W. H. Forsyth ..	18	U159
107	W. H. Forsyth ..	21	U152
131	T. C. Ollier ..	14	U149
150	J. Potter	13	U146
111	G. E. Rogers ..	22	U139
123	W. H. West ..	22	U135
105	C. C. Dennis ..	17	U125
106	W. H. Forsyth ..	19	U112
114	W. R. Wilson ..	27	U107
137	W. D. Melrose ..	3	U61
136	W. D. Melrose ..	1	U43
129	E. C. Raymond ..	0	U29

Other Varieties.

118	Mrs. J. Pryde (R.I.R.) ..	16	156
155	W. L. Howard (W.W.) ..	17	135
151	W. H. Forsyth (S.W.) ..	20	134
152	W. H. Forsyth (S.W.) ..	17	131
157	J. Pryde (Lang.)..	23	129
166	A. S. Keith (Ancona) ..	13	121
120	Mrs. J. Pryde (R.I.R.) ..	14	115
167	A. S. Keith (Ancona) ..	21	115
164	J. L. Hill (B.L.)..	20	106
119	Mrs. J. Pryde (R.I.R.) ..	7	105
159	J. Pryde (Lang.)..	15	105
153	W. H. Forsyth (S.W.) ..	0	92
160	W. and G. W. Hindes (B.L.)	29	U139
154	W. L. Howard (W.W.) ..	18	U136
156	W. L. Howard (W.W.) ..	11	U123
161	W. and G. W. Hindes (B.L.)	17	U123
162	W. and G. W. Hindes (B.L.)	19	U103
168	A. S. Keith (Ancona) ..	0	U63

"U" indicates eggs under 2 oz.

C. Kidd, Hon. Secretary.

OBSERVATIONS ON THE PLANTS OF CHARLEVILLE.

CHARACTERISTICS OF THE WESTERN FLORA.

By W. D. FRANCIS, Assistant Government Botanist.

As Charleville is situated about 360 miles from the sea, one expects to find that its flora is different from that of the coast because of the dissimilar conditions prevailing in the two regions. The native coastal species with a very few exceptions do not extend so far inland. Only a few species such as some common grasses and the Moreton Bay Ash (*Eucalyptus tesselaris*) are common to both areas. The vegetation of Charleville and of similar western areas impresses one with its general grey appearance, its comparatively small number of species, and the predominance of one or a few species of plants over fairly large areas. The occurrence in places of forests composed almost exclusively of coolibar, cypress pine, gidgee, box, or mulga supplies instances of tracts of vegetation in western areas composed of one or a few kinds of plants. The dense rain forests of parts of coastal Queensland form a strong contrast to these western plant associations in many repects. In the rain forests vegetation is represented by numerous forms, growth is luxuriant, species are very numerous, in place of the relative simplicity of the western flora there is complexity or even confusion in the constitution of the plant communities, and it is seldom possible to find areas in which one species greatly predominates over all others.

Influence of Rainfall.

A very large number of the pecularities of the western flora is obviously due to the rainfall. Of all the natural factors by which plants are affected and by which plant distribution is controlled, the supply of water is probably the most fundamental. This is consistent with what is known of the constitution of living matter as water is the medium in which many of its elements and compounds are dissolved or suspended. In addition, water is generally by far the most abundant constituent of plants.

The average annual rainfall of Charleville is about 20 inches. The heavy rain forests of the coast are situated in areas in which there is an average precipitation of 50 inches or more per year.

The grey appearance of the foliage of many western plants is due either to a clothing of fine, silvery hairs or a grey, wax-like scurf or powder. The pale colour of the mulga (*Acacia aneura*) and of the galvanised burr (*Bassia Birchii*) is due to their clothing of fine, whitish hairs. A partial covering of grey scurf or powder gives the cypress pine (*Callitris glauca*), the gidgee (*Acacia Cambagei*), the silver-leaved ironbark (*Eucalyptus melanophloia*), and the sandalwood (*Santalum lanceolatum*) their grey appearance. A resinous covering on the leaves and young twigs is another feature of several western plants. This peculiarity is possessed by one of the native fuchsias (*Eremophila Goodwinii*), which is very common in the Charleville district, and by the western sandalwood (*Eremophila Mitchellii*).

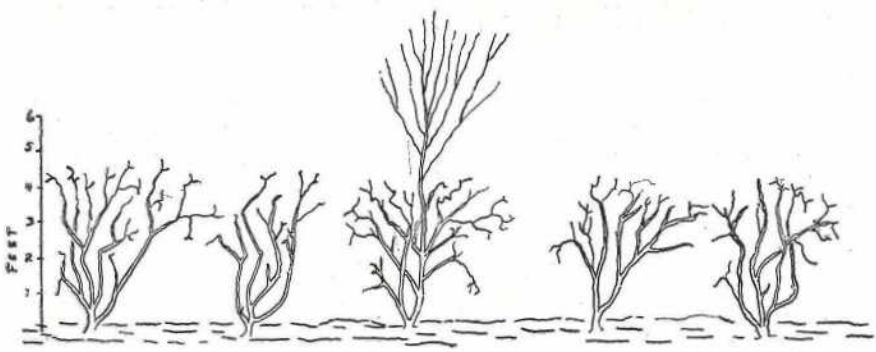


Diagram showing the stunted and distorted forms assumed by Mulga (*Acacia aneura*) as a result of trimming by stock. The tree in the middle has been fed down in the earlier part of the growth but has assumed its normal shape in its upper part owing to the development of a shoot situated towards the middle of the tree which has apparently been inaccessible to stock.

The three kinds of vestiture, described as so frequent on the foliage of many western plants, are regarded by those who have made a special study of plants in relationship to their environment as a protective measure against the rapid evaporation of the water contained in the tissues of plants in dry areas. In other parts of the world it has been observed that the coating of hairs on the same species becomes more dense as the location of the species passes into drier areas. A Queensland example of this kind was noted quite recently in the case of *Trichosdesma zeylanicanum*, specimens from Boulia in the far west being much more hairy than those from Charters Towers in the east.

The relative simplicity of the western flora can also be attributed to a great extent to the low rainfall. The restricted natural supply of water fixes a narrow limit to the number of perennials which can survive for lengthened periods in a climate characterised by a high evaporation factor. Consequently only plants which are specially adapted to prevent the evaporation of the water in their tissues, which is essential to their existence, are to be found in such areas. The distribution of the species into plant associations which are often well defined is also partly explicable, as the number of species, already strictly limited by the supply of water, is subject to the further restrictive influence exerted by the composition of the soil.

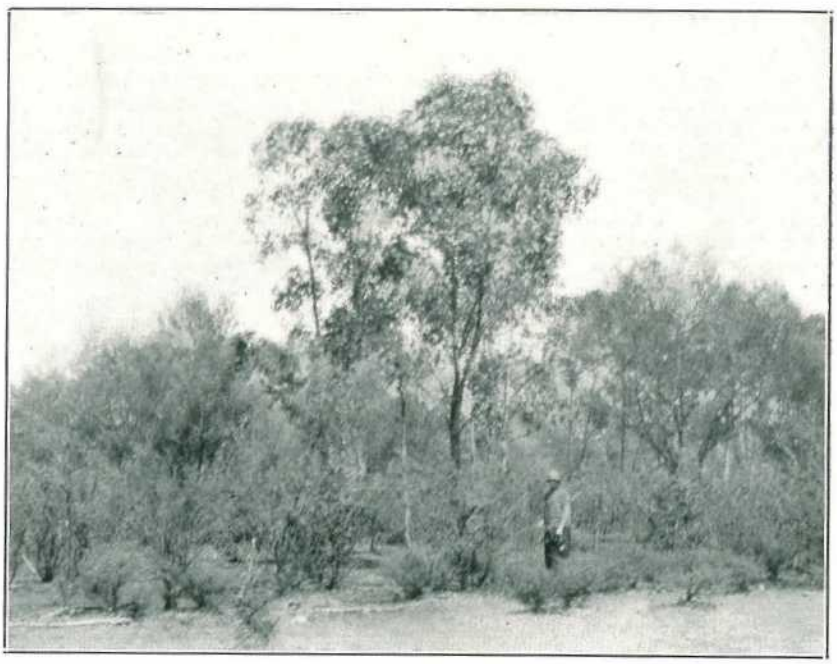


Photo.: W. D. Francis.

PLATE 149.

Mulga (*Acacia aneura*) scrub, Charleville. Poplar box (*Eucalyptus populifolia*) trees in middle of picture. The low undershrubs in the foreground are a species of native fuchsia (*Eremophila Goodwinii*). Extending across the picture from left to right near the figure is an area of mulga eaten down by stock to a height of 4 to 6 feet. Mulga trees in background left and right of the poplar boxes.

Modification of the Mulga by Stock.

Mulga is a western Acacia (*Acacia aneura*). When not eaten down it is a small tree with erect or ascending branches. The great fondness of stock for the leaves and young twigs of this tree is strikingly evident in an area southwards from the town of Charleville where there are many acres of the trees closely eaten back. The sight of acres of mulga trimmed to a regular height of from 4 to 6 feet is a remarkable presentation of vegetation modified in form by browsing stock. The diagram shows that where stock have access to them the stems and branches are

very irregular, angular, and frequently ramified. These distortions are due to the arrested growth of terminal shoots which are eaten by stock. Lateral shoots then emerge and in their turn are eaten off, and these are followed by the development and subsequent trimming of other lateral shoots. Occasionally, however, a shoot towards the middle of a spreading, trimmed tree escapes being eaten, apparently on account of its inaccessibility, and the normal development of the tree ensues as shown in the diagram and one of the photographs.

Suspected Poisonous Plants Trimmed by Stock.

In some of the mulga scrubs it was noticed that one of the native fuchsias (*Eremophila Goodwinii*), which is very abundant in much of the country around Charleville, was eaten off a fair amount. This shows that stock do not always avoid this plant, which has a poisonous reputation. Probably the poisonous principle becomes evident when hungry stock feed upon it, as suggested by Mr. Cardell, the local Stock Inspector. Another suggested poisonous plant, *Myoporum acuminatum*, which belongs to the same natural order (Myoporineæ) as the native fuchsias was found to be trimmed off to a large extent. The shrubs of this species are plentiful on the sandy area near the town known as "The Sandhills."

Brittleness of Some Western Trees.

While collecting specimens during a recent visit to Wallumbilla and Charleville, the writer noticed that the twigs of many of the trees and shrubs of these areas were very brittle. The twigs of *Heterodendron oleæfolium* are typical examples of this kind. It is interesting to find that a similar peculiarity has been noticed in other parts of the world, as Warming (Oecology of Plants 127, 1909) states that the wood of plants in a dry climate is frequently dense and hard and often brittle. Another case of the brittleness of parts of a Queensland tree growing in a dry area is that of *Eucalyptus pallidifolia*, the "Snapping Gum" of the extreme north-west of Queensland. Specimens of it were recently collected at Settlement Creek by Mr. L. Brass, who noticed the brittleness of the wood and bark.

Plant Associations of Charleville.

The mulga scrub is one of the most important plant communities of the district on account of the fodder value of the tree which is the principal constituent. It is frequently found in soil with a loose sandy surface and a hard, coherent subsoil strongly impregnated with iron compounds. Mr. L. C. Ball, Deputy Chief Government Geologist, who has just completed a tour of the western districts, informs the writer that he also observed this peculiar subsoil, and describes it as "hard pan" with a sandy skin. The hard subsoil, he states, is lateritic in a certain sense. Mulga scrub often consists of the mulga alone. At other times it contains a native fuchsia (*Eremophila Goodwinii*), an undershrub with resinous leaves and large blue flowers; poplar box (*Eucalyptus populifolia*); Moreton Bay ash (*Eucalyptus tesselaris*); "acacia" (*Cassia pleurocarpa*), a shrub with large yellow flowers; *Acacia Oswaldii*, a tree somewhat like mulga; cypress pine (*Callitris glauca*); corkwood (*Hakea Ivoryi*); and western sandalwood (*Eremophila Mitchellii*).

Cypress pine forests occur in some of the more sandy soils about the town. They are sometimes intermixed with poplar box. Western sandalwood forests of very limited extent occur in places near box and cypress pine forests.

Acacia Oswaldii forests were seen eastward from the town. They sometimes contain other constituents similar to those of the mulga scrub. Poplar box forests intermixed with silver-leaved ironbark and *Acacia Oswaldii* were also seen in a direction eastward from the town.

Forests composed almost exclusively of the Coolibar (*Eucalyptus microtheca*) occur westward from the town in the low country near the Warrego River.

The woody vegetation on the banks of the Warrego River is composed of the river gum (*Eucalptus rostrata*) and the coolibar. Nearer the bed of the river a tea-tree (*Melaleuca linariifolia* var. *trichostachya*) grows.

Forests composed of gidgee (*Acacia Cambagei*), occupy fairly large areas to the north-west of the town, and appear to be an accompaniment of the black soil which Mr. L. C. Ball describes as Rolling Downs (Marine Cretaceous).

Photo.: W. D. Francis.

PLATE 150.

Mulga scrub, Charleville. The large trees on left of picture are poplar boxes. On their right is seen mulga, which is eaten down in foreground by stock. The mulga tree in foreground on right has grown up out of reach of stock by development of a shoot near the middle when the tree was closely trimmed.

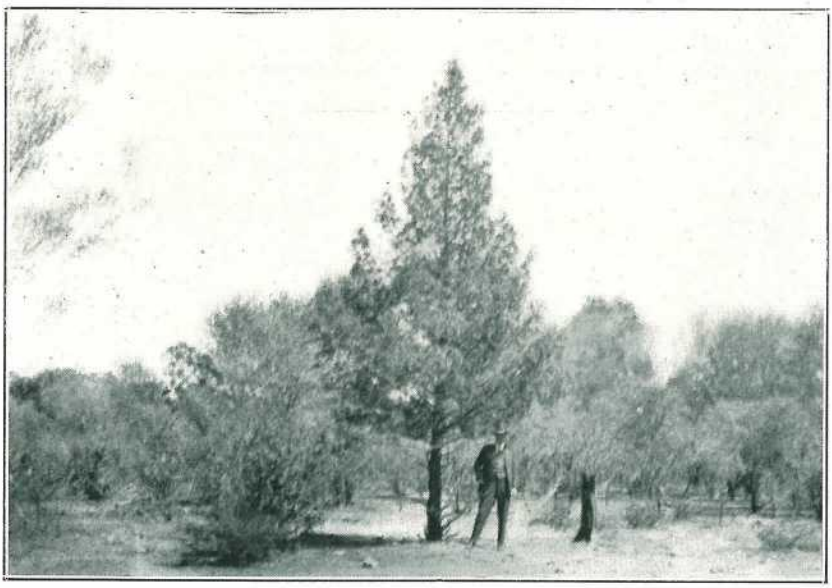


Photo.: W. D. Francis.

PLATE 151.

Mulga scrub, Charleville. The tree in the middle of picture is a small cypress pine (*Callitris glauca*).

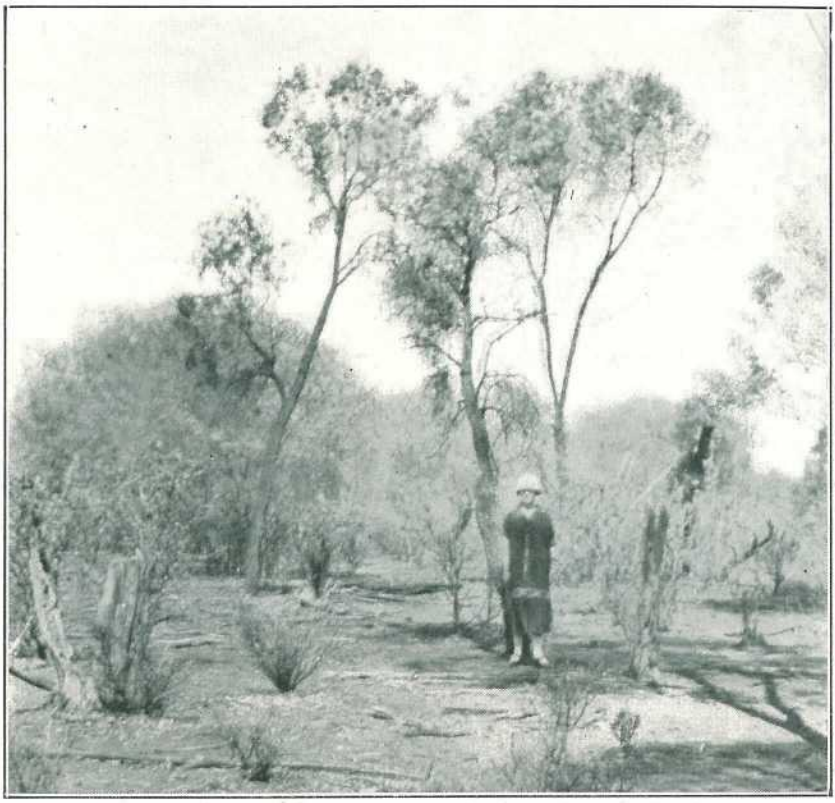


Photo.: W. D. Francis.

PLATE 152.

Mulga scrub, Charleville. The three trees in the middle of picture are corkwoods (*Hakea Ivoryi*). They are characterised by a very thick, deeply-fissured bark.

PLATE 153.

FODDER TEST CROPS. MONAL DEMONSTRATION FARM.

IMPROVING DAIRY HERDS—BETTER BULL CAMPAIGN.

GOVERNMENT ASSISTANCE—MINISTERIAL ANNOUNCEMENT.

The Minister for Agriculture and Stock (Hon. W. Forgan Smith) has outlined a scheme approved by the Government the objective of which is the improvement of dairy herds in the State. In the course of a recent Press interview Mr. Smith said that for some time past the Government has been endeavouring to improve the standard of dairy herds with a view to increasing production. The Departmental Herd Testing Scheme has been fairly well received. Last year 22,000 cows were tested, and this year applications to date have been dealt with involving 11,000 dairy cows. The scheme has been designed for the purpose of demonstrating to the farmer the profitable and unprofitable cows in his herd. "It is recognised, however," continued the Minister, "that more than this is necessary, and following on Government policy, Cabinet has approved of a scheme whereby assistance will be given to dairy farmers to purchase pure bred bulls. Subject to certain conditions, the Department of Agriculture will make available to the approved purchaser of an eligible bull a subsidy of 50 per cent. of the purchase price, provided this subsidy shall not exceed £50 and that the approval of the Minister is first obtained, and that both vendor and purchaser make the necessary declaration to meet the requirements of the Department."

Mr. Smith added that the subsidy will be available to farmers in districts that have been proclaimed under "*The Dairy Produce Act of* 1920." He anticipates that the practical assistance which the Government is prepared to render to dairy farmers will be the means of inaugurating what might be termed "A Better Bull Campaign."

The conditions attaching to the subsidy are as follow:—

1. The bull must have passed a tuberculin test by a veterinary officer within three months prior to date of sale.

2. The bull must be in good health, well grown, and true to type.

3. The bull shall be registered in a recognised herd book or be eligible for herd book entry.

4. The bull shall be not less than twelve months and not more than six years old, provided the Minister may approve of the purchase of an older bull which has sired high-producing females on official test.

5. The vendor of any bull, two years old and over, must produce evidence of fruitfulness in the preceding year.

6. The vendor of any bull shall produce concerning such bull a declaration of health on a form to be supplied by the Department of Agriculture and Stock.

7. The bull shall be the progeny of an approved sire and an officially tested dam which has reached the undermentioned butter fat standards during 273 days' milking:—

2 years and under 3	230 lb. butter fat
3 years and under 4	267 lb. butter fat
4 years and under 5	303 lb. butter fat
5 years	340 lb. butter fat

Over 5 years add 1/10 lb. butter fat for each day over 5 years up to 6 years.

The purchaser's application for subsidy shall be made on a form supplied by the Department of Agriculture and Stock. Any bull in respect of which the purchaser has received a subsidy as aforesaid shall, if required, be made available for the use to other dairymen, at a fee not exceeding 10s. per cow.

The purchaser of a bull shall have the right to refuse the service of such bull for any cows which he may have reason to believe to be suffering from disease, provided that the owner of such cows is unable to produce a certificate of a qualified veterinary surgeon to the effect that such cows are free from disease.

The bull shall be kept under conditions satisfactory to the Department of Agriculture and Stock.

In the allocation of subsidy by the Minister preference will be given to prospective buyers of eligible bulls who have submitted their herds to a butter fat test under the Herd Testing Scheme of the Department of Agriculture and Stock.

It shall not be permissible for the owner of a bull who has received subsidy to resell the animal without the sanction of the Minister.

THE POINTS OF A CLYDESDALE.

