ANNUAL RATES OF SUBSCRIPTION.

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VOL. XXXIX. 1 MAY, 1933. PART 5.

Event and Comment.

Anzac.

GALLIPOLI was a test of manhood and nationhood, and it found a young army of Australians and New Zealanders worthy of the best traditions of the British people. "The desperate feat was expected and then done. . . . No such body of free men has given so heroically since the world began." So wrote John Masefield, the Poet Laureate of Britain, recently, and his words were in eulogy of the men of Anzac. On 25th April Anzac Day was commemorated reverently, fitly, and amply in every centre of population in this vast continent, and in that observance was seen the vital element that keeps Australia true to itself, true