A few years ago, in the course of an extended tour through Northern Scotland, the editor of this Journal had the privilege of visiting many of the notable cattle and horse studs for which Scotland is famous the world over, and of meeting there studmasters whose names are known and whose work is appreciated wherever stockmen foregather. Among the best-known Clydesdale studs visited was that of Messrs. D. and W. Ross, of Bridgend and Dochearty, near Dingwall. Thirty-two animals, all practical working farm geldings and mares, were paraded for inspection, together with notable sires in which were represented all the more famous Clydesdale families. They were a fine lot and showed conspicuous evidence of the breeders' knowledge of their job. In the mob every strong point of type had been cleverly brought out and from notes made at the time the Scottish breeder's ideas of a true Clydesdale are as follows:—

Head.—Fairly long with ears likewise. A short, small, neat head and cocky ears are not generally in an animal of size.

Shoulders.—Well set-up at top, thin at withers. An animal with good length from the top of the shoulder to head generally arrives at good growth.

The Male.—Should be short in the coupling of withers and hip-bones.

The Female.—Should possess greater length of middle.

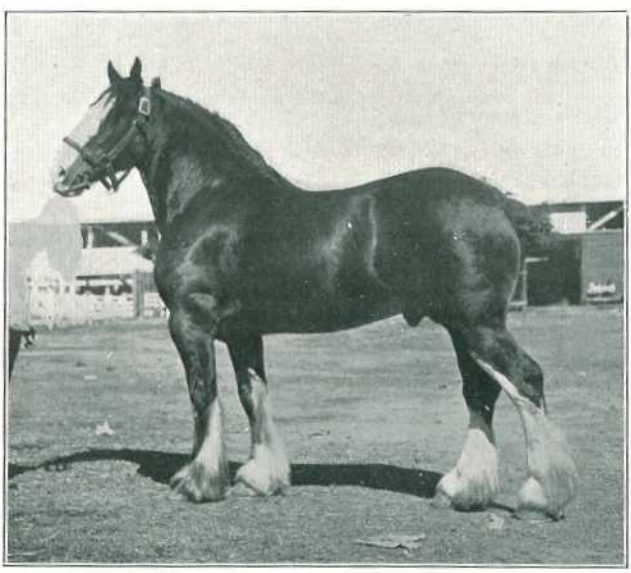


PLATE 154.—"GENERAL WALLACE."

One of the notable Clydesdales purchased by the Queensland Government for farm-horse improvement. He was bred in New Zealand by Mr. W. Kennedy, of Otarau, and is by "General Douglas," ex "Studleigh Queen."

Comparison.—As compared to a Shire horse with a leg at each corner and thighs bulging out from body, the Clydesdale's legs should be well knitted to the body without any prominences. An animal set in "bulldoggy" form is not a good mover. In Clydesdales more regard is paid to the body of the animal. The male should have a good forearm. In the female it should not be as largely developed.

Legs.—The animal should have a great knee-joint, tendons well back of bone, well-shaped pasterns, a good open foot, round and shapely and wide at heel. Knee and hock joints should be large and cleanly cut. The "feather" should spring from the back of the leg and should be silky in texture. Nature can be assisted by careful breeding. Long toes are a right development, but when they are too long the foot narrows. Heels should be brought down, frog to reach the

ground, throwing foot gently out. There should be plenty of room at the top of the coronets.

Body.—There should be great depth of rib, quarters of fair length, thighs with plenty of muscle, and down, narrow across hock joint, not too much bone, really flat and clean below hocks, the hind pastern rather longer than fore, but this can be overdone.

Pace.—The animal should walk with grace, freely, and with long step. Action should be perfectly straight, with no twisting. In well-bred animals the soles of the feet should be seen when walking, and fore-legs should be in a straight line. The Clydesdale is naturally an active breed, with good, clean action. In trotting, the foot should be lifted straight and put down straight. Exaggerated action is not desired.

The Stallion.—Unless a sire of good character and breed-type is used it is idle to expect a get of good class. Like any other breed, conformation—*i.e.*, the whole make-up of the animal, should be pleasing, with each part smoothly merging into the other, so making for evenness of line. Each part should be in proportion. A horse of good size is desired provided that mere size has not depreciated other essentials—viz., soundness of limb, quality and character.

Scottish breeders have produced an animal with long hair practically confined to the rear tendon, with a nice "spat" round the hoof head.

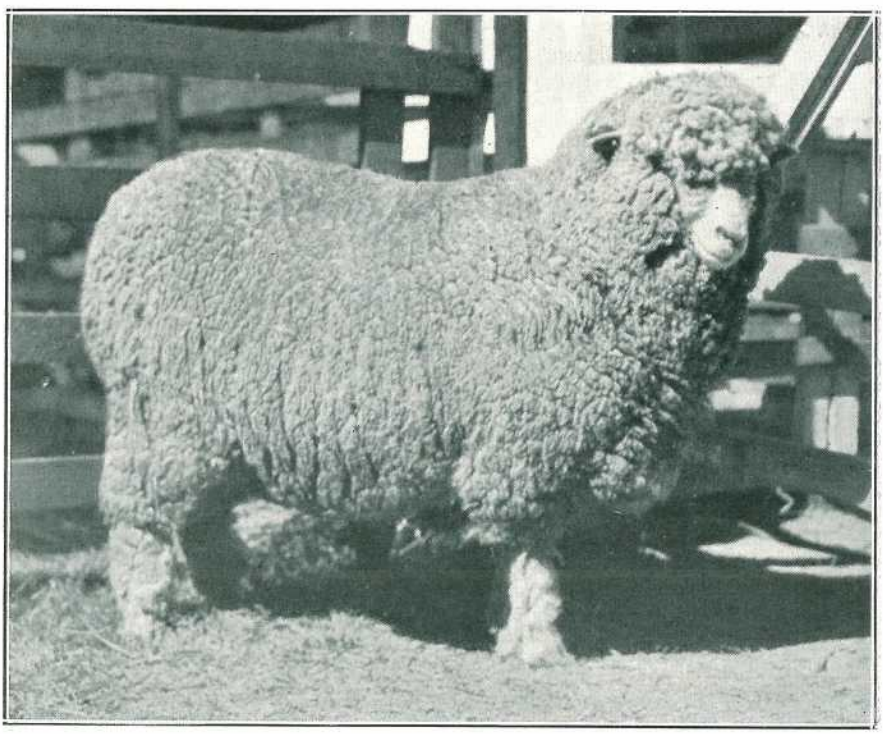


Plate 155.—Corriedale Ewe.

Champion Royal National Agricultural Show, Brisbane, 1925. The Property of Mr. J. H. Fairfax, "Marinya," Cambooya, Darling Downs.

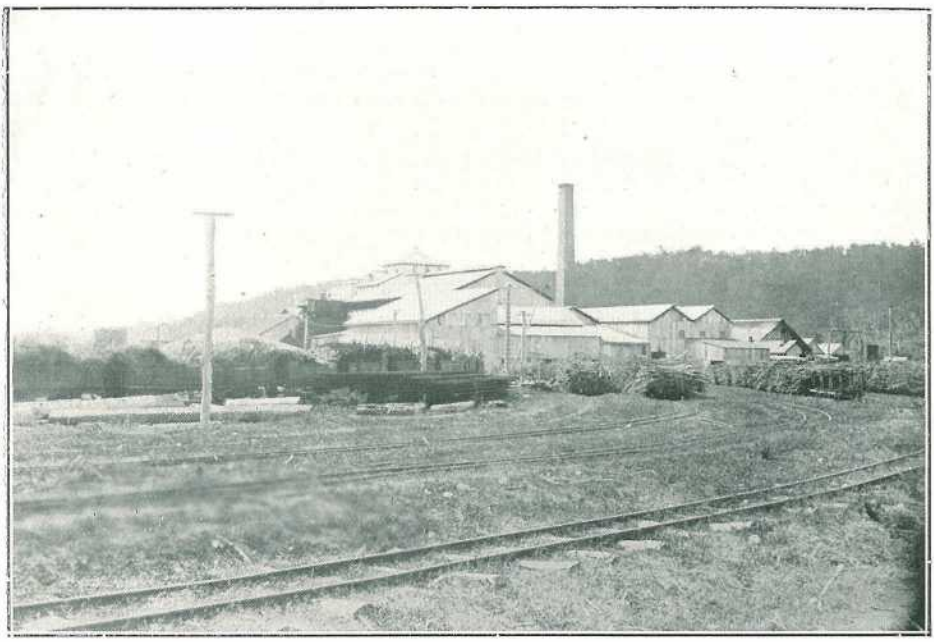


Photo.: G. B. Brooks.]

PLATE 156.—PLANE CREEK CENTRAL SUGAR MILL, SARINA.

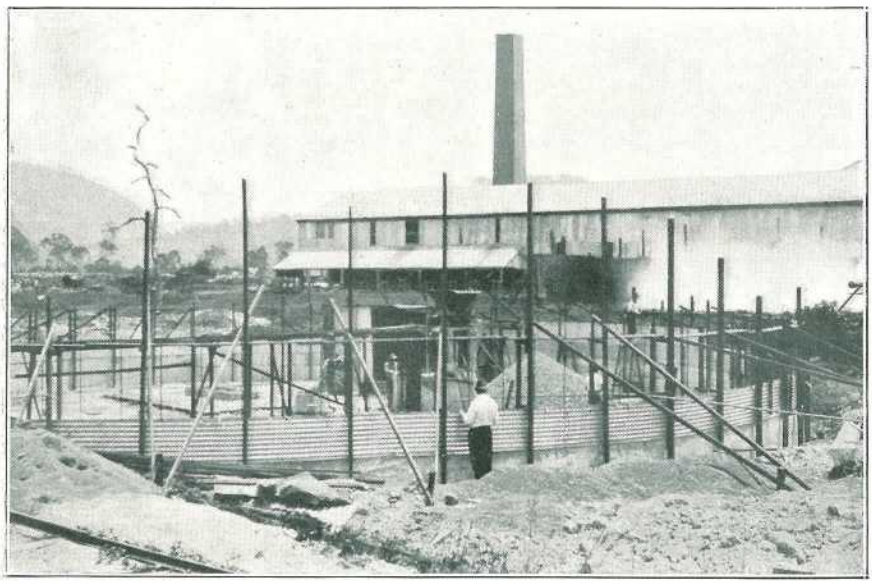


Photo.: G. B. Brooks.]

PLATE 157.—MOLASSES TANK UNDER CONSTRUCTION (90 FEET DIAMETER, 10 FEET HIGH)—PLANE CREEK CENTRAL SUGAR MILL, SARINA.

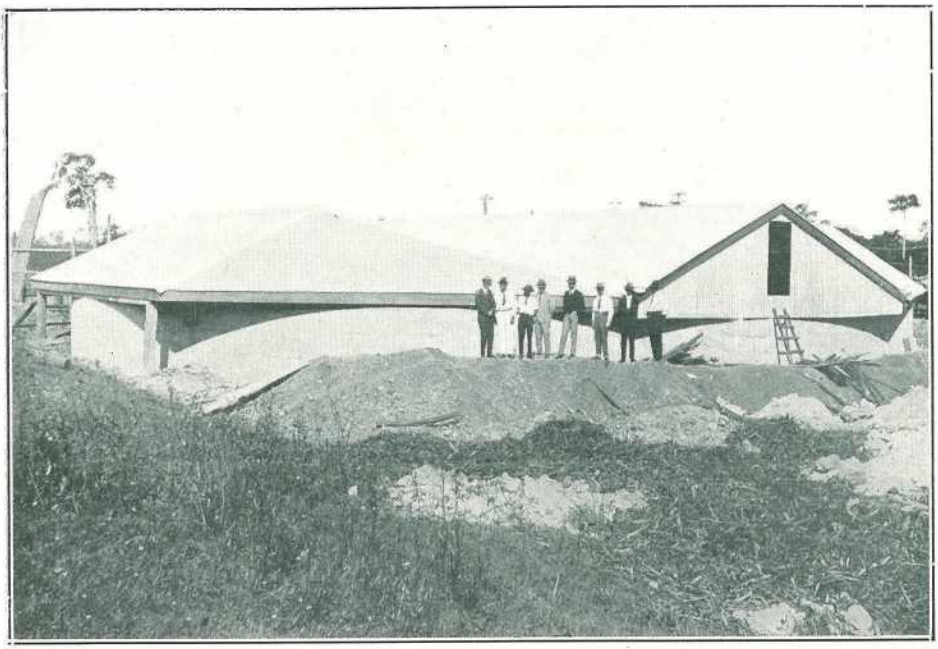


Photo.: G. B. Brooks.]

PLATE 158.—COMPLETED MOLASSES TANK, PLANE CREEK SUGAR MILL, SARINA

The tank which is 90 feet diameter and 10 feet high, is to store surplus molasses for use in power alcohol production.

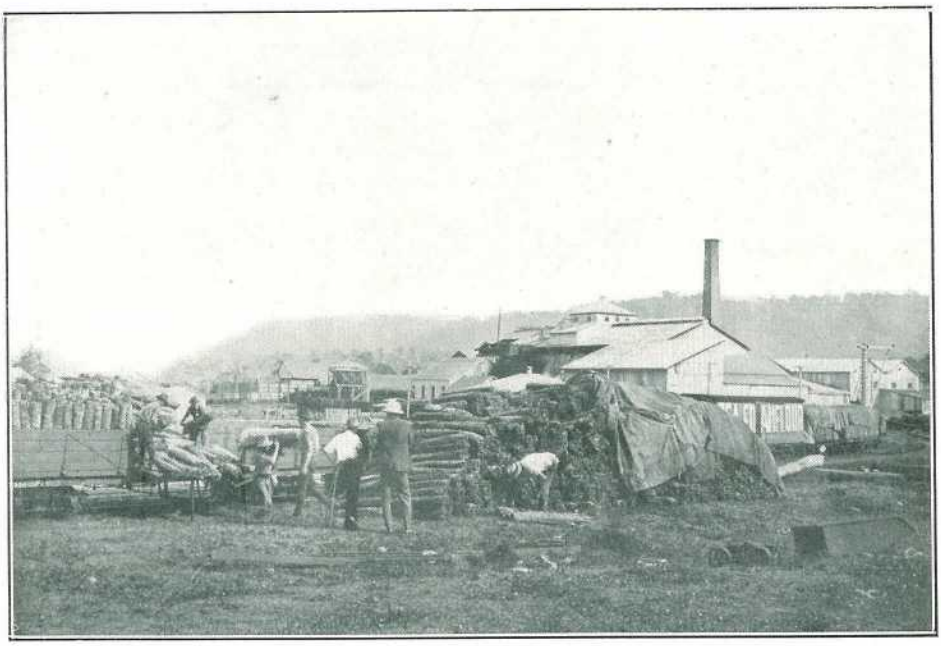


Photo.: G. B. Brooks.]

PLATE 159.—UNLOADING FIRST LARGE CONSIGNMENT OF CASSAVA FROM JAVA, AT SARINA, 23RD NOVEMBER, 1925.

Photo.: G. B. Brooks.]

PLATE 160.—INSPECTION OF CASSAVA, CUTTING INTO SETS, &C., AT PLANE CREEK CENTRAL MILL, SARINA.

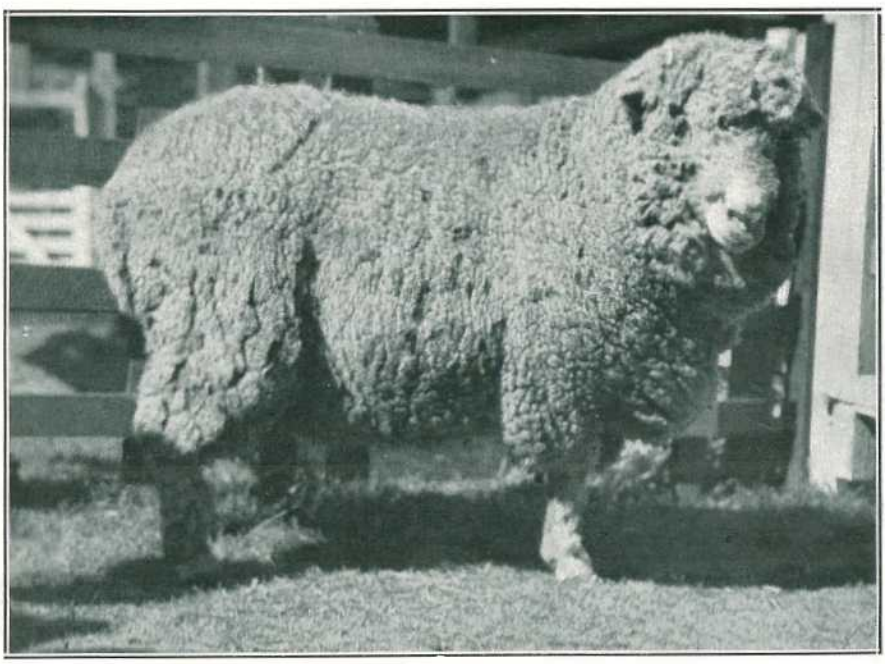


PLATE 161.—CORRIEDALE RAM.

CHAMPION ROYAL NATIONAL AGRICULTURAL SHOW, BRISBANE, 1925. THE PROPERTY OF MR. J. A. FAIRFAX, "MARINYA," CAMBOOYA, DARLING DOWNS.

MARKETING PIGS IN QUEENSLAND—VII.

E. J. SHELTON, H.D.A., Instructor in Pig Raising.

The marketing of his products is claiming much closer attention from the man on the land, and in this series Mr. Shelton describes how pigs are handled at the selling end. In previous instalments several marketing systems with which Queenslanders are familiar were reviewed, and in the seventh article are many points of equal interest to the wide-awake pig-raiser.—Ed.

The ultimate success attending the venture of the farmer who sets out to produce and market pork or bacon pigs in this State will very largely depend upon his ability to carry on satisfactorily under a variety of circumstances, some favourable, a great many adverse, and some altogether unsatisfactory. He will need to carefully study his losses and endeavour to eliminate as many of them as possible. The objective in this article is to illustrate ways and means of overcoming some of the losses from which the individual farmer, as well as the industry as a whole, suffers.

These points have all been emphasised by one or other of the various bacon curing concerns in this State, and are therefore the studied opinion of men who are actually handling the pigs both in transit to the factories and during the processes of manufacture and delivery for sale.

They cover a great deal of ground, but are, nevertheless, of very considerable importance in the development of the industry. Some of them, indeed, have been the subject of special pamphlets and articles by authorities in other parts of the world, as well as by the writer of this series, and are therefore worth diligent study on the part of the pig farmer.

Beginning at the production end of the journey to the consumer it will be well to emphasise a number of these losses—

(1) Losses due to unsatisfactory breeding stock, to the use of crossbred and mongrel boars and to sows of no known breeding, and to inbreeding—the result frequently of purchasing stock from neighbours who have no records of the breeding of their animals; or from purchasing indiscriminately at pig sales on the principle of "appearance" only, and anything so long as it is cheap.

(2) Losses due to inexperience, to improper foods and feeding, to insufficient food, and frequently also to overfeeding on fat-forming foods and foods of a very oily nature, such as peanuts.

(3) Losses due to insanitary piggeries, to low-lying, wet, or damp yards and sties, and to unsuitable pig sty buildings generally.

(4) Losses due to disease and abnormal conditions—particularly to such diseases as tuberculosis frequently the result of a weakened constitution occasioned by improper care—neglected coughs and colds, pneumonia (pants), pleurisy, or other bronchial or lung troubles, infection by bacteria of other diseases, parasitic infestation both internal and external. Losses due to improper castration and to complications—these are very serious, and are forming the subject of a special illustrated pamphlet on the proper castration of pigs, which will be available in January.

(5) Losses due to weaning pigs at too early an age, and to the sale of weaners six to eight weeks old in saleyards as store pigs; pigs which, unless very carefully handled, will fail to mature to advantage. Many losses are due to farmers offering for sale at pig sales animals which they know to be bad doers, and of whose health and constitution they have very grave doubts.

(6) Losses due to a lack of knowledge in so far as actual marketing is concerned. Many pigs reach the factories underweight and in very poor condition. Many are overloaded with fat. Quite recently many very soft "peanut-fed" pigs have been marketed. These have been unsatisfactory and unprofitable.

(7) Losses due to lack of proper exercise during fattening period, and to lack of sufficient green food (flesh formers) during this period.

(8) Overfeeding immediately before despatch has proved disastrous on many occasions.

(9) Absence of watering facilities whilst in transit.

(10) Slowness of trains carrying live stock; excessive bruising and damage to carcasses *en route* from farm to factory. These form the subject of a number of special recommendations herein.

The deaths which actually take place under the eyes of the buyers at saleyards, trucking stations, &c., chiefly arise from overfeeding shortly before delivery at yard. Other causes of deaths at yards would arise from absence of proper loading facilities at the farm, bad handling during unloading, unsuitable wagons and exposure to heat on the way to the sale or trucking yards, and fighting at yard and consequent overheating.

Speaking generally, losses by death in transit have been greater with pigs trucked long distances than those travelling short journeys; greater during hot weather than cold; greater with weighty fat pigs than with small or porkers; greater with crowded trucks than with uncrowded trucks.

Losses Due to Unsatisfactory Breeding Stock.

Experience gained as a result of an extensive tour through many of the pig-raising districts of this State demonstrates that there is abundant scope for improvement in the class of breeding sows kept on our farms, and in the use of better sires, though in very geenral terms it might be definitely stated that our pigs as a whole compare very favourably with those produced in the other States of the Commonwealth. It is unfortunately not an easy matter to bring about this general improvement in the quality of our breeding stock, for it requires both time and money and a great deal of experience to do these things. Stud farms from which better type breeding stock can be purchased are comparatively few and far between; those breeders specialising in this class of stock report a rapidly increasing demand, they have been hard pressed to keep orders supplied, but in many instances though the demand warrants it they have not had the necessary capital to finance extension of their operations, for with them as with most other pig farmers the piggery is but one branch of the farm's activities. It is, however, good to note that there is an increasing demand for better breeding stock, for the future of the pig industry depends entirely upon the success of those engaged and those contemplating engaging in the industry now. Crossbred and mongrel boars have been and are still being used far too freely. Some farmers do not appear to know that the use of a crossbred or mongrel sire is disastrous even though the animals themselves may look quite "O.K." Their use on mongrel sows or sows of no known breeding certainly spells disaster, while a farmer would be extremely foolish to mate a crossbred or mongrel boar to a sow of good breeding and type.

In pig-raising as in every other vocation the best and only the best should be considered if good results are to be expected. The writer will be pleased to assist any farmer in this direction either by the person selection of breeding stock or by putting them in touch with breeders who have reliable stock for sale. A good deal has been done on these lines during the past two years, but ample opportunity offers for a further extension of this service. Details of stock we know to be available for sale will be willingly supplied at any time.

One of the secrets of success in pig raising is the selection of breeding stock from large, thrifty, healthy, and profitable litters, and from stud breeders who can give a health declaration and a correct record of the breeding of their animals with every pig sold. The indiscriminate purchase of breeding stock at pig sales on appearance only, or because they happen to be "going cheap," is to be strongly condemned. Quite recently the writer visited a stud from which a number of stud animals had been distributed. About this time a consignment or two of culls in the form of barrows, badly teated sows, &c., had been sent to a co-operative bacon factory with the result that the manager advised that certain pigs and several "heads" had been condemned on account of the presence of tuberculosis. This farmer remarked quite innocently that he intended sending his next lot of pigs to the local saleyards, where either pork or bacon buyers could operate or where they could be sold "under the hammer." One could quite imagine farmers "hopping in" and purchasing sows from this consignment if they happened to meet a falling market or if competition was restricted and prices were lower than usual. This surely emphasises the necessity of giving careful attention to the selection of breeding stock if one hopes to succeed.

Get the Pure Bred Idea and Keep Better Breeding Stock.

The writer has been approached on many occasions when attending pig sales by farmers anxious to purchase breeding stock. Their requests are generally for a general inspection of the boar or sow to see if he or she is good enough for the

purpose. The first question put to the farmer is usually to ascertain what knowledge he has of the particular animal under inspection. Whether it is from a reliable healthy herd, whether it is a good doer, likely to continue developing till it reaches maturity, whether it is from a large thrifty litter or whether it is one of three or a similar-sized litter, whether it carries any guarantee of breeding, &c., &c. These are all important questions which the seller should be prepared to answer promptly and willingly if he is a genuine seller. The questions speak for themselves; sometimes a sale results, more often the farmer is advised to look elsewhere for the purchase of his breeding stock as the risk of indiscriminate purchase at pig sales is too great for the struggling farmer.

Price should not be the only consideration, for a good breeding sow or an active vigorous prepotent boar is worth far more than its ordinary "meat" value. This is a most important point which should not be overlooked.

Losses Due to Inexperience, and Improper Foods and Feeding.

The whole subject of foods and feeding is one worthy of the most serious consideration on the part of the pig farmer. It is hoped in due course to have a complete treatise available on this subject, meantime the pamphlet entitled "Pig Raising in Queensland" carries a good deal of useful information. This pamphlet with others referred to elsewhere in this issue may be obtained on application to the Department of Agriculture and Stock, William street, Brisbane.

The three outstanding features of successful pig raising are:—

(1) Knowledge of the job, personal attention to all details of management, reliable breeding stock and a good farm.

(2) Efficiency in all operations, keeping an ever-watchful eye on the growth and development of each animal, studying carefully the costs of production.

(3) Co-operation in developing the industry, in the production of all food supplies on the farm, in the marketing of the stock, and in uplifting the industry by co-operating with the Department of Agriculture and Stock in its efforts to keep disease out and to place the industry on a successful basis.

These words written two years ago as an introduction to the pamphlet "Pigs for Profit" appear truer than ever to-day, especially in so far as they refer to the growth of the food supplies on the farm, and to co-operative effort in building the industry up. During recent months, however, a good deal of trouble has been experienced in some districts as a result of growing too many peanuts, or at any rate feeding pigs too heavily on peanuts during the fattening stages. This has been the direct cause of heavy losses from soft oily pork, meat and fat which would not "set" or firm up no matter how long it was kept in the chilling or curing rooms; and for which very low "small goods" price has had to be accepted to clear supplies.

This subject will form material for a special article in our next issue. It is one of the utmost importance.

The two outstanding faults in Queensland bacon pigs during the past two years are:—

The pigs are being held too long on many of our farms, thus they are over the profitable limit in age when marketed.

They are too fat and too heavy for the curers and for the best local and interstate trade, thus they are less profitable to the farmer than they should be.

The remedy lies in a better knowledge of the subject of feeds and feeding, and the balancing of rations with the judicious use of ample supplies of green food and an abundant supply of fresh drinking water.

Losses Due to Insanitary Piggeries.

An illustrated pamphlet dealing fully with the construction of pig-sty buildings is in course of preparation and will, it is hoped, be available early in the New Year, for the subject is one of very considerable economic importance in the production of both pork and bacon pigs as well as of pigs for breeding and sale purposes generally.

Certain it is that the losses from causes outlined here are exceedingly heavy in every part of the State, many piggeries are situated in low-lying, wet, or damp places totally unsuited to the purpose; others have been in use continuously for so many years that they have become veritable bog holes in wet weather and extremely

dry dusty spots when the weather is more favourable; the pig pens are frequently erected in the lowest portion of the yards and very soon become quagmires when heavy rain falls. Many piggeries are but tumbled down, unsightly, and insanitary structures in which it is with the utmost difficulty that the pigs are confined at all. Quite recently one farm was visited on which the pig pens were low dark structures with a log fence scarcely 2 feet high. Just as it happened the boar had broken out and on our arrival the farmer was giving the boar a good thrashing with a lengthy stock whip, remarking the while in rather raucous language that the next time he dared to get out of his pen he would get a bullet in his skull. One could not but help feel that the low tumbled-down fence was nothing but an invitation to the animal to seek a better home on his neighbour's farm where the buildings were of a much better type. Pigs will be "pigs," I suppose, and it is but natural for a boar to seek wider range, and unless the pen and its fencing are of a satisfactory nature the results will never be good.

It is unfortunate that we are compelled to admit that the pig sties on most of our farms are quite unsuited to the job, though it is satisfactory to note that during the last three or four years considerable improvement has taken place in this as in other branches of the pig sections on many farms.

The whole subject will, however, be dealt with in as complete a manner as possible in the "Construction of Pig Sty" pamphlet, copies of which will be available gratis at an early date.

Losses Due to Disease and Abnormal Conditions.

The following figures taken from the Annual Report of the Department of Agriculture and Stock for the year 1924-1925 show the position in regard to trade losses as indicated by result of inspection of carcasses at Queensland Bacon Factories.

Return of swine slaughtered and condemned at bacon factories in Queensland for the year ended 30th June, 1925.

Swine Slaughtered.	Carcasses and Portions Condemned.	Disease.	Percentage.
206,505	861 carcasses ..	Tuberculosis	·416
	8,826 heads	Tuberculosis	4·273
	625 heads	Abscesses	·302
	7 forequarters ..	Abscesses	·0016

Return of swine slaughtered and condemned at various country slaughtering establishments. This list is compiled from returns furnished by permanent officers of the department performing slaughtering duties at the following centres:—Brisbane, Toowoomba, Ipswich, Gympie, Maryborough, Bundaberg, Rockhampton, Mount Morgan, Townsville, Warwick, Charleville, Bowen, Roma, Dalby, Clermont, Barcaldine, Cloncurry, Springsure, Gladstone, Mareeba, Longreach, Normanton, Charters Towers, Mackay, Gayndah, and Beaudesert (*vide* report of Chief Inspector of Stock).

Swine slaughtered and condemned at country slaughtering establishments for year ended 30th June, 1925.

Swine Slaughtered.	Carcasses and Portions Condemned.	Disease.	Percentage.
33,340	126 carcasses	Tuberculosis	·376
	845 heads	Tuberculosis	2·534
	9 carcasses	Abscesses	·026
	134 heads	Abscesses	·401
	4 carcasses	Emaciated	·011
	3 carcasses	Pleuro-pneumonia ..	·008
	1 carcass	Dermodex	·0029
	1 carcass	Decomposition ..	·0029
	1 carcass	Bruised	·0029
	1 forequarter ..	Gangrene	·0014
	6 heads	Unwholesome	·0179

It is difficult to estimate the financial losses the result of these condemnations. They are heavy enough to warrant greater care and attention to the matter of

selection of farm and building sites, selection of healthy vigorous and profitable stock, proper care and attention to all matters connected with feeding and management, and greater care in marketing the animals when ready for slaughter.

These returns, after all, only indicate the actual losses the result of condemnation, but it would appear that the losses to the industry and indirectly to the individual farmer are much heavier, including the result of excessive bruising in transit to market, and deaths in transit (which fortunately are very light considering the long distances over which pigs are trucked during the warmer months of the year).

The economic losses the result of the infestation of animals by both external and internal parasites are also heavy. These will be dealt with in pamphlet form during the coming year in the hope that our losses may be considerably reduced by having a better knowledge of the life history and effects of these parasites.

Losses Due to Improper Castration.

As indicated above these losses are very serious and are forming the subject of a special illustrated pamphlet on the "Proper Castration of Pigs," a pamphlet it is hoped to have available early in January, 1926.

Discussing this matter recently with one of our Meat Inspectors he stressed the urgency of improving the methods employed in the castration of male pigs, for he stated our losses must run into 1 per cent. or more every week. With some factories treating 1,000 or more pigs per week 1 per cent. means ten pigs or

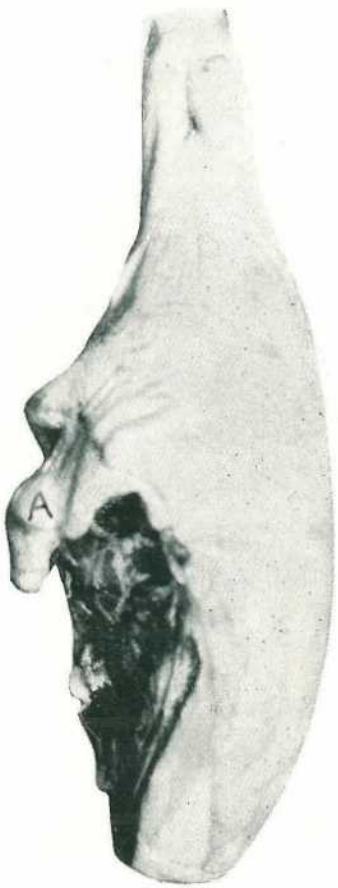


PLATE 162.—PHOTOGRAPH OF HAM, SALE VALUE OF WHICH HAS BEEN REDUCED MORE THAN 50 PER CENT. AS A RESULT OF IMPROPER CASTRATION.

The portion marked "A" represents abscessed areas, which would have to be cut away before this ham was "passed" as fit for human consumption.

portion thereof—a heavy loss indeed through a simple operation, which, if properly performed leaves no ill-effect, nor does it injure or check the growth of the animal at all if performed when the pig is six weeks old—the correct age for castration in pigs.

The illustrations in the "castration" pamphlet will clearly show how these losses are sustained, and will very clearly emphasise the necessity of learning to perform this operation correctly before attempting same on any pig except it be a porker killed for consumption on the farm. The writer will willingly arrange practical demonstrations in castration on a porker killed for farm use at any convenient centre in the course of his travels through the State. L.P.A. secretaries please not for future attention.

Dealing with the subject of losses due to deaths of pigs in transit and through excessive bruising, &c., the following information was supplied recently by one of the bacon factories operating in Southern Queensland, this information speaks for itself and emphasises again the urgency of the instructional campaign among pig-raisers of this State. An excerpt from this letter reads as follows:—"For your information I beg to advise that from the 1st January to 30th June of this year 93 pigs owned by us died either in transit to the works or very shortly after their arrival there; 78 were condemned, while we have had no less than 722 bruised hams and 559 bruised flitches in that period. There are many causes, of course, to which bruising may be ascribed as well as the deaths in transit. . . ."

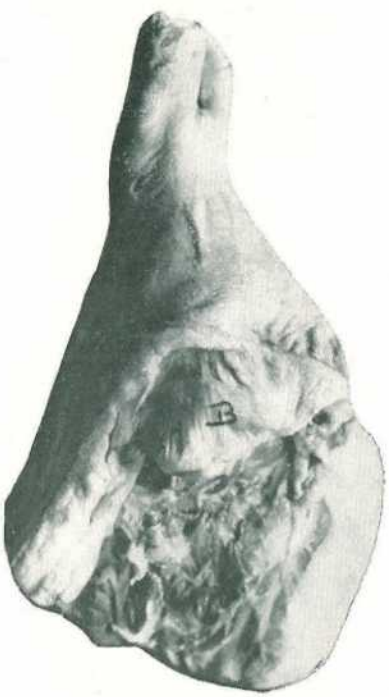


PLATE 163.—ANOTHER RUINED HAM.

The area marked "B" is abscessed to such an extent as to necessitate cutting deeply into the fleshy portion of ham to remove all traces of this damage. Improper castration results frequently in serious abscess formation in this portion of the carcass.

Another factory had this to say: "What pigs we are unfortunate enough to lose are caused through not having proper trucking facilities. If the trucking yards, &c., were attended to the loss of pigs would be nearly nil. . . ."

Another smaller factory wrote on these lines:—"In *re* losses through deaths in trucking we have had very little trouble in this direction, and what few losses we do sustain are chiefly caused through over-crowding in hot weather. Round about our district we are particularly fortunate in respect to condemnations. We have occasional heads condemned, and on rare occasions have the misfortune to have a body condemned. About the only cause of condemnation here is tuberculosis.

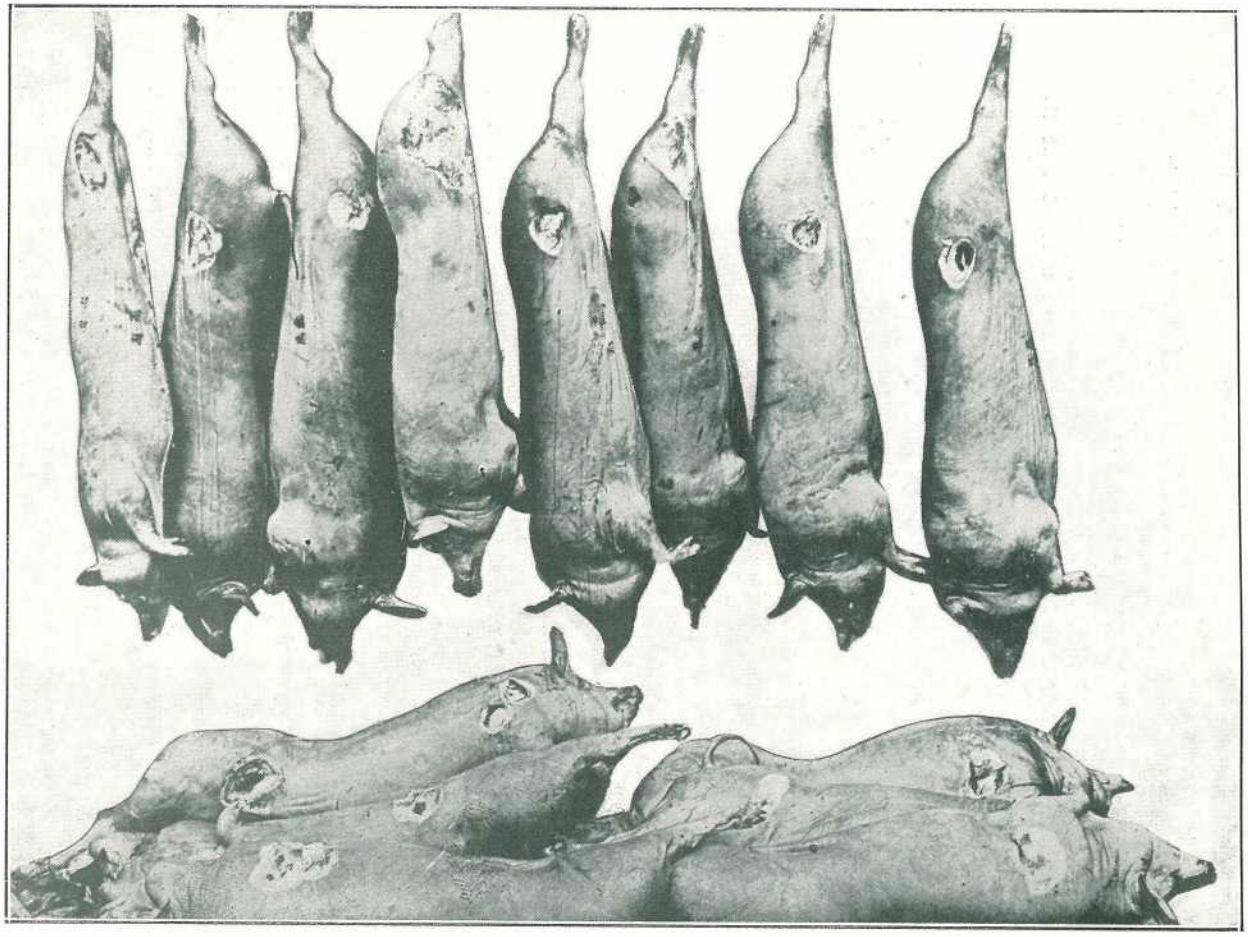


PLATE 164.

This Photograph illustrates very strikingly the serious effects of bruising and damage in transit to the factories of pigs of various weights, in both prime and lean condition. The Meat Inspector is compelled to cut away all abscessed, bruised, or otherwise damaged areas, and as may be noted his knife has been at work on these carcasses. The animal value has in every instance been reduced very considerably as a result of this rough handling. It behoves every farmer to see that his pigs, or those of his neighbours who might be trucking at the same time, are handled more carefully than was the case with the pigs illustrated.

Other complaints are practically unknown to us. At times we have a good many losses through bruising, and as those in charge of loading are generally careful men the only reason we can assign for this is either carelessness in loading on the part of the farmer when he is taking his pigs to sales, or to knocking about received in transit per rail.''

These letters are worth careful study. They are the studied opinions of men actually handling thousands of pigs each year in both Central and Southern Queensland.

The following is the preliminary draft copy of a special notice which is to be exhibited in the form of a printed calico notice at all pig-trucking stations and railway sidings where pigs are loaded into trucks, for the information of pig raisers generally.

This notice has been approved by all of the Queensland Bacon Factories, and also by the Commissioner for Railways, and it is hoped as a result that the information thus broadcasted will be of permanent value to the industry, for certain it is that our losses due to deaths in transit and to excessive bruising are heavier than they ought to be.

Losses Due to Injury in Transit.

Queensland bacon-curers affirm that the pig farmers of this State suffer loss to the extent of *thousands of pounds sterling* annually through *careless handling of live pigs in transit to market*, this the result of *excessive bruising and damage, deaths in transit, &c.*

Your attention is *specially drawn* to the *following general recommendations:*—

Remember that the great demand now is for prime light to medium weight fleshy bacon pigs.

See that your pigs are properly fed and ''topped up'' on grain food for several weeks before marketing.

Give your pigs ample exercise during the growing and ''topping up'' stages. Do not keep your pigs closely confined in small sties, as this is conducive to over-fatness and to soft flabby fat.

Allow your pigs clean drinking water at all times and provide shade and protection from the effects of the weather.

Be careful to market at correct weight; you should weigh your pigs regularly and accustom them to being handled and driven. Ask your factory for their current schedule of weights and prices.

Avoid beating the pigs with whips, rods, or sticks; every time you strike them you inflict a bruise which reduces the animal value.

Do not feed your pigs on the morning of despatch, they travel better on an empty stomach, but provide plenty of clean water. We are endeavouring to have the railway authorities provide water troughs and water at all pig-trucking stations, and, if possible, for water to be supplied en route to destination.

Co-operate with your neighbours in arranging assistance at sale and trucking time.

Firebrand your pigs with your registered firebrand. Ear marks and ear tags have not proved satisfactory; the factories prefer fire branding.

Be certain that the factory receives early advice *re* your consignment, the numbers, grade, brand, mark, and time and date loaded. Hand a written statement to the buyer or official loading agent.

Co-operate with the Railway Department and the factories in their endeavours to deliver your pigs at destination in the best condition possible.

Use purebred boars only and sows of the best breeding you can obtain in producing your pigs and buy store pigs only from reliable sources.

Help us to help you succeed in the industry.

Write to the Department of Agriculture and Stock, Brisbane, for all available information on the subject of pig raising.

Issued under the authority of the Department of Agriculture and Stock, Brisbane, Queensland, 1925.

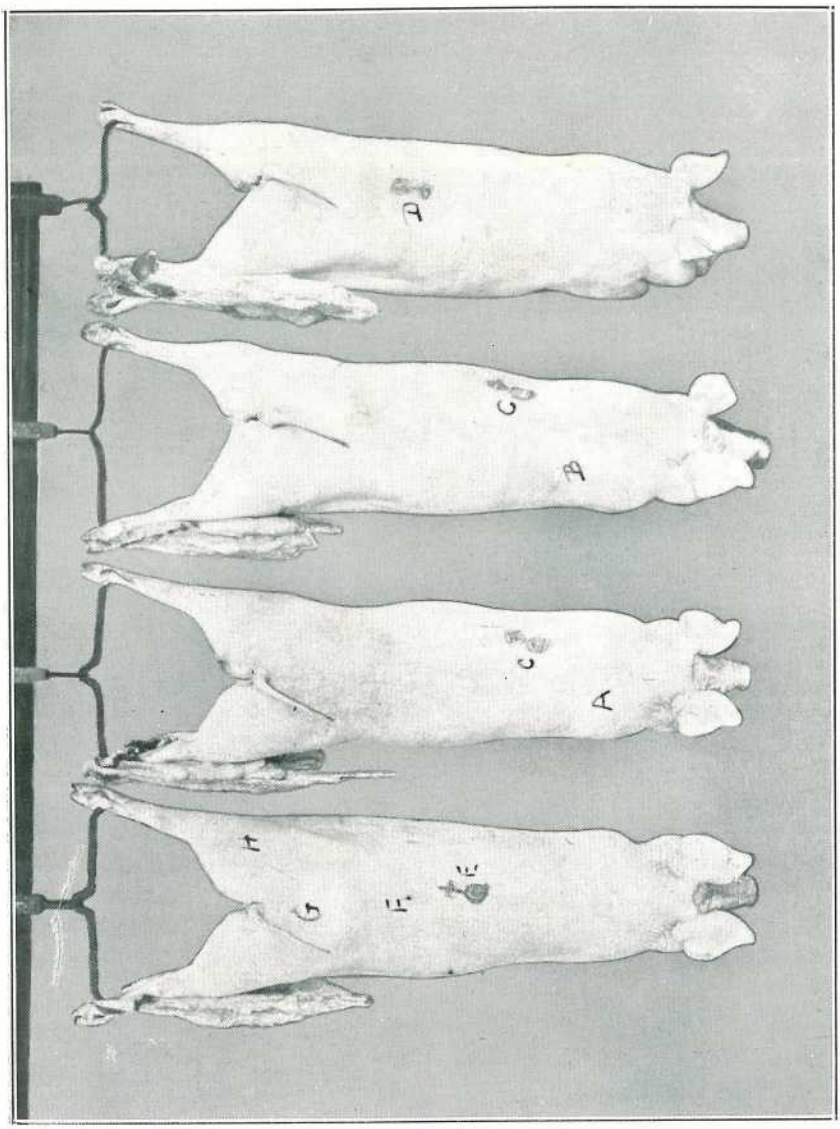


PLATE 165.

BACON PIGS FIREBRANDED WITH THE REGISTERED BRAND $\frac{+}{C}$.

NOTE REMARKS REGARDING POSITION OF FIREBRAND.

A is the position preferred by factory managers, *i.e.*, just off the top of the shoulder, yet not too far down side. B is also a good position, but being on the point of shoulder blade the brand is liable to slip and blur. C is not a good position, though it is preferable to D, which is an awkward position if the pig squats down on its haunches, as it probably would do if in a crush or among other pigs. E is in a bad position from the factory point of view, while F is decidedly bad. The positions marked G and H, or in fact anywhere on the loins or hindquarter, should not be selected as the site for the brand as the tendency is to damage the ham, the most valuable portion of the carcass. Great care should be taken to mark the pigs in the correct position and to have the brand at the correct heat before applying. Where pigs have a coarse heavy coat of hair it would be preferable and much more effective to have a pair of horsehair clippers to clip the hair off the spot before applying the brand. This may seem too much trouble to the busy farmer, but it means a great deal to the factory people to have clean, attractive, readily distinguished brands.

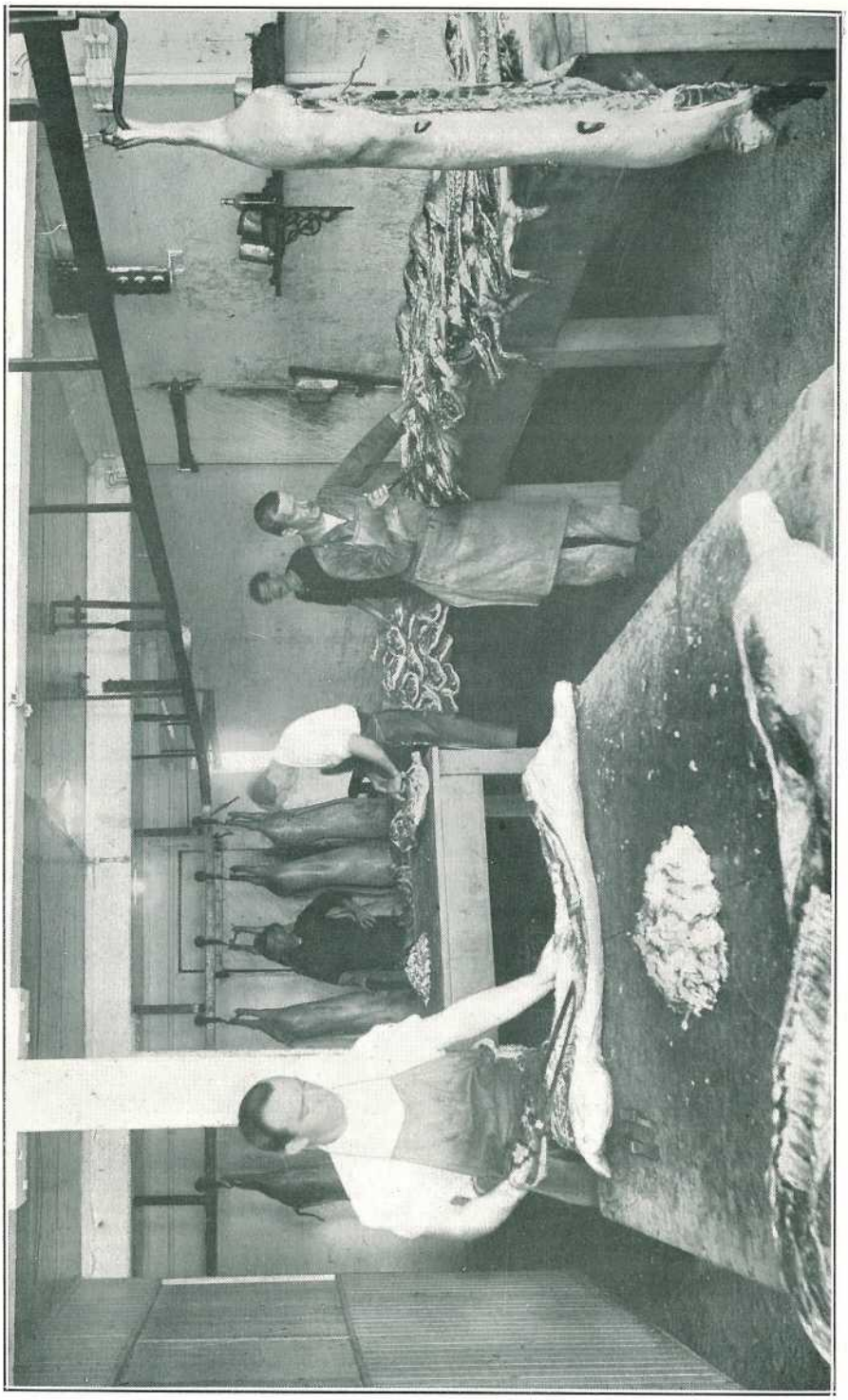


PLATE 166.—THE CUTTING-UP ROOM AT THE ZILLMERE BACON FACTORY—J. C. HUTTON'S LTD.
Every care and attention is given to the carcass in its journey to the consumer in order to ensure to all concerned a satisfactory, saleable, and attractive article.

Plate 167.—Cotton Ratooned at Gatton College.
(*See* letterpress, p. 523.)

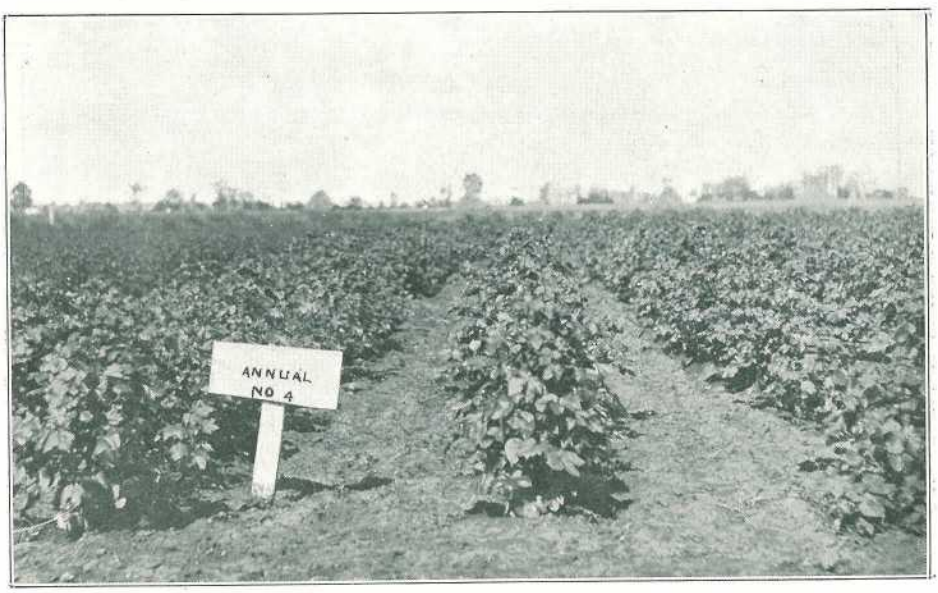


Plate 168.— Gatton College—Annual Cotton.
(*See* letterpress, p. 523.)

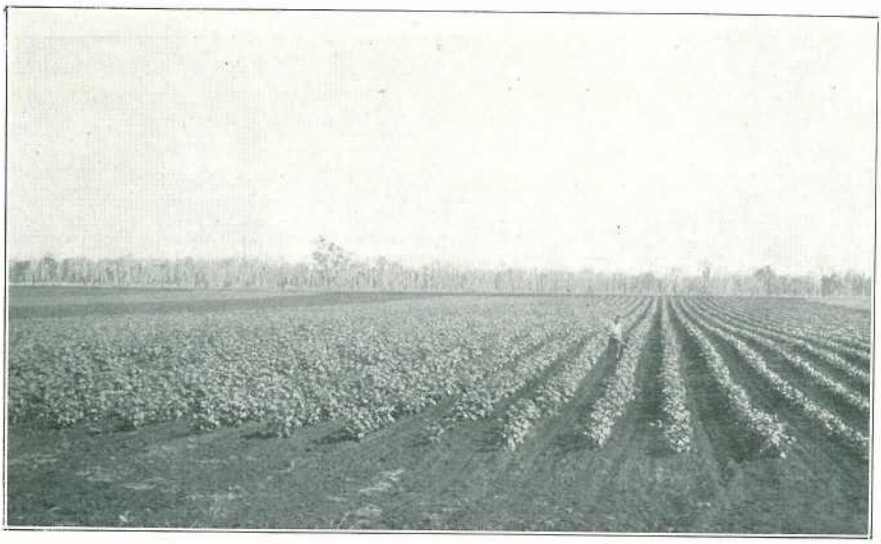


PLATE 169.—CALLIDE RESEARCH FARM—DURANGO COTTON CROP, 1924–25.
(*See* letterpress, p. 523.)

PLATE 170.—COTTON AT CALLIDE—SHOWING CORRECT SPACING.
(*See* letterpress, p. 532.)

RAINFALL IN THE AGRICULTURAL DISTRICTS.

Table showing the Average Rainfall for the Month of October, in the Agricultural Districts, together with Total Rainfalls during October, 1925 and 1924, for Comparison.

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Oct.	No. of Years' Records.	Oct., 1924.	Oct., 1925.		Oct.	No. of Years' Records.	Oct., 1924.	Oct., 1925.
North Coast.					*South Coast*—continued:				
	In.		In.	In.		In.		In.	In.
Atherton	0·96	24	1·02	0·11	Nambour	3·06	29	5·24	1·70
Cairns	1·92	43	0·58	0·25	Nanango	2·38	43	7·01	0·07
Cardwell	2·04	52	1·19	...	Rockhampton ...	1·87	38	1·84	0·70
Cooktown	1·09	49	0·58	0·07	Woodford ...	2·62	38	5·54	...
Herberton	0·94	38	0·70	0·06					
Ingham	1·63	33	1·75	0·12					
Innisfail	2·93	44	0·86	3·62	*Darling Downs.*				
Mossman	2·96	17	0·54	2·63					
Townsville	1·30	54	3·09	0·09	Dalby	2·08	55	2·59	0·22
					Emu Vale ...	2·22	29	2·39	0·30
					Jimbour	1·91	37	4·10	0·22
Central Coast.					Miles	2·06	40	6·24	0·19
					Stanthorpe ...	2·62	52	4·37	0·60
Ayr	1·05	38	3·00	...	Toowoomba ...	2·61	53	2·12	0·38
Bowen	1·10	54	3·96	0·06	Warwick	2·33	60	2·38	0·09
Charters Towers ...	0·71	43	1·46	...					
Mackay	1·81	54	0·42	0·13					
Proserpine	1·89	22	5·58	0·17					
St. Lawrence ...	1·81	54	1·66	0·06	*Maranoa.*				
					Roma	1·81	51	4·20	0·36
South Coast.									
					State Farms, &c.				
Biggenden	2·35	26	6·48	0·25					
Bundaberg	2·05	42	1·75	0·61					
Brisbane	2·57	74	1·63	0·35	Bungeworgorai ...	1·64	11	4·61	0·21
Childers	2·51	30	7·34	0·66	Gatton College ...	2·12	26	1·70	0·14
Crohamhurst ...	3·61	30	6·34	1·38	Gindie	1·47	26	3·36	0·15
Esk	2·47	38	2·76	0·39	Hermitage ...	1·96	19	2·42	0·44
Gayndah	2·41	54	4·96	0·16	Kairi	1·19	10	...	0·02
Gympie	2·73	55	5·11	1·31	Sugar Experiment Station, Mackay	1·70	28	0·46	...
Caboolture	2·58	38	3·47	0·61					
Kilkivan	2·64	46	5·49	0·18	Warren	2·28	11	3·48	0·67
Maryborough ...	2·66	53	4·27	0·82					

Note.—The averages have been compiled from official data during the periods indicated; but the totals for October this year, and for the same period of 1924, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND,
Divisional Meteorologist.

THE NORTHERN PIG BOARD.

Subject to a poll on the question, it is the Government's intention to extend the operations of the Atherton Tableland Pig Pool Board until 31st December, 1930. The proposed new board will not only apply to the Atherton Tableland, but will include the Petty Sessions Districts of Atherton, Herberton, Chillagoe, Cairns, Douglas, and Mourilyan, and will be known as the Northern Pig Board. The board to deal with the commodity will consist of five representatives of growers and one appointed by the Minister. Any petition for a poll to decide whether the proposed board shall be formed must be signed by at least fifty growers, and must reach the Minister before 12th December. Nominations for growers' representatives on the board will be received up to 12th December, and each nomination must be signed by at least five growers of pigs.

General Notes.

The Royal Society of Queensland.

At the last ordinary monthly meeting of the Royal Society held in the Geology Lecture Theatre of the University, the President, Prof. R. W. Hawken, B.A., M.E., M. Inst. C.E., was in the chair.

The meeting, to which the public was invited, was devoted to the celebration of Huxley's Centenary. The following addresses were given:—

Huxley: Personal Characteristics, by Mr. Heber A. Longman;

Huxley: The Biologist, by Professor E. J. Goddard;

Huxley: The Educationalist, by Professor J. P. Lowson.

The various aspects of the life and work of Thomas Henry Huxley were dealt with in an interesting way by the three speakers, and the addresses were greatly appreciated by the large audience.

For Profitable Horse-Breeding.

A horse-breeder may have first-class mares, and he may breed them to sires above the average, but unless he realises the importance of generous feeding to the brood mares and foals his efforts to produce good, well-developed horses will be sadly hampered. Feeding should be regarded as of equal importance to breeding, but we know that it is far from being recognised, and as a result of the neglect to feed breeding stock and the growing animals our markets to-day are over-supplied with undersized animals for which there is no demand. This is why many breeders cannot command payable prices for the horses they raise, and then they say, "horse-breeding does not pay."

Horse-breeding will, and does, pay the man who uses good breeding stock and who does not grudge giving chaff or grain to the brood mares and foals, especially during the winter or in dry seasons. It has become a saying that "the cheapest fuel is that grown on the farm," and a breeder should reserve a liberal supply for his horses, which should produce all the farm power he requires, while his surplus stock will help to add to the profits of the farm.

Sources of Nitrogen—The Action of Soil Organisms.

Although leguminous plants are most widely known as enriching the soil in nitrogen, which they obtain from the air, it is of interest to note (says a writer in the South African "Farmers' Advocate") that there are other sources by which free nitrogen may be drawn upon and deposited in the soil for future use. Experimenters are realising that there is evidence that leads to the belief that the direct fixation by bacteria, independent of legumes, is by far more important than it was thought to be until recently.

Observation has certainly shown that soil which is cultivated without the aid of legumes may hold its nitrogen content fairly well, and this points to the conclusion that the direct fixation of nitrogen independent of legumes is of very great significance, and possibly the greater factor concerned with the process of the fixation of nitrogen. We thus see that the whole problem of soil fertility is inextricably interwoven with the action of micro-organisms.

From the origin of the soil, then, through its use by plants and the subsequent destruction and change of their original condition, every step is associated with the action of these organisms.

In the future the problem of the proper treatment of the soil by the agriculturist may become to a large extent one of the control of these infinitesimally small soil workers, and he may have to learn how to stimulate the activities of those which are desirable in the maintenance of a supply of plant-food in the soil. Cultivation, associated with moisture and warmth, is the means of assuring this. Therefore, the thorough cultivation of the land increases soil fertility.

Electrical Treatment of Seeds.

Various experiments to test the utility of electricity in crop production have been carried out at different times.

In connection with the treatment of seeds, several kinds of vegetable seeds have been tested, but with negative results. There is local evidence to show that in some cases electrically-treated tomato seed has taken longer to germinate than untreated seed. In one case the electrically-treated seed germinated in fourteen days, while the untreated seed germinated in five days.

The question of electricity in relation to plants and plant growth is at present undergoing investigation in different parts of the world. The latest available results are to the effect that seed treatment has no appreciable effect on the subsequent character or yield of the plants. In most instances the seeds were immersed in an electrolyte of brine, and subjected to the action of the current. The high-tension electric discharge, however, has resulted in increased yields of a number of crops when treatment was applied continuously throughout the growing season.

Claims have been made that seed treatment by electrical means has resulted in marked changes in the subsequent crops, but these have not been substantiated in carefully conducted trials, and the matter is for the present in the experimental stage.

Grazing of Stock—The Danger of Overstocking.

It may be laid down as a rule to which there is practically no exception that the increase in the risk from disease occasioned by overstocking is out of all proportion to the increase in the number of stock added to those already on a given area. This increase in risk involves three types of disease—infectious, parasitic, and dietetic. The chances of infectious disease spreading is, of course, obviously greater where animals come into more direct contact with one another, and the longer such contact is continued the greater the risk. Since in most instances of parasitic infestation the eggs or embryos of the parasites are passed out of the animal with the fæces, it is equally obvious that the more stock are crowded together the more they will tend to become reinfected with the parasites.

Dietetic diseases are in most instances only to be expected when overstocking is continued for a long period; such diseases are sometimes so delayed in their appearance, and the exhaustion of the soil by overstocking is also so gradual that it is difficult at first sight to connect the two, but the connection undoubtedly exists. This refers to overstocking of a whole holding. It is, of course, often economically sound and wise from a health point of view temporarily to overstock some portion of a holding, even to a very marked extent, and then to allow that portion a rest from stocking. Changes such as this practice lead to benefit both of stock and pastures.

The danger from crowding many stock together on small areas is most marked in the case of young stock—particularly calves. Concerning the dangers peculiar to grazing on certain types of country, mention may be made of paddocks particularly subject to blackleg, of swampy and low-lying country likely to favour the development of parasites, and of small areas on which certain markedly noxious plants may be growing. In dangerous areas of the first type, spelling, or better still, cultivation, have been found beneficial; in the second, draining, cultivation, and fencing off may be utilised; and for the third, either the cutting of the plant or the interference with its accessibility for stock. When the last-named measures are impracticable, much loss may at times be saved if, when the stock first get on to the area they are watched carefully, and instantly removed on the first sign of sickness. Instances, too, are not wanting where loss has followed the deliberate disregard of warnings issued by competent authorities.

Water on the Dairy Farm—Some Labour-saving Suggestions.

Dairying is frequently made considerably more arduous than it need be, points out a writer in the New South Wales "Agricultural Gazette." It must be admitted that farmers, as a whole, do not take advantage of the many labour-saving devices which are available to them. Many, no doubt, cannot afford them, but it is equally true that many others can who still persist in the old laborious ways.

The first essential on a dairy farm is a plentiful supply of good water, both for use by the stock and for use in washing utensils, floors, &c. For the latter purpose, it saves many hours work, and the walking of many miles in a year, if water is laid on to the dairy and bails from an overhead tank, supplied either by windmill or other power. Most inland farmhouses are supplied with overhead tanks in this way, as the rainfall is often uncertain, and tanks supplied from the roof cannot be depended upon. Yet even where overhead tanks are already in use, it is the exception rather

than the rule to find water laid on to a dairy. In coastal districts, where the rainfall is heavy, the common practice is for the water caught from the dairy roof to be used for washing down. In dry periods this supply often fails, with a consequent serious effect on the quality of cream; so that even on the coast many farmers could greatly improve their own prospects by installing an independent water supply. The farmer's wife also, as a rule, has not the easiest row to hoe, and to have the water laid on in the house and garden is a very great convenience.

On the vast majority of dairy farms there is room for great improvement in the methods used in heating water. It is probable that, of all causes of second-grade cream, the washing of separators and utensils with lukewarm water without afterwards scalding is the greatest. The importance of a plentiful supply of boiling water cannot be stressed too much, for only by its use can cleansing be properly carried out. The essential part of "washing up" is the cleansing and sterilising of all those surfaces with which the milk or cream comes in contact. By sterilising we mean the destruction of all germ life, and the only way open for the farmer to do this is to use boiling water. Many diverse methods are in use for obtaining hot water; kerosene buckets suspended over an open fire is one common practice—slow, tiresome, and wasteful of fuel. Numerous farmers use a copper, and unless the copper is bricked in, and by a man who understands the work, this way is nearly as slow and uses nearly as much fuel as the open fire.

A fairly large volume of water, such as may be contained in a copper, will take a long time to heat to boiling point. The usual practice is to light the fire under the copper or other heating arrangement when starting milking, and when the milking and separating are done, if the water happens to be boiling so much the better, but if not, well, it is used just the same—the results often being, as previously stated, second-grade cream.

Sometimes the water is heated over a stove or open fire in the farm kitchen; and one farmer, who had a six-cow milking plant and a large herd, obtained all his water for washing up from the hopper of a water-cooled oil engine. Needless to say, his cream was always second grade, solely through the fact that he was not using anything like the quantity of hot water he should have been.

A cheap and easy method of securing plentiful supplies of boiling water is the ordinary chip bath heater. These heaters, which cost only a few pounds, will supply boiling water in a few seconds, using as fuel any waste material, such as old papers, brushwood, or chips. They are best used when connected by piping to either an overhead or rainwater tank, or other source of water supply, and it is hard to understand why more farmers do not make use of them.

Proposed Grain Board.

The following nominations have been received for membership of the proposed Grain (Maize) Board, which closed at the Department of Agriculture and Stock, on the 14th November, 1925:—

District No. 1 (Moreton).—No nominations received.

District No. 2 (Darling Downs and Maranoa).—Patrick McNee, Kingsthorpe; Harry Obst, Shepperd; George Burton, Cambooya; Thomas Braithwaite, Warwick; Joseph James Booth, Warwick; Henry Hildred, Gladfield.

District No. 3 (Rest of Queensland).—James Henry Sigley, Kingaroy; James Alexander Slater, Wondai.

Two (2) Members are required for each District.

Pamphlets for Pig Raisers.

The under listed pamphlets on pig raising may be obtained gratis on application to the Under Secretary, Department of Agriculture and Stock, William street, Brisbane. Applications may be made personally or by letter at any time.

"Pig Raising in Queensland," "The Dentition of the Pig," "Weaning the Pig," "Feeding Pigs—Feeding Problems," "The Berkshire Breed—Litter Records," "Concrete Feeding Floors," "Mineral Mixtures for Pigs," "Flushing the Breeding Sow," "Diarrhoea or White Scour in Pigs," "Paralysis of the Hind-quarters in Pigs," "A Peculiar Disease Affecting the Ear of Pigs," "Early History of the Pig," "Gestation Chart for Pigs," "Selecting the Boar—Points Worthy of Note," "Marketing Pigs in Queensland, Parts 2 to 6," "Pigs for Profit," "A Useful Fence for Pig Paddocks," "A Thrifty Profitable Litter," "Yorkshire Pigs," "Maize for Pigs," "Pig Clubs—Their Value in Queensland Agriculture," "Young Judges' Competitions at Agricultural Shows."

Pamphlets on "Castration of Pigs," "Construction of Pig Sty Buildings," and several others are in course of preparation, and will be made available on publication.

Egg Board.

His Excellency the Lieutenant-Governor (Hon. W. Lennon) has approved of the extension of the operations of the present Egg Board until the 31st December, 1925. The present members of the Board, namely:—J. R. Wilson, Eudlo; R. A. Chapman, The Gap; M. H. Campbell, Albany Creek (Chairman and Representatives of Council of Agriculture); H. M. Stevens, Lanefield; and J. Hutton, Kingsthorpe; will therefore hold office until the 31st December, 1925.

Atherton Tableland Maize Board.

His Excellency the Lieutenant-Governor has approved of an Order in Council by which the term of office of the present members of the Atherton Tableland Maize Board shall expire on the 31st December, 1925. This has been done in order to coincide with the election of members of District Councils of the Council of Agriculture. Members elected to the Atherton Tableland Maize Board after the 31st December, 1925, will hold office until the 31st August, 1927, and members appointed thereafter will hold office for one year.

Staff Changes and Appointments.

The Police Magistrate, Blackall, has been appointed Government Representative on the Barcoo Dingo Board.

The resignation of Mr. R. R. Anson as Assistant Instructor, Cotton Section, Department of Agriculture and Stock, has been accepted.

Mr. E. Barr, of Sunday Creek, Wondai, Mr. W. B. Alexander, of Sherwood, and Mr. E. F. Pollock, of the Royal Zoological Society of New South Wales, have been appointed officers under and for the purposes of the Animals and Birds Acts.

Mr. J. H. Simmonds, of the Department of Agriculture and Stock, has been appointed Plant Pathologist to that Department, as from the 1st January, 1926.

Losses Due to Weaning Pigs at Too Early an Age.

The economic loss to the industry as a whole through weaning pigs at too early an age is a very serious one—one that could very largely be minimised by a better knowledge of the business. Pigs should not be weaned or taken away from their mother till they are eight weeks of age, and if they can be allowed to run with the sow a few days longer, even to nine or ten weeks, so much the better; though where the objective is (as it should be) two litters per sow per year it will be necessary for the sow to be separated temporarily from the young pigs when they are between eight and nine weeks old, for it is at this period the sow will come "in season" and be ready for the service of the boar.

It is almost criminal to wean pigs at six weeks of age, place them in a cart or wagon and take them off to the pig sales to sell to some other farmer under whose care they will have an entirely different class of food to that to which they have been accustomed prior to weaning. The farmer who purchases them will be very fortunate indeed if the growth of these animals is not seriously checked by this early weaning, though it is admitted that with special care and attention and a "drop of new milk" they can, if they are specially well developed, be carried on without undue risk; but it is this special care and attention and the new milk (milk fresh from the cow and prior to passing through the separator) which is often lacking. Nevertheless thousands of young pigs suffer each year as a result of early weaning. This matter is treated in the pamphlet, "Weaning the Pigs," obtainable gratis on application to this department.

It is unfortunate also that we have little or no legislation dealing specially with the pig industry. This matter is, however, being looked into with a view to submitting a draft copy of a Pig Industry Act; an Act which would be designed with a view to strengthening the position of the pig farmer and in making the industry a more attractive and reliable one. It would aim also at introducing measures which would result in a better type of accommodation being provided for pigs generally, possibly also for the compulsory firebranding of all bacon pigs coming forward to our bacon factories in order that it would be possible to trace condemned pigs to the farm from which they came. This is only possible now with pigs coming forward to co-operative factories in which case firebranding or marking in some other way is necessarily compulsory as is understood and appreciated by all suppliers to these factories. It is felt that such an Act would eventually prove a Godsend to the industry, though doubtless at first many farmers would object to the introduction of legislation.

Reference has been made elsewhere in this issue to the question of farmers marketing in saleyards pigs of the health and wellbeing of which they have grave doubts. This is a question which breeders in their own interests should give attention to, and they should see to it that no stock leaves their farm for a saleyard or factory unless they are satisfied that the animal is in good health and in a marketable condition.—E. J. Shelton, Instructor in Pig Raising.

State Wheat Board Election.

Following is the result of the voting for Districts 1, 2, 3, 4, and 5 in connection with the Wheat Board Election held on the 12th November, 1925:—

District No. 1—Old electorates of Maranoa, Dalby, Nanango, and Murilla, with the exception of the Goondiwindi Division.

	Votes.
Mulholland, William Thomas (Jandowae)	154
Swan, Robert (Wallumbilla)	279
Informal	10
Total	443

District No. 2—Old electorate of Pittsworth.

	Votes.
Edwards, David Robert (Nobby)	178
Harvey, Alfred John (Pittsworth)	259
Krieg, Arthur Carl (Brookstead)	429
Informal	7
Total	873

District No. 3—Old electorates of Warwick, Carnarvon, and the Goondiwindi Division of Murilla.

	Votes.
Bradford, Harry Curnow (Oman-ama)	163
Kirkegaard, Bergittinus Clemen Chris. (Freestone)	164
Informal	4
Total	331

District No. 4—The electorate of Cunningham—Muir, Thomas (Allora), returned unopposed.

District No. 5—Old electorates of Lockyer, Drayton, Aubigny, Toowoomba, and East Toowoomba.

	Votes.
Archibald, John (Oakey)	234
Chamberlin, John Thomas (Kingsthorpe)	177
Informal	7
Total	418

A Fine Berkshire Record.

A record probably unexcelled in the stud pig business in Queensland has recently been established by Messrs. Mat. Porter and Sons of the Roseloch Stud, Wondai, Queensland, with a Berkshire sow purchased for him by the Instructor in Pig Raising at last Sydney Show.

This sow, "Dundas Dora," was bred by Mr. Dawson of the "Dundas" Stud, Dundas, New South Wales, and is now about two years old. She was forward in pig when purchased and farrowed seven very fine pigs soon after arrival in Queensland. She has in the course of her first six months in Queensland put up this fine record:—First Prize, Maryborough Show; First Prize, Childers Show; First Prize, Bundaberg Show; First Prize, Gin Gin Show; First Prize and Reserve Champion, Rockhampton Show; and First Prize and Champion, Gympie Show; where also she was one of the champion group of Berkshire pigs. Her progeny have now also entered the show ring, and have carried off a prize or two.

This sow has done wonders in this time, for travelling first from Sydney Show to Queensland she was out at Wondai a few weeks only before she commenced her show circuit, and was for nearly six months on and off the road journeying to and from the several shows at which she was a competitor.

Mr. Porter has been very successful this year, for in addition to winning the prizes listed, he carried off quite a number of other awards at the several shows at which he exhibited, as well as at Brisbane Show in August, where he purchased a prize-winning sire in "Hillview Lennie" from the stud of Mr. Luke Williams, of Tasmania. Within a month of Brisbane Show "Hillview Lennie" scored First and Champion at the Gympie Show; at which Mat's record included first with sow and litter; first with sow under twelve months old; first and second with sow under six months; second with pen of young boars; Champion Berkshire boar and sow; and Champion Group of Berkshires.

All this constitutes a record of which any breeder might justly be proud.

Mr. Porter, who is one of the most progressive farmers in a district of good farmers, has been breeding stud pigs for a number of years, and has always been high up in the winning lists.

The Necessity for Fallowing.

"The fallowed areas, however, are showing up well." The remark is one that we have heard increasingly frequently of late. Its significance scarcely needs stressing. With large areas and favourable seasons, a few have made fortunes by continuously sowing wheat on stubble land, but a greater number have experienced great hardships with the advent of drought, and the money saved during the years of plenty has disappeared in providing for the necessities of life and in feeding working horses during the lean years. Such is the case when the areas are large. Then how much greater is the chance of failure as the areas become smaller if such a policy is persistently followed?

The aim of the farmer should be, not to chance making a fortune during a few years, but rather to follow a system which will ensure a comfortable yearly income during his life on the farm. To this end, it is well to consider the advisability of following a system of mixed farming—sheep and wheat, in conjunction with a suitable rotation.

Reduction of Fruit Marketing Costs.

According to Mr. A. R. Rule, general manager of the Federated Fruit and Vegetable Growers of America, in a recent address to the American Institute of Co-operation, federation of grower co-operative fruit associations in the United States cut waste in marketing costs by 1,700,000 dollars in the last year, and an additional 2,000,000 dollars were added to the farmers' returns without increasing the consumers' cost.

"Joint national selling is still young," he said, "but successful experience points to a greater pooling of effort in reaching the international markets for perishables."

Co-operative marketing tends to bring about orderly distribution, which in turn tends to stabilise prices, Mr. Rule declared, and added:—"Stability of prices tends to narrower margins of profit by jobbers and retailers. This means lower average cost to consumers. Thus the co-operative movement inevitably reduces the cost of living and justifies the whole-hearted support of consumers.

"I predict that the co-operatives will soon federate their strength in reaching the general public through a powerful advertising campaign, educational in character and telling the true story of co-operative marketing."

What we Learn from Cultural Experiments.

"Looking back over the records of this branch of agricultural experiment work as carried on during the past twenty-five years," writes the Senior Experimentalist of the New South Wales Department of Agriculture on the subject of cultural experiments, "one is struck by the gradual change in the attitude of experimenters generally towards the soil. In the early days the soil was regarded as a more or less constant factor, and tests were mainly devised to test such points as deep *versus* shallow ploughing, mould-board *versus* disc ploughing, harrowing *versus* no harrowing, and so on. It was expected that the results of such trials were capable of fairly general application, and considerable experience, mainly of a negative character, was accumulated from this type of experiment. As knowledge of the various soil types increased, it was realised that different soils required widely different treatments, and that no hard and fast rules could be laid down regarding the operations to be carried out during the important time of preparation for seeding.

"As regards fallowing, for example, in the wheat areas the objective is a weed-free, well-mulched seed-bed, while the soil should be sufficiently consolidated to hold a plentiful supply of moisture within easy reach of the young seedlings. The method of arriving at this desirable condition necessarily varies with different types of soil. Seasonal conditions from year to year also largely determine the time and nature of the cultural operations with a corresponding choice in the type of implement used. The fact that cultural problems are so local in character renders difficult the planning of experiments designed to apply over a wide area. Considerable latitude must be allowed to officers conducting such experiments regarding when and how they carry out the various operations. Results aimed at are of a general nature, capable of as wide an application as possible—in other words, principles are investigated rather than details."

Reclaiming War-Devastated Regions in France.

Queensland farmers who served in France with the A.I.F. will be interested in this:—It is reported that of the 7,250,000 acres of land rendered unsuitable for use at the time of the armistice, 95 per cent. had been restored on the 1st January, 1925. Practically all the land covered with barbed wire entanglements has been cleared, and 97 per cent. of the earth that had been thrown up in making trenches has now been used for filling in. Of the nearly 5,000,000 acres of farm land unsuitable for use at the time of the armistice, 4,525,000 acres had been levelled off.

At the time of the armistice the number of destroyed buildings reached 893,792. On 1st January, 1925, 508,319 of these had been rebuilt. A considerable number of the remaining destroyed buildings will not be re-erected, however, as their owners have accepted war damages with no intention to rebuild.

The number of factories destroyed by the war was 22,900. On 1st January, 1925, 21,000 of these establishments had been rebuilt or repaired, as had over one-half of the 5,081 schools and 3,311 churches that had also been destroyed.

On 31st December, 1924, France had paid out for the restoration of the devastated regions a sum of 74,206,000,000 francs. On the same date the Minister of the Liberated Regions reported that an additional 22,500,000 francs would be necessary to complete this restoration. It is hoped, however, that economies will bring down the latter total to about 18,250,000 francs.

Buying a Separator—It's After Care.

There are few farm machines that are as universally used and abused as the cream separator, points out a writer in the "New Zealand Dairyman." It is by far the most delicate machine the farmer uses, and needs different care and attention from what the average farmer gives it if he would get the years of service that the manufacturers build into it.

The question, "Will it pay me to buy a cream separator?" has rather given place to that other question, "What points should I consider in selecting and purchasing a new separator?" Assuming that all cream separators available for purchase skim equally clean or efficiently when new, and so long as they remain in good mechanical condition, the factors requiring study might be put down in the following order:—

(1) Personal preference or choice based on actual previous experience with one or more makes or types of machine, and the quality of service rendered by the manufacturers and agents in connection therewith.

(2) Proximity of repairs and the kind and duration of service which will probably be given in connection with the various makes of separators being considered.

(3) The quality of material and workmanship, and the simplicity or lack of it which are characteristic of the different makes of machines.

(4) Ease with which a separator may be washed and kept sanitary.

(5) Ease of keeping a machine properly oiled, and ease of assembling and operating.

(6) Capacity, or the number of pounds of milk which can be separated in one hour's time.

After you have bought your cream separator, study the instruction book until you know it by heart, and then follow the instructions that it gives. Here are a few simple rules that, if followed, will save a lot of trouble:—

If the machine turns hard, nine times out of ten it is the oil. Drain out the old oil, clean the bearings, and clean all the sediment out of the oil case; then refill with the best oil you can buy. Don't go to the dealer and call for just separator oil, and let him dump some out of a barrel into a dirty can. Insist on getting the best oil he has in stock, even if it does cost more. It will be cheaper in the long run.

Keep the machine level at all times. More machines are ruined by being set on an unlevel foundation than by all other causes put together. Almost any machine will run well on an unlevel foundation for a short time, but the weight of the bowl will soon wear the spindle and bearings on the one side until the machine is ruined or causes costly repairs to be necessary. As a rule, very little attention is paid to levelling the machine, but no machine made will last as long or run as well on an unlevel foundation as it will where it is set perfectly level.

Start the machine slowly. Take plenty of time starting, as jerking and heaving on the crank is hard on the machine and liable to spring some of the working parts. Run the machine at the speed recommended by the manufacturer. Always use the milk or cream screw to regulate the density of the cream. Never try to regulate the density of the cream by turning slowly or fast or by partly shutting off the flow of milk into the bowl.

Handling Sheep Skins.

Useful points in the handling of sheep skins are conveyed in Bulletin No. 60 ("The Farmer's Clip") of the Department of Agriculture of Western Australia. The losses through carelessness in this relation in New South Wales justify the following quotation:—

Great care should be taken in removing the skins from the carcass. In skinning a sheep the knife should only be used where absolutely necessary, merely for opening at different points. By using the hand, and punching it against the skin, the latter is separated from the flesh without either making knife cuts or leaving flesh on the skin. As soon as this operation is completed, take the skin and hang it over a rail from neck end to tail, flesh side upwards, allowing the trotters and legs to hang down on either side. When it becomes sufficiently dry in this position, have it painted with an anti-weevil skin paint.

Be sure that the rail over which the skin is hung is underneath a roof, which will protect it from the sun rays or rain. Either of these do material damage and make the pelt useless; therefore, great care should be taken to dry in a shed. When the skins are thoroughly dry, and there are sufficient to make a bundle, fold them exactly opposite from the way they are hung over the rail. This leaves the woolly side outwards. Place these skins on top of each other, tie them up in a bundle, and label them for the broker. The reason for folding them with the wool out is to protect the pelt.

Be sure to cut off the trotters, and fold in any hanging ends, which are easily got hold of by people handling the bundle. If a loose end is left, it is certain it will be used as a handle for lifting, and in nearly every instance the skin will be ripped and torn at that point; therefore, fold the skin so that the bundle is neat and square, showing nothing but wool on the outer side.

Thousands of skins each year have to be valued and treated as damaged just for the want of a little care when they are being removed from the carcass and in process of drying and packing. Damaged skins come under the following headings:—Skins from dead sheep; cut skins; perished skins; weevil-eaten skins; sun-dried skins; any skins exposed to the weather which are shrunk and wrinkled. Faulty skins are ribby skins, and those with seed pricks or seeds piercing through them.

Be careful to leave as little bloodstain as possible on the skin. This all has a tendency to encourage weevil.

Why Potato Varieties "Run Out."

There has for some time been an insistent demand from potato-growers for new varieties to take the place of some of the many old sorts under cultivation, which are frequently said to be "running out." One of the agricultural instructors of the New South Wales Department of Agriculture in the central-western district points out that trials with imported varieties in the last two or three years have not been successful. The direction in which it appears the greatest headway can be made is in improving existing varieties by hill selection—an undertaking which the potato-grower can and should perform.

Increased yields can also be obtained by the employment of a more systematic rotation of crops. The value of organic matter is not sufficiently recognised. In portion of the central-west the pea crop is quite as important as the potato, and these two make an excellent rotation. It is desirable that the potato crop be preceded by a leguminous crop, such as clover or peas, and every endeavour should be made to augment the soil's supply of organic matter. A frequent cause of depleted yields, and the reason for the "running out" of varieties, is the haphazard selection of seed for sowing. Continual selection in the barn of the smallest tubers for seed can only lead to a deterioration of the variety. Hill selection in the field when digging is the only safe means of maintaining the vigour and vitality of a variety.

The Care of a Grindstone.

A good grindstone is worth treating properly, and it can be spoilt by ill-usage just the same as any other tool. In the first place, it is necessary to see that it is true (round) before starting to use it, which can be ascertained by laying a bar just clear across the frame and turning slowly—if uneven, it will bump the bar at the full part. If not true, it must be made so; if only a little out, by fixing a heavy piece of iron, or a bar, on the stand, so that the full portions will just grind on it—as they grind down to the true circle, keep shifting the iron up against them again till right. When true the iron will be grinding all the time the stone is turning round. If the stone is very uneven, get a mason to cut it true if not used to working

stone yourself; if you are any good with the tools, mark the true circle from the centre (with two nails in a piece of batten or a nail and a pencil) on each side and chip it out.

The stone true, see that the spindle runs exactly through the centre. This fixed, set it into its stand, which may be carpenter-made, or simply a broad slab squared and set firm and level on two stout blocks in a corner of the workshop. The centre of the slab is, of course, mortised out to let the stone drop in; each side supports its little wheel on which the spindle runs. This spindle is generally cast-iron, and is good enough for ordinary use. The handle, however, should be wrought-iron, as a cast-iron one is too liable to break off short when you are in a hurry.

Always have a flat block of wood on top of the slab, at either end of the stone, just clearing it; this acts as a rest for the tool you are grinding, and makes it less liable to jump or chatter on the stone. This chattering is what makes the stone wear unevenly. An upright should be fixed on which to hang a tin of water, with a little hole plugged loosely with a bit of rag or a dry stick so that there will be a constant trickle on the stone face while grinding.

This is much better than the turner knocking off every now and then to wet the stone, and better for the steel, too. Never, under any circumstances, grind tools dry; it burns the carbon in the steel and ruins it.

Never leave the grindstone exposed to the weather, as heat and cold affect the cementing material and the stone is then spoilt. The top side gets burnt with the sun, or over-wetted by rain and dew, and becomes softer than the bottom, causing the stone to wear out unevenly. If impossible for any reason to have the stone inside, always keep a couple of wheat or corn bags thrown over it to modify the effects of the weather.

If a stone is found to be too hard, or becomes so after being used a little, soak it in the nearest waterhole for a few hours or days as it requires, and then keep it in a cool place afterwards. If a stone is too soft, put it in the sun for a few hours; this will sometimes bring it right, though as a rule soft stones are very hard to fix up satisfactorily.

Nomenclature of Queen Bees.

The following explanations of the terms used in relation to queen bees will be of interest to the beginner in apiculture:—

Ripe Queen Cell.—A cell in which a young queen is being reared in its fourteenth to sixteenth day of development. The virgin usually emerges on the sixteenth day.

Virgin Queen.—An unmated queen from four to six days old.

Drone-laying Queen.—A queen which through any cause has been prevented from leaving the hive on her nuptial flight—usually when five to eight days old—and which starts to lay eggs, all of which produce males.

Exhausted Queen.—An old queen in which the supply of spermatozoa received at mating is spent, indicated by her aged appearance and the development of numbers of drones in worker cells.

Untested Queen.—A purebred queen that has been mated and whose brood consists of both workers and drones. The absolute proof of fertility is not assured until the brood is capped over. When her progeny begins to emerge such a queen may prove to have mated purely or to have mismated.

Mismated Queen.—A purebred queen the markings of whose progeny indicate that she has mated with a drone of a different race, such a queen's drone off-spring are pure, but her workers are hybrids.

Tested Queen.—A queen that has mated with a drone of her own species, indicated by the correct colour marking on the bodies of her progeny.

Select Tested Queen.—A queen that is selected (1) for all-round excellence in quality in herself, *i.e.*, in size, shape, colour, and work, and (2) for correctness of colour marks above and beneath the abdomen in her progeny, showing purity of mating and also evenness of size.

Breeding Queen.—Such a queen has all the characteristics of a select tested queen, but has been kept for one or two years, and has proved the superiority of her progeny by any or all of the following qualities—storing, wintering, building up, stamina, disease resisting, and quietness. A strain is sometimes found with a fixity of character that makes it safe to select breeders at one year old.

Danish Egg-selling Regulations.

Eggs and their containers exported from Denmark are now stamped "Fresh Danish Eggs," "Danish Chipped Eggs," "Danish Eggs, Second Grade," or "Danish Cold-stored Eggs," according to the results of grading. According to the American Agricultural Commissioner at London, the new regulations governing export eggs, hitherto stamped either "New Laid" or "Cold-stored," are effective for three years, beginning 12th June, 1925.

Danish export eggs have borne some distinguishing mark since the organisation of the Danish export co-operatives. It has been thought, however, that the old regulations did not classify the product closely enough. The royal decree announcing the new law stresses the object of raising the quality and reputation of Danish export eggs, and imposes penalties upon exporters for infringements and misrepresentations.

Fur-breeding Industry in the United States.

According to the Department of Markets and Migration, it is reported that 1,000 acres of land to be set aside as a fur-producing centre have been purchased in Michigan, by the Detroit Silver Fox Farms, better known as the Pontiac Strain Organisation, the world's largest fur-producing enterprise. The company already owns, or operates, fifteen farms in several States in America and Canada. This is the first of a group of similar areas that will be established by this company in different sections of the country that are suitable for the raising of different kinds of fur-bearing animals. For almost three years the company has been looking over different tracts of land and has been making a careful research and study of the results of investigations by the United States Bureau of Biological Survey and the Geodetic Survey, as well as of the various State departments of agriculture and of Canada, in addition to a study of the fur markets of the world.

The enormous scale of the new project brings strikingly to the mind the passing of the historic fur-trading organisations whose activities blazed the way for civilisation to follow. In their place are coming gigantic fur-producing organisations that will rival and surpass in magnitude the great fur-trading companies that flourished in the early days of the country and built the first fortunes in America. The new industry of fur-production is closely related to conservation. It is restoring what the fur-trading companies destroyed as they took off the fur bearers and civilisation made their reproduction impossible. The statement issued by the Pontiac Strain Organisation at Detroit continues as follows:—

"Another feature of the new industry is that it will make possible the putting to profitable use great sections of country that are now useless and valueless for any other purpose. In Michigan alone there are thousands of worthless farms that have been abandoned or taken over by the State for taxes. The conservation of our forests and reforestation go hand in hand with conservation of game and fur-bearing animals. This has been the practice of Europe for years and is the policy of the United States Forest Service.

"Private interests that do not feel that they can afford to make the long-time investment required in reforesting vast areas that never will be fitted for agricultural purpose can now do so, and by raising fur-bearing animals realise immediate profits from their investment. Shade is essential to the production of good quality fur, which makes reforestation and fur-production logically go together.

"More than 90 per cent. of the silver fox skins sold on the market are from ranch-raised foxes. The ones that bring the highest prices are from foxes raised in captivity. The reason for this is that the animals are protected and properly fed and the fur taken when prime. Fur becomes prime the same as fruit.

"All kinds of fur-bearing animals will be raised, including mink, marten, muskrat, fisher, beaver, chinchilla rabbits, and karakul sheep. Enormous beds of small fruit will be grown in order that the fruit necessary for priming the fur of the animals will be available for their diet and the surplus will be marketed.

"Thoroughbred cattle, sheep, and pigs will be raised so that in addition to raising breeding stock, milk and meat can be produced to feed the fur-bearers. In other words, nature's great plan in the wilderness will be worked out on a scientific basis by man."

Segregated Cotton Growing—Protecting One-variety Communities from Mixtures.

The importance with which American authorities invest the idea of protecting one-variety cotton communities from the danger of mixture and impairment of seed stocks by careless or irresponsible individuals who would plant a variety other than the one agreed upon by the community, is shown in a recent Californian enactment forbidding practices contrary to general community interests. The advantage of one-variety community cotton production, as long urged by the United States Department of Agriculture, are now so apparent in California that the State Legislature found it necessary to make a law to keep other kinds of cotton seed from being planted in single-variety communities where the farmers have restricted cultivation to the Acala variety.

A recent issue of the "New York Times" (23rd August, 1925) gives prominence to the Californian Act, the purpose of which is to protect the public interest in the improvement of the cotton industry and is regarded by its framers as in line with well established precedents. No extra cost is involved in establishing the one-variety improvement, but only the requirement that growers refrain from injuring their neighbours who have adopted an improved system of production.

As compared with the usual conditions of mixed-variety production, it is claimed that each individual farmer of a one-variety community is able to raise more cotton of better quality, which can be sold at a higher price. Manufacturers are willing to pay more for dependable supplies of uniform fibre because spinning and weaving is less expensive and the resulting fabrics are better. The advantages to be expected eventually through establishing and maintaining a system of community production and marketing of the crop of Acala cotton in the single-variety communities may be estimated conservatively at from 1½d. to 5d. per lb. more than the growers would receive if other varieties were admitted and the usual mixing and mongrelising of the seed stocks took place.

Under the usual conditions of production, with different varieties grown in neighbouring fields and the seed mixed together at the public gins, most of the crop is produced from mongrelised or "gin-run" seed, and the lint is irregular and inferior quality. On account of cross pollination by insects and the construction of the gin machinery, the mixing and deterioration of seed stocks is practically inevitable if different varieties are grown in the same community.

Poisoning of Sheep at Kaimkillenbun—The Darling Pea.

In connection with the recent mortality among sheep at Kaimkillenbun, Mr. J. H. McCarthy, Stock Inspector at Dalby, has submitted specimens of two suspected plants. One specimen is the Darling Pea (*Swainsona galegifolia*), and the other a closely allied species (*Swainsona brachycarpa*). The former is definitely poisonous to sheep, and the latter is a suspected poisonous plant. The Darling Pea is described by the Assistant Botanist, Mr. W. D. Francis, as a perennial of 6 in. to several feet in height with pea-like flowers, varying in colour from white to purplish pink, and with inflated pods 1 to 2 in. long. It is found in coastal and inland parts of the State, and in New South Wales and South Australia. The Darling Pea is one of the few cases of Queensland plants in which a poisonous effect upon animals has been definitely established, and the precise result of the poisonous principle localised in the tissues of affected animals. This exact knowledge is due to the careful investigations of Professor C. J. Martin, who is also well known by his work on bacterial poisons. Professor Martin's work was carried out in New South Wales in 1896. He found by feeding sheep on Darling Pea that all the symptoms attributed by pastoralists to the ingestion of this plant were reproduced. The symptoms thus reproduced were: Stupidity, followed by stiffness and slight staggering and frequent trembling of the head and limbs, and later by clumsiness, until the animal often falls down. At this stage the action of the animal in running over small obstacles is characteristic, as it jumps over a twig as though it were a foot high. Definite symptoms were produced experimentally in three or four weeks in sheep two or three years old. Sheep were

found to recover if returned to proper food before the symptoms were fully established, but when once the paralytic symptoms were established they did not recover, but remained in much the same condition when proper food was restored to them. Professor Martin was not able to discover with the naked eye anything amiss with the organs of affected animals, but by microscopic means he was able to ascertain that degeneration of the essential part of the nerve fibres near their terminations in skin or muscle took place, and he concluded that this injury was the cause of the symptoms of affected animals. In suggesting preventive measures, he states that pastoralists might take advantage of the fact brought out in the experiments that it takes about a month to produce definite symptoms and arrange their paddocking, so that a flock shall not remain in a Darling Pea infested paddock for a longer period than four to six weeks at a time.

Bunt and Smut—The Use of Carbonate of Copper.

There was evidence throughout the wheat districts visited recently by the Director of Agriculture (Mr. H. C. Quodling) of the presence of "Bunt" (ball smut) also of "Flying Smut." The former is readily overcome by the use of carbonate of copper; the latter is more difficult to eliminate, but can be kept in check by pickling the seed wheat with what is known as the "Jensen Hot Water Method." This is rather a tedious process, but is equally efficacious in dealing with "bunt."

The Department has used carbonate of copper for several years and has not had any smutty crops. To determine the efficacy of this chemical, tests were carried out at the Roma State Farm. This year's trial with infected grain, using at the rate of 1, 1½, and 2 oz. of copper carbonate per bushel gave the following results:—

Untreated, infected seed	87 per cent. smutty
Treated with 1 oz. to the bushel	2 per cent. smutty
Treated with 1½ oz. to the bushel	No smutty plants
Treated with 2 oz. to the bushel	No smutty plants

The seed used throughout was well shaken up with broken "bunt" balls until it was practically black, and a proportion so treated was then pickled with its respective percentage of carbonate of copper and sown immediately afterwards.

The sample of grain used had been bleached by exposure to wet weather in the field and was therefore in a highly susceptible condition.

Wheat Breeding—Mr. Soutter's Work.

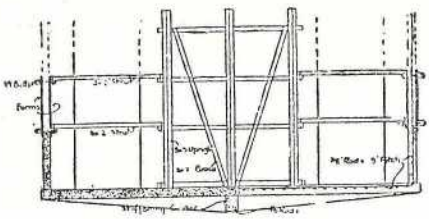
The manager and wheat breeder of the Roma State Farm, Mr. R. E. Soutter, has been engaged for nearly twenty years in the production of new varieties of wheat to suit Queensland conditions. Several of these wheats, notably "Cedric," "Novo," "Roma Red," "Watchman," "Warrior," and "Three Seas" are now to be found in general cultivation. Many crops grown originally from departmental seed were recently inspected to observe the behaviour of each variety and to compare them with standard varieties. Generally, these new wheats are doing well and proving an acquisition. Fully one hundred new crossbreds were tried this year in nursery plots at Allora. Some of these are most promising. Special attention has been given by the breeder, Mr. Soutter, to the cross fertilisation of the more favoured varieties commonly grown here, so that many defects, such as susceptibility to rust and bunt, premature shattering of grain, weakness of straw, lack of constitution, and weakness of flour may be eliminated in the process of evolution associated with the segregation and fixation of desirable unit characters in a new variety.

The carrying on of this work to its logical conclusion must have a most beneficial effect on the industry, and one has only to see the many new and promising strains of wheat at Roma to realise that in a few years the Queensland grower will have wheats represented by crosses between "Florence" and "Gluyas," "Florence" and "Pusa," "Pusa" and "Warren," "Cretan," "Comeback," and "Gluyas," "Florence" and "Warren," and many other combinations calculated to do away with certain weaknesses in the commonly grown varieties which can only be eliminated by careful, painstaking, scientific work.

A CONCRETE TANK.

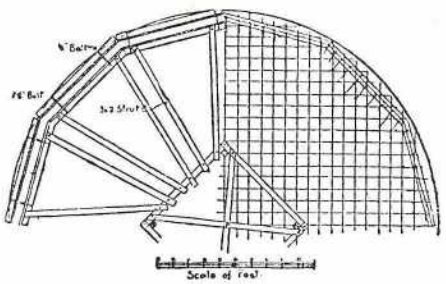
By far the most reliable form of tank either for underground or overhead construction is the reinforced concrete type. It possesses the one big drawback in its construction that unless a good deal of ingenuity is used, the cost of the forms will exceed the actual cost of the tank. If a number of tanks could be constructed in a circumscribed area, using the one set of forms, the cost could be distributed, and so be only a small proportion of the value of each tank. Communal arrangements such as this, however, are not likely to be entered into, so that if a man wishes to construct a concrete tank he must design forms as cheap as possible, and likely to be of some use as second hand material when the job is complete.

In the method of construction here illustrated, for the sake of economy the true circular type gives place to a multi-sided tank, 12-sided to be exact. Each section of forms can thus be built up straight. The cheapest material at present procurable for making the form is that provided by motor car cases, which are fashioned of tongued and grooved boards. Failing that, a cheap grade of flooring can be used. All the rest of the timber is straight 3 by 2 and 3 by 3 oregon, all of which should be useful on a farm later on. A complete set of forms, inside and outside, for once around the tank will be required. The walls will be constructed in a series of "lifts," the height of which will depend on the material used in the form. Three feet is a good average to aim for. The diameter of the tank having been decided upon, the whole job should be set out full size on the ground, and the actual dimensions for struts, &c., taken from this set out, also the size of the shutters for the forms.



METHOD OF STRUTTING.

The forms are strutted and held in place by means of arms radiating to the forms from a central square tower, which must be built up true and plumb, and well braced, and provided with horizontal pieces at heights that will correspond with the heights of the forms. The construction of the tower and the arms is shown in the drawing. The tower may be bolted to one or two bolts built into the base of the tank, and afterwards cut off flush before the rendering is done. In the upper drawing the forms are represented as being in position for the second lift. They will be resting on bolts passing through the boards and resting on top of the concrete, and which can be pulled out while the concrete is still green. The inner and outer forms must be kept apart at the required distance by means of blocks, which must be removed as the concrete comes up to them. For additional security each adjacent pair of radial struts may be lashed together near the circumference. In unshipping the forms a little difficulty will be met with in getting out the first inner section. This can be obviated by making the last shutter slightly smaller and filling the aperture with a vertical strip tacked in position. Care must be taken not to jar the concrete when removing the forms.



THE BOTTOM.

The whole of the tank can be built of a six to one concrete. Good river gravel makes a splendid aggregate, but all large pebbles should be cracked small. The bottom here shown is strengthened by means of two cross girders formed in trenches cut in the earth, and reinforced with rods as shown. The mat for the bottom must be made before the concreting commences, and small upright pieces fastened around the circumference to which can be tied the vertical wall reinforcements later on. The thickness of walls recommended is four to five inches. All ends of rods should be hooked. The horizontal wall reinforcements for each lift can be put in as the work rises. Care must be taken that the reinforcement does not come too close to the outside of the wall. The pitch here shown is 9 inches throughout, the finer niceties of design in the spacing of reinforcements having been disregarded. Three-eighths rods may be used throughout (¼-inch for the smaller tanks), and 22-gauge soft wire for tying at intersections.

Explanation of Drawing.

The upper drawing shows a section of the tank with bottom laid, and one lift of walls completed. The forms are in position for the second lift. Positions of reinforcements are shown on the right-hand half. The left-hand portion of the lower drawing (which is a half-plan) shows the forms in position for filling, while the right-hand portion shows the method of reinforcing the bottom and sides.

Filling.

Care should be taken in filling the forms to get the concrete as dense as possible, ramming it down each side of the rods with a stick. Concrete must not be too wet, but it must be soft enough to flow easily around the rods. Always do the whole of one lift all round the tank in one operation. Before putting new concrete on top of old always brush over the old with a slurry of neat cement and water. Keep all the work damp, covered with wet bags as long as possible. The tank should be rendered both inside and out with a cement mortar of two parts of sand to one of cement, trowelled hard to a smooth finish.—"Adelaide Chronicle."

A PORTABLE FOWLHOUSE.

A reader has asked for sketch plans of the portable poultry-house, a model of which accompanied the Better Farming Train. This colony poultry-house, devised by Mr. W. C. Rugg, poultry expert of the Department of Agriculture (Victoria), is

Fig. 1. Front

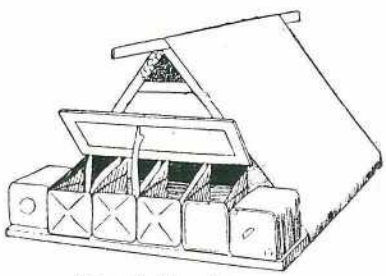


Fig 2 Back.

6 feet by 5 feet, 4 feet high, built in the shape of a tent, and will accommodate 50 chickens 10 to 12 weeks old, for from six to eight weeks, when the number should be thinned down. The house can be conveniently used for laying hens after the

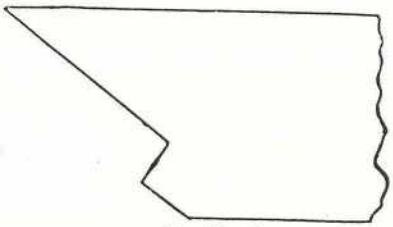


Fig. 3. Top.

chicken season is over, and will accommodate from 20 to 24 layers. Portion of the back of the house being hinged can be lifted up, and four nests made from kerosene tins, cut as directed, can be fitted in. The entrance to the nests is from inside the house, so that the hinged portion forms the lid to the nests, and can be lifted

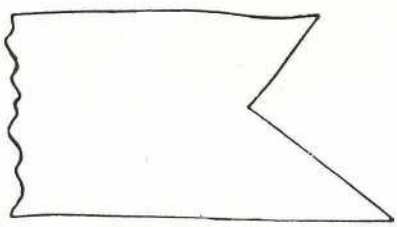


Fig 4 Bottom

when the eggs are being gathered. The width of the back of the house allows space for six kerosene tins—four nest-boxes, one water-tin, and one with separate spaces for shell grit and charcoal. These tins all rest on the frame of the house, and can be lifted with it. The whole building is very light, but stiff and strong. It is very advisable to make a floor with a frame of 2 by 1 battens on edge, over which wire-netting is tightly stretched. This keeps the birds dry in wet weather, and prevents the hens carrying dirt into the nests. These houses are recommended for use in the

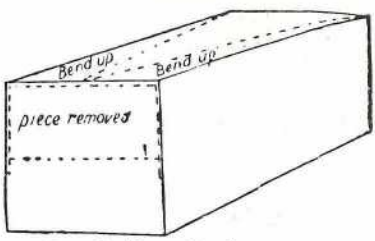


Fig 5. Kero. tin for nests

orchard. Movable hurdles are used to make a small enclosure round the house until the birds get accustomed to it. Five hurdles 10 feet by 3 feet of 2 inch by 1 inch hardwood, covered with wire-netting, will be enough to keep in young birds. The material required for the house is as follows:—Two pieces of 3 by 1 hardwood, 7 feet 2 inches for the bottom length; two pieces of 3 by 1 hardwood, 4 feet 10 inches for the bottom width; one piece of 2 by 1 hardwood, 5 feet for the bottom width at end; six pieces of 2 by 1 hardwood, 4 feet for sides of roof; one piece of 2 by 1

hardwood, 8 feet for ridge; two pieces of 2 by 1 hardwood, 3 feet for perches to rest on; one piece of 2 by 1 hardwood, 3 feet 4 inches to hinge nest lid to; one piece of 2 by 1 hardwood, 1 foot 4 inches for ventilator at back; two pieces of 2 by 1 hardwood, 1 foot 3 inches for door frame; two pieces of 2 by 1 hardwood, 5 feet 10 inches for perches; one door, 1 foot square; six pieces No. 14 gauge wire, 8 feet 6 inches to support ruberoid; two pieces No. 2 ply ruberoid 8 feet 4 inches for roof. For front—One kerosene tin flattened out and cut in half—half to cover in each side of door; one pair of 1½ inch butt hinges; one piece of wire-netting, triangle shaped (3 feet at base, 2 feet to peak). For back—One kerosene tin and a-half flattened out—one above the nest-boxes and a quarter on each side of them; one piece of tin, 3 feet 3 inches by 1 foot 3 inches (cover for nests); one pair butt hinges, 1½ inches for cover; one piece of wire-netting for ventilator, 1 foot at base, 8 inches to peak; four kerosene tins for nests; one kerosene tin for water; one kerosene tin for shell grit and charcoal. For floor frame—Two pieces 2 by 1 hardwood, 5 feet 7 inches; four pieces 2 by 1 hardwood, 4 feet 7 inches; one piece wire-netting, 5 feet 7 inches by 4 feet 7 inches, 1½ inch mesh. The 5 feet of 2 by 1

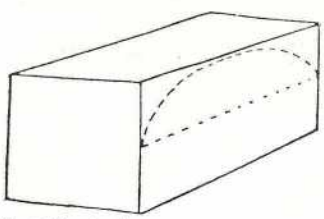


Fig 6. Kerotin for water also shell grit and charcoal

cross piece at the bottom is checked into the 7 feet 2 inches pieces on the underneath side at the back, and forms the rest for the nests. One 4 feet 10 inches cross piece is 14 inches from this, and the other is at the front end. The end pieces for sides of roof are cut as shown in figures 3 and 4, but the two middle pieces are cut on the flat. The 8 feet ridge pole projects 18 inches at the back and 6 inches in front, which is handy for moving the house. The kerosene tins are cut as shown by the dotted lines, figures 5 and 6. At the front of the nest tins cuts 2 inches long are made, and the piece of tin is bent over the 3 by 1 batten or the bottom frame of the house, the back resting on the 2 inch by 1 inch piece of timber. The remainder of the details can be understood from the sketch plans.—"The Australasian."

A SHEEP DRENCHER FOR STOMACH WORMS.

This is a labour-saving device for dealing with worms in sheep, and has been designed on suggestions made by an experienced sheep station manager who has had many years' experience in dealing with worm-infested sheep in Queensland.

The old style was to measure separate doses of the drenching liquid into sauce bottles or metal measures. This drencher does the measuring automatically, delivering any sized dose required, and the operator carries the liquid in a knapsack container strapped on the shoulder, and this is connected with the hand-piece by rubber tubing, so that one man can now do the work quickly and efficiently that took two men with the old style of hand measuring, and with the certainty that each dose is uniform in quantity.

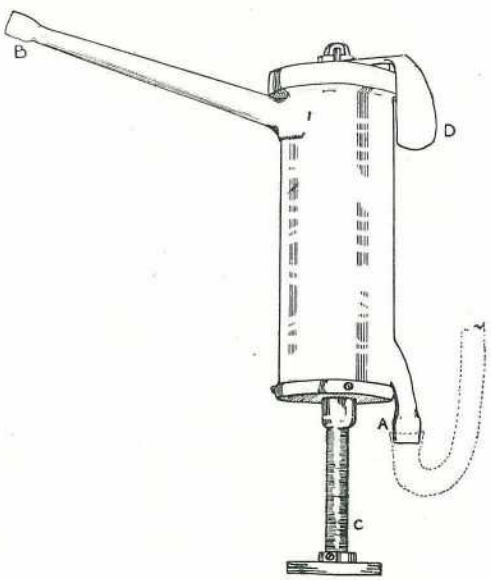
In drenching large mobs of sheep a saving of at least 50 per cent. of labour can be made by using this drencher. The drencher can also be used by connection with a small tank above the level of the operator, who then only carries the hand-piece with the connecting rubber tube.

Set drencher to desired dose by adjusting the marked screw C at bottom or hand-piece and testing dose by graduated glass supplied, to make certain that proper amount is being delivered.

To fill measure hold hand-piece in vertical position below the level of the bottom of the knapsack container or reservoir, with the thumb lever D pushed back to the right as far as possible (holding the hand-piece in the right hand).

To administer the dose the operator holds the sheep between his legs on four feet and inserts the discharge pipe into the mouth of the sheep and at the same time pushes the thumb lever D to the left as far as possible, and this allows the dose to flow into the sheep's mouth at a rate which the sheep can swallow safely.

To ensure that each sheep only gets one dose, it is advisable for the operator to carry a stick of raddle and mark each sheep as treated. This applies to one-man drenching; in large yards the more economical method would be to pass each sheep out of the pen as drenched and have catchers to bring the sheep up to the operators.



DIRECTIONS FOR USE.

A recipe which has stood the test of time for stomach worms in sheep for many years on the Darling Downs is made as follows:—

Take 4 oz. of full strength arsenic and 14 lb. of epsom salts, boil for half an hour in a 10-gallon drum with 5 gallons of water, stirring continually while boiling. (Keep cold water handy to add if the mixture starts to boil over.) Then fill drum to 10-gallon mark and the mixture is ready for use as soon as it cools down.

Dose as follows:—

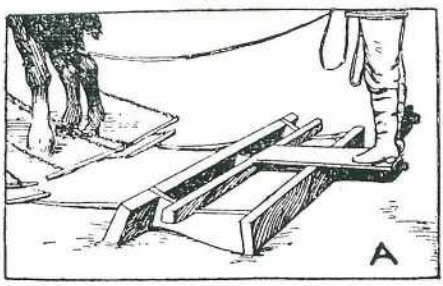
Lambs 3 to 4 months old	1 oz.
Lambs 4 to 6 months old	1¼ oz.
Lambs 6 to 9 months old	1½ oz.
Lambs 9 to 12 months old	1¾ oz.
Dry ewes and wethers	2 oz.
Ewes rearing lambs	2¼ oz.
Grown sheep badly affected	2½ oz.

Yard sheep for twelve to fifteen hours before drenching, and keep in yards for three or four hours after drenching (without access to water). If sheep are starving when yarded then drench at once.

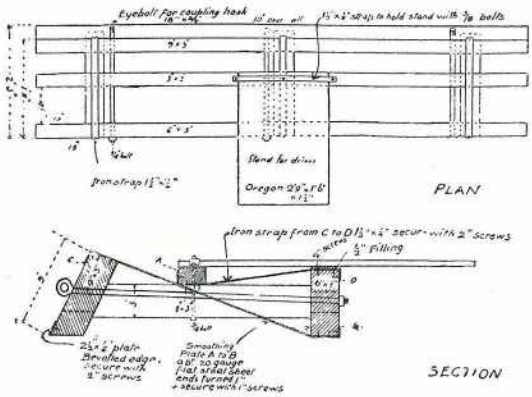
To diagnose stomach worms in sheep:—Examine whites of eyes; if no small veins visible and if appearance of face is white and skin under wool on body shows white as though there were no blood, this is an indication of stomach worms. Badly affected sheep will show "bottle jaw" and a wormy sheep will, as a rule, lie down and sulk if run for a few yards. To make certain, if in doubt, kill a sheep and examine fourth stomach, where the worms will be found.

AN EFFECTIVE LAND LEVELLER AND SMOOTHER.

The implement can be made any length convenient up to 12 feet. The steel smoothing plate should be of 10 gauge, although 20 gauge may be used if the amount of work in view is not very great. It is brought from the middle 3 by 2 beam to the underneath of the back 6 by 3 beam, and holes are cut in it for the ties and bolts. In use the driver, standing on the plates, by moving forward causes



INEXPENSIVE AND EFFECTIVE LAND SMOOTHER



the front beam, with its cutting edge, to enter the ground and carry forward any dirt cut off, and by moving backward he raises the front, thus allowing the accumulated earth to pass under in as great or as small quantity as he pleases. while the sloping steel sheet smoothes it out, crushes the lumps, and spreads it in any depressions.—Water Supply Commission of Victoria.—"Melbourne Weekly Times."

PLATE 171.—IN THE COTTON BELT—TYPICAL VIRGIN FOREST COUNTRY IN THE BURNETT-DAWSON REGION.

(*See* letterpress, p. 523.)

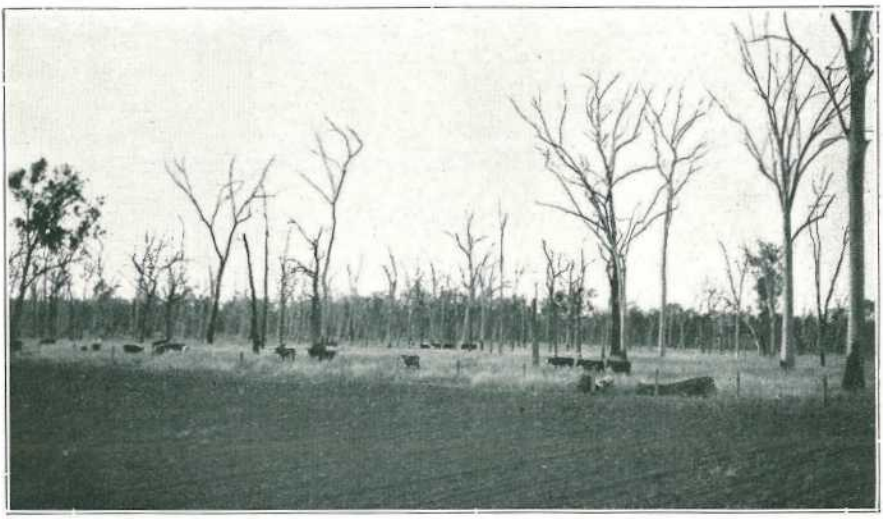


PLATE 172.—FIRST FURROWS ON VIRGIN LANDS—IN THE COTTON BELT, BURNETT-DAWSON COUNTRY.

(*See* letterpress, p. 523.)

Answers to Correspondents.

Hog Lice.

A.S. (Bylong).—

The Instructor in Pig Raising, Mr. Shelton, advises that the best remedy for pigs suffering from hog lice or other skin parasites is to apply liberally the mixture:—Benzine, ½ pint; kerosene, ½ pint; fish oil, 7 pints. Apply by hand, with a soft cloth, sponge, or brush, after the pigs have been well washed. Keep the mixture well corked in a tin or glass container. If fish oil is not available any cheap grade of vegetable oil would do, such as raw linseed oil, crude castor oil; or a mineral oil, such as old motor oil, separator, or machine oil. As the eggs (nits) deposited by the female louse hatch in about three days after being laid, the mixture should be applied a second time about one week after first application, then again in about two or three weeks, or as required. Very young pigs are frequently very heavily infested with lice, and the irritation due to their presence checks growth. A favourite resort for lice is inside the ear and in other more or less inaccessible parts where they cannot be rubbed off. On large runs automatic hog oilers are worth while.

White Scour in Young Pigs.

W.D. (Woolooga)—

White scour in young pigs is a complaint almost entirely due to overfeeding of the sow at this particular time. The boar may be at fault, for some sires produce progeny which are bad doers right from the start. If you think this is the case Mr. Shelton advises that he should be culled immediately and replaced with a more active, vigorous, unrelated sire. The fact that when the sows are fed with dry corn the trouble is not so severe seems to indicate that overfeeding is the cause, for where sows are feeding on dry corn they do not consume so much bulk, and dry corn is not such a heavy milk producing food as skim milk and similar foods.

Ensilage for Pigs—Shelter Shed—Grasses.

E.B. (Biggenden)—

The Instructor in Pig Raising, Mr. Shelton, advises that (1) Ensilage is a very useful food, particularly for breeding sows, especially when it consists of green corn stalks chaffed when the cobs are in the milky stage. Grain sorghums also provide an abundant supply of nutritious grain and these are useful drought-resisting crops which should be grown more extensively. They can if required be converted into ensilage, but give better results from the grain. Ensilage is not so useful for very young pigs. Ensilage, however, is such an excellent food for dairy cattle that few farmers will spare any for their pigs except it be the musty, mouldy stuff from the top or sides of the stack or pit, which should be burned or ploughed in instead of being used for pig feed. Nevertheless ensilage is one of the "stand-by" foods you can rely upon. Sugar-cane and improved cow cane are both very useful crops which can stand over from one season to another if desired as also is arrowroot, a very reliable root crop.

Where soil and climatic conditions suit, sweet potatoes can be grown to considerable advantage, while Jerusalem artichokes stand quite a lot of dry weather. Lucerne hay can also be used, moistening or soaking same for the first few days until the pigs become accustomed to it.

It is difficult to educate farmers up to the necessity for conserving fodder and grain for dry spells, most farmers appearing to prefer to take the risk, especially when grain crops like maize rise in value to around 5s. per bushel. Where corn can be grown to advantage and can be conserved in the form of grain in tanks it is perhaps the most reliable stand-over cereal grain we have, though both wheat and English or Skinless barley can also be used. We know all too little of the value of crushed barley as a food; it is the grain *par excellence* in the old land.

(2) Your suggestions *re* shelter shed are practical and valuable. If you decide on constructing a shelter shed of the type referred to we would appreciate a clear photograph of it, both before the roof goes on and when the shed is complete.

(3) Rhodes grass grows very rank and soon becomes coarse and fibrous, it is nevertheless a hardly drought-resisting grass which in the earlier stages of growth has a good feeding value. Pigs prefer grasses such as paspalum, couch, or Kikuyu. All these are much more succulent than Rhodes. Kikuyu seems to be of great value though it would suffer considerably in very dry seasons, but Rhodes would make little growth during dry spells, and it would be worth while trying Kikuyu.

Ailing Boar.

F.W. (Dalma Scrub)—

The Instructor in Pig Raising (Mr. Shelton) advises:—Reduce the allowance of green corn or of grain, and give the animal plenty of green food and clean drinking water. If you could feed some soaked cowpeas it would be effective in freshening him up, and we would suggest doubling the dose of Epsom salts and giving him this medicine twice a week for three weeks, after which the dose could be reduced to normal; also keep him away from the sows altogether during treatment and only place them together again when one or other of the sows is actually ready for service. Compulsory and, if necessary, vigorous exercise is sometimes necessary in inducing activity in young boars, while in obstinate cases it has been found necessary to enclose the sow in a breeding race during service. Both male and female should be kept in normal breeding condition.

Selecting a Poland-China Boar—Prolific Sows.

H.D.S. (Cecil Plains)—

Mr. Shelton advises:—Much of course depends upon the animal himself, for after all prolificacy is only one of the many valuable characteristics of pigs. Poland-China sows would not in a general way average more than nine pigs per litter nor have we any other breed that could be relied upon to produce and rear (this is important also) more than nine pigs per litter. Our advice, therefore, is, that as long as the animal is otherwise of good quality and is growthy and vigorous, to go ahead with the purchase but do not use the boar for stud purposes before he is ten months old, otherwise he will become stunted and will have a shorter life. We met with an instance a few days ago in which a Brisbane show purchase, a Poland-China sow, produced eleven pigs in her first litter, nine boars and two sows. These were all very well-developed pigs of excellent quality and type. Nevertheless it is not every sow that is as prolific as this. Care and attention count for much in the handling of pigs of all descriptions.

Loss of Sow.

J.B. (Mutdapilly)—

The Instructor in Pig Raising, Mr. Shelton, advises:—It is extremely difficult from the information supplied to diagnose definitely the complaint from which your sow died. Possibly, she suffered from acute constipation, for that is one of the commonest and most serious causes of death among pigs that are housed and fed on most of our farms. Whether this was the cause of the trouble cannot be said, for you make no reference to the condition of the animal's bowels. The foot injury may have been the cause, and tetanus germs may have entered where the skin was broken; for pigs, like all other animals, are occasionally affected by this peculiar and rapidly fatal disease, in which the paralysis and twitching of muscles are very common symptoms. There is no cure for tetanus when it develops to the extent referred to, for it is rapidly fatal, the animal suffering intense agony for a few hours before death. Then food poisoning is a possible cause, this frequently resulting through the animal drinking corned beef water, the water in which salted meat has been cooked, or through consuming some other poisonous material, musty or mouldy grain, &c., which cause severe abdominal pain (colic). Then, again, diarrhoea or white scour is a common trouble among pigs, a trouble responsible for the the death of thousands of young pigs every year. This usually commences while the animal is very young, and develops into an acute form about weaning age.

Allow your pigs a good large run and give them ample green food. Be careful in using cob corn in the milky stage, for this sometimes causes scouring in very young pigs. It was considered for many years to be one of the primary causes for the huge losses of young pigs in America during the period when they suffered so heavily from swine fever (hog cholera).

Feeding Pigs.

H.F.R. (Kenilworth)—

Mr. Shelton's opinion is that in feeding maize to pigs it pays handsomely to grind the maize to a meal and then either soak or cook it for the pigs, though it must be admitted that experiments have indicated that there is not a wide margin to allow for expense (fuel, labour, &c.) between results obtained from feeding maize uncooked *versus* cooked. Much depends upon the class of pig handled and upon local farm conditions. For instance, the American people advocate allowing the pig to do its own harvesting by turning it into the maize crop and allowing in addition free range over succulent pasture. Our conditions are somewhat different, for our most popular bacon pig is one ready for the market at five and a-half to six months of age. These pigs would not benefit to the same extent by being turned out in large corn paddocks. We find it pays much better to keep the bacon pigs in acre or so pig paddocks and to hand feed and thus hurry them on. Breeding sows (and the boar if convenient) benefit very largely by having larger pig paddocks. Under your conditions a system allowing for a little of each of the above would pay, that is allowing the pigs to run for a month or six weeks prior to their reaching the fattening stage, and then to bring them into close range and finally to top up on grain and milk for several weeks before marketing. In this case it would certainly pay you to grind and either soak or soften the meal by cooking. In this system you could also work in your potatoes, for it certainly pays to cook potatoes, and using them as a mash with maize meal would be a good idea.

M.C. (Toogoolowah)—

In the absence of skim milk, root crops and grain make excellent substitutes, while it is necessary to have ample supplies of green stuff, lucerne, grasses, &c., especially for the breeding stock and young pigs. Of the root crops you will find that sweet potatoes are the most payable, while Jerusalem artichokes, arrowroot, and mangel wurzels are ideal foods. We recommend your taking this Journal regularly. It costs but one shilling per annum, which represents the postage on twelve issues. It carries, as you will see, a great deal of useful information, is well illustrated, and would be a useful addition to your farm literature.

J.A.W. (Goomboorian)—

For your purpose we consider paspalum grass has many advantages from a pig-feeding standpoint. In the Maleny district giving kikuyu grass is being tried and it is proving very satisfactory, as also is couch, white clover, &c. Burseem or Egyptian clover is a useful plant, too, but requires better soil than most of the others to secure best results. It will pay handsomely to grow maize, cowpeas, and field peas. In root crops sweet potaoes are the best, though Jerusalem artichokes also pay well. Mr. Shelton suggests cutting out swede turnips as they are not a payable pig crop, but mangel wurzels pay and are an excellent standover crop, as also is arrowroot. Improved cow cane and the softer varieties of sugar-cane are excellent, as also are saccaline and other sweet sorghums.

The Instructor in Pig Raising will willingly assist in the matter of the selection of breeding stock, and if you let him know your requirements he would be able to obtain prices at which suitable stock may be bought.

MARKET FOR TOMATOES IN JAVA.

By the courtesy of the Department of Markets and Migration, we have received a copy of a letter from H.B.M. Commercial Agent for the Netherlands East Indies, Batavia, concerning the market for tomatoes in Java. The Commercial Agent states that "though considerable quantities of tomatoes are grown in Java, there is a shortage of the locally grown product during the months extending from September to April. From October to March, in fact, tomatoes are almost unobtainable here. It would thus appear that there should be a fair market in the Netherlands East Indies for Australian-grown tomatoes during at least six months of the year. The period of transit from Geraldton to Batavia is eleven days, or two days less than from Geraldton to Melbourne, and if the tomatoes are properly packed, it should be possible to land them here in good condition." The foregoing suggests that there might be some business in this for North Queensland growers.

Farm and Garden Notes for January.

FIELD.—The main business of the field during this month will be ploughing and preparing the land for the potato and other future crops, and keeping all growing crops clean. Great care must be exercised in the selection of seed potatoes to ensure their not being affected by the Irish blight. Never allow weeds to seed. This may be unavoidable in the event of long-continued heavy rains, but every effort should be made to prevent the weeds coming to maturity. A little maize may still be sown for a late crop. Sow sorghum, imphee, Cape barley, vetches, panicum, teosinte, rye, and cowpeas. In some very early localities potatoes may be sown, but there is considerable risk in sowing during this month, and it may be looked upon merely as an experiment. Plant potatoes whole. Early-sown cotton will be in bloom.

As the regular wet season is expected to commence this month, provision should be made accordingly.

On coastal and intercoastal scrub districts, where recently burnt-off scrub lands are ready for the reception of seed of summer-growing grasses, sowing may commence as soon as suitable weather is experienced. Much disappointment may be saved, and subsequent expenditure obviated, by ensuring that only good germinable grass seed is sown, of kinds and in quantities to suit local conditions, the circumstance being kept in mind that a good stand of grass is the principal factor in keeping down weeds and undergrowth.

In all districts where wheat, barley, oats, canary seed, and similar crops have recently been harvested, the practice of breaking up the surface soil on the cropped areas should invariably be adopted. Soil put into fit condition in this way will "trap" moisture and admit of the rains percolating into the subsoil, where the moisture necessary for the production of a succeeding crop can be held, provided attention is given to the maintenance of a surface mulch, and to the removal, by regular cultivation, of volunteer growths of all kinds. If not already seen to, all harvesting machinery should be put under cover, overhauled, and the woodwork painted where required.

Where maize and all summer-growing "hoed" crops are not too far advanced for the purpose, they should be kept in a well-cultivated condition with the horse hoe. Young maize and sorghum crops will derive much benefit by harrowing them, in the same direction as the rows are running, using light lever harrows with the tynes set back at an angle to obviate dragging out of plants, but the work should not be done in the heat of the day.

Quick-maturing varieties of maize and sorghum may still be sown in the early part of the month in coastal areas where early frosts are not expected.

Succession sowings may be made of a number of quick-growing summer fodder crops—Sudan grass, Japanese and French millet, white panicum, and liberty millet (panicum). In favourable situations, both "grain" and "saccharine" sorghums may still be sown; also maize, for fodder purposes.

Fodder conservation should be the aim of everyone who derives a living from stock, particularly the dairyman; the present is an important period to plan cropping arrangements. Exclusive of the main crops for feeding-off (when fodder is suitable for this purpose), ample provision should be made for ensilage crops to be conserved in silo or stack. As natural and summer-growing artificial grasses may be expected to lose some of their succulence in autumn, and more of it in winter and early spring, the cropping "lay-out" to provide a continuity of succulent green fodder throughout the season calls for thorough and deep cultivation and the building up of the fertility and moisture-holding capacity of the soil. Planter's friend (sorghum) may be sown as a broadcast crop at the latter end of the month for cutting and feeding to cattle in the autumn and early winter. Strips of land should be prepared also for a succession sowing about the second week in February, and for winter-growing fodder crops.

KITCHEN GARDEN.—A first sowing of cabbages, cauliflower, and Brussels sprouts may now be made in a covered seed bed, which must be well watered and carefully protected from insect pests. Sow in narrow shallow drills; they will thus grow more sturdy, and will be easier to transplant than if they were sown broadcast. The main points to be attended to in this early sowing are shading and watering. Give the beds a good soaking every evening. Mulching and a slight dressing of salt will be found of great benefit. Mulch may consist of stable litter, straw, grass,

or dead leaves. Dig over all unoccupied land, and turn under all green refuse, as this forms a valuable manure. Tur over the heavy land, breaking the lumps roughly to improve the texture of the soil by exposure to the sun, wind, and rain. In favourable weather, sow French beans, cress, cauliflower, mustard, cabbage, celery, radish for autumn and winter use. Sow celery in shallow well-drained boxes or in small beds, which must be shaded till the plants are well up. Parsley may be sown in the same manner. Turnips, carrots, peas, and endive may also be sown, as well as a few cucumber and melon seeds for a late crop. The latter are, however, unlikely to succeed except in very favourable situations. Transplant any cabbages or cauliflowers which may be ready. We do not, however, advise such early planting of these vegetables, because the fly is most troublesome in February. For preference, we should defer sowing until March. Still, as "the early bird catches the worm," it is advisable to try and be first in the field with all vegetables, as prices then rule high. Cucumbers, melons, and marrows will be in full bearing, and all fruit as it ripens should be gathered, whether wanted or not, as the productiveness of the vines is decreased by the ripe fruit being left on them. Gather herbs for drying; also garlic, onions, and eschalots as the tops die down.

Flower Garden.—To make the flower-beds gay and attractive during the autumn and winter months is not a matter of great difficulty. Prepare a few shallow boxes. Make a compost, a great part of which should consist of rotten leaves. Fill the boxes with the compost; then sow thinly the seeds of annuals. Keep the surface of the soil moist, and when the young seedlings are large enough to handle, lift them gently one by one with a knife or a zinc label—*never pull them up by hand*, as, by so doing, the tender rootlets are broken, and little soil will adhere to the roots. Then prick them out into beds or boxes of very light soil containing plenty of leaf mould. Keep a sharp lookout for slugs and caterpillars.

All kinds of shrubby plants may be propagated by cuttings. Thus, pelargoniums, crotons, coleus, and many kinds of tropical foliage plants can be obtained from cuttings made this month. After putting out cuttings in a propagating frame, shade them with a piece of calico stretched over it. Be careful not to over-water at this season. Propagate verbenas, not forgetting to include the large scarlet Fox-hunter. Verbenas require rich soil. Palms may be planted out this month. If the weather prove dry, shade all trees planted out. With seed-boxes, mulch, shade, water, and kerosene spray, all of which imply a certain amount of morning and evening work, the flower garden in autumn and winter will present a charming sight.

Orchard Notes for January.

THE COASTAL DISTRICTS.

All orchards, plantations, and vineyards should be kept well cultivated and free from weed growth; in the first place, to conserve the moisture in the soil, so necessary for the proper development of all fruit trees and vines; and, secondly, to have any weed growth well in hand before the regular wet season commences. This advice is especially applicable to citrus orchards, which frequently suffer from lack of moisture at this period of the year if the weather is at all dry, and the young crop of fruit on the trees is injured to a greater or less extent in consequence.

Pineapple plantations must also be kept well worked and free from weeds, as when the harvesting of the main summer crop takes place later on, there is little time to devote to cultivation. If this important work has been neglected, not only does the actual crop of fruit on the plants suffer, but the plants themselves receive a setback.

Banana plantations should be kept well worked, and where the soil is likely to wash badly, or there is a deficiency of humus, a green crop for manuring may be planted. Should the normal wet season set in, it will then soon cover the ground without injury to the banana plants. When necessary, banana plantations should be manured now, using a complete manure rich in potash and nitrogen. Pineapples may also be manured, using a composition rich in potash and nitrogen, but containing no acid phosphate (superphosphate) and only a small percentage of bone meal, ground

phosphatic rock, or other material containing phosphoric acid in a slowly available form.

Bananas and pineapples may still be planted, though it is somewhat late for the former in the more southern parts of the State. Keep a good lookout for pests of all kinds, such as Maori on citrus trees, scale insects of all kinds, all leaf-eating insects, borers, and fungus pests generally, using the remedies recommended in Departmental publications.

Fruit fly should receive special attention, and on no account should infested fruit of any kind be allowed to lie about on the ground to become the means of breeding this serious pest. If this is neglected, when the main mango crop in the South and the early ripening citrus fruits are ready, there will be an army of flies waiting to destroy them.

Be very careful in the handling and marketing of all kinds of fruit, as it soon spoils in hot weather, even when given the most careful treatment. Further, as during January there is generally more or less of a glut of fresh fruit, only the best will meet with a ready sale at a satisfactory price.

Grapes are in full season, both in the Brisbane and Coominya districts, and in order that they may be sold to advantage they must be very carefully handled, graded, and packed, as their value depends very much on the condition in which they reach the market and open up for sale. Well-coloured fruit, with the bloom on and without a blemish, always sells well, whereas badly coloured, immature, or bruised fruit is hard to quit.

One of the greatest mistakes in marketing grapes is to send the fruit to market before it is properly ripe, and there is no better way to spoil its sale than to try and force it on the general public when it is sour and unfit to eat.

Bananas for sending to the Southern States require to be cut on the green side, but not when they are so immature as to be only partially filled. The fruit must be well filled but show no sign of ripening; it must be carefully graded and packed and the cases marked in accordance with the regulations under the Fruit Cases Acts and forwarded to its destination with as little delay as possible.

Pineapples should be packed when they are fully developed, which means that they contain sufficient sugar to enable the fruit to mature properly. Immature fruit must not be marketed, and if an attempt is made to do so the fruit is liable to seizure and the sender of the fruit to prosecution under the abovenamed regulations. Further, the fruit must be graded to size and the number of fruit contained in a case must be marked thereon. Immature fruit must not be sent. For canning, the fruit should be partly coloured; immature fruit is useless; and overripe fruit is just as bad. The former is deficient in colour and flavour and the latter is "winey" and of poor texture, so that it will not stand the necessary preparation and cooking.

Should there be a glut of bananas, growers are advised to try and convert any thoroughly ripe fruit into banana figs.

The fruit must be thoroughly ripe, so that it will peel easily, and it should be laid in a single layer on wooden trays and placed in the sun to dry. If the weather is settled, there is little trouble, but if there is any sign of rain the trays must be stacked till the weather is again fine, and the top of the stack protected from the rain. To facilitate drying, the fruit may be cut in half lengthways. It should be dried till a small portion rubbed between the finger and thumb shows no sign of moisture. It can be placed in a suitable box to sweat for a few days, after which it can be dipped in boiling water to destroy any moth or insect eggs that may have been laid on it during the process of drying and sweating. It is then placed in the sun to dry off any moisture, and when quite dry it should be at once packed into tight boxes lined with clean white paper. It must be firmly packed, when, if it has been properly dried, it will keep a considerable time. It can be used in many ways, and forms an excellent substitute for raisins, sultanas, currants, or other dried fruits used in making fruit cakes and other comestibles. Banana figs will be found useful for home consumption, and it is possible that a trade may be built up that will absorb a quantity of fruit that would otherwise go to waste.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

January is a busy month in the Granite Belt, and orchardists are fully occupied gathering, packing, and marketing the crop of midseason fruits, consisting of plums of several kinds, peaches, nectarines, pears, and apples. The majority of these fruits are better keepers and carriers than those that ripen earlier in the season;

at the same time, the period of usefulness of any particular fruit is very limited, and it must be marketed and disposed of with as little delay as possible.

With the great increase in production, owing to the large area of new orchards coming into bearing and the increasing yields of those orchards that have not come into full profit, there is not likely to be any market for immature or inferior fruit. There will be ample good fruit to fully supply the markets that are available and accessible. Much of the fruit will not carry much beyond the metropolitan market, but firm-fleshed plums, clingstone peaches, and good firm apples should stand the journey to the Central, and, if they are very carefully selected, handled in a manner to prevent any bruising, and properly graded and packed, they should carry as far as Townsville. Growers must remember that, given a market fully supplied with fruit, only such fruit as reaches that market in first-class condition is likely to bring a price that will pay them; consequently the grower who takes the trouble to send nothing but perfect fruit, to grade it for size and colour, to pack it carefully and honestly, placing only one sized fruit, of even quantity and even colour, in a case and packing it so that it will carry without bruising, and, when opened up for sale, will show off to the best advantage, is pretty certain of making good. On the other hand, the careless grower who sends inferior, badly graded, or badly packed fruit is very likely to find when the returns for the sale of his fruit are to hand, that after paying expenses there is little, if anything, left. The expense of marketing the fruit is practically the same in both cases.

Then "why spoil the ship for the ha'p'orth of tar" after you have gone to the expense of pruning, spraying, manuring, and cultivating your orchard? Why not try and get a maximum return for your labour by marketing your fruit properly? The packing of all kinds of fruit is a fairly simple matter, provided you will remember—

(1) That the fruit must be fully developed, but yet quite firm when gathered.

(2) That it must be handled like eggs, as a bruised fruit is a spoilt fruit, and, when packed with sound fruit, spoils them also.

(3) That only one-sized fruit, of an even degree of ripeness and colour, must be packed in a case.

(4) That the fruit must be so packed that it will not shift, for if it is loosely packed it will be so bruised when it reaches its destination that it will be of little value. At the same time, it must not be packed so tightly as to crush the fruit.

If these simple rules are borne in mind, growers will find that much of the blame they frequently attribute to the fruit merchants or middlemen is actually the result of their own lack of care. Fruit that opens up in the pink of condition sells itself, whereas any fruit that opens up indifferently is hard to sell on any except a bare market, and on a glutted market is either unsaleable or realises such a poor price that the grower is frequently out of pocket and would have been better off had he not attempted to market it.

If spraying with arsenate of lead, and systematic bandaging, has been properly carried out, there will be comparatively few codlin moths to destroy the later ripening pip fruits; but if these essential operations have been neglected or carelessly carried out, a number of moths will hatch out and the eggs laid by them will turn to larvæ that will do much damage, in some cases even more than that caused by the first broods that attack the fruit as soon as it is formed. Where there is any likelihood, therefore, of a late crop of moths, spraying with arsenate of lead must be continued if the late crop of pip fruits is to be kept free from this serious pest.

Fruit fly must be systematically fought, and on no account must any fly-infected fruit be allowed to lie about on the ground and breed this pest, to do further damage to the later ripening fruits.

Citrus orchards will need to be kept well cultivated in the drier and warmer parts of the State, and, where necessary, the trees should be irrigated. If scale insects are present, the trees should be either sprayed, or, better still, treated with hydrocyanic acid gas.

Western grapes are in full season, and if they are to be sent long distances by rail, then they are all the better to be cut some hours before they are packed, as this tends to wilt the stems and keep the berries from falling off in transit. The fruit must be perfectly dry when packed, and should be as cool as possible. It must be firmly packed, as a slack-packed case always carries badly and the fruit opens up in a more or less bruised condition.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. K. CHAPMAN.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

1925.	NOVEMBER.		DECEMBER.		MOONRISE. NOV.	DEC.
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					p.m.	p.m.
1	5·3	6·9	4·50	6·32	6·35	7·16
2	5·2	6·10	4·50	6·32	7·32	8·9
3	5·1	6·11	4·50	6·33	8·29	8·59
4	5·0	6·11	4·50	6·34	9·25	9·45
5	5·0	6·12	4·50	6·35	10·17	10·29
6	4·59	6·13	4·50	6·35	11·5	11·8
7	4·58	6·13	4·50	6·36	11·49	11·45
8	4·57	6·14	4·50	6·37	nil	nil
					a.m.	a.m.
9	4·57	6·15	4·50	6·37	12·33	12·20
10	4·56	6·15	4·51	6·38	1·12	12·54
11	4·56	6·16	4·51	6·39	1·47	1·28
12	4 55	6·17	4·51	6·40	2·23	2 3
13	4·55	6·18	4·51	6·40	2·56	2·40
14	4·54	6 18	4 52	6·41	3·33	3 24
15	4·54	6·19	4·52	6·41	4·11	4·9
16	4·53	6·20	4·52	6·42	4·50	5·2
17	4·53	6·21	4·52	6·43	5·33	6·0
18	4 53	6 21	4·53	6·43	6·23	7·5
19	4 52	6·22	4·53	6·44	7·17	8·11
20	4·52	6·23	4·54	6·44	8·17	9·16
21	4·51	6·24	4·54	6·45	9·19	10·20
22	4·51	6·25	4·55	6·46	10·23	11·24
						p.m.
23	4·51	6 26	4·55	6·46	11·26	12·24
					p.m.	
24	4·51	6·27	4·56	6·47	12·28	1·23
25	4·51	6·28	4·56	6·47	1·29	2·19
26	4·50	6·29	4·57	6·47	2 29	3·16
27	4·50	6·29	4·57	6·48	3·27	4·12
28	4·50	6·30	4·58	6·48	4·25	5·7
29	4·50	6·31	4·59	6·48	5·22	6·0
30	4·50	6·31	5·0	6·49	6·20	6·52
31	...	...	5·1	6·49	...	7·40

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 somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

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

Phases of the Moon, Occultations, &c.

9 Nov.	☾	Last Quarter	1	13 a.m.
16 „	●	New Moon	4	58 p.m.
23 „	☽	First Quarter	12	5 p.m.
30 „	○	Full Moon	6	11 p.m.

Apogee, 8th November at 5 36 a.m.
Perigee, 25th November at 5 36 p.m.

On the 20th November, about one hour after sunset, it will be interesting to notice that the planet Jupiter and the Moon, then nearly in its first quarter, will be apparently in somewhat close proximity in the western part of the sky. There will be, however, several millions of miles seperating the two objects as the Moon will be at a distance from the Earth of about 226,000 miles only, while Jupiter will be far away at a distance of about 700 millions of miles.

Mercury will be at its greatest elongation, 22 degrees 3 minutes east of the Sun, on the 22nd, when it will remain above the horizon 1 hour 42 minutes after sunset. The constellations in the same direction in the sky are Sagittarius and Scorpio, near the borders of which the planet will seem to be situated. As no bright stars are in the immediate neighbourhood Mercury should be clearly discernable, with Antaries the brightest star of Scopio about 15 degrees above it towards the Moon. On and about the 26th November the two most brilliant planets, Venus and Jupiter, will be apparently not very far apart in the western sky soon after sunset, with the constellation Sagittarius and Capricornus in the background. Although the Moon will be somewhat bright, being between the first quarter and full, the two principal stars of Capricornus which lie apparently somewhat remarkably close to one another should also be observable above these two planets.

On the 28th Venus will be at its greatest elongation 47 degrees 18 minutes east of the Sun, and therefore at its highest point above the western horizon after sunset. Venus will be apparently in the constellation of Sagittarius near Capricornus and will not set until 3 hours 32 minutes after the Sun.

8 Dec.	☾	Last Quarter	10	11 p.m.
16 „	●	New Moon	5	5 a.m.
22 „	☽	First Quarter	9	8 p.m.
30 „	○	Full Moon	12	1 a.m.

Apogee, 6th December at 4 6 a.m.
Perigee, 18th December at 12 18 a.m.

On and near the 1st December, about 8 o'clock in the evening, the Southern Cross will be at the lowest part of the circle which it apparently makes every twenty-four hours, also once every year around the South celestial pole, a point in the sky at the same distance above the Southern horizon as the position of the observer is from the equator. The Cross being at a distance of 30 degrees from the Pole, describe a circle 60 degrees in diameter. At Warwick, 28 degrees South, the pole is only 28 degrees above the horizon and the Cross therefore when at its lowest position is just below the southern horizon. This position is represented by Figure VI. on the clock face; about midnight the Cross will reach position VIII. and will be coming into view head downwards in a south-easterly position.

About midday on the 19th Venus will be occulted by the Moon, but only to a very small extent in Southern Queensland. As this will occur within four days of the new moon, a beautifully interesting phenomenon will be somewhat marred by the intense brightness of the Sun in too great proximity on the left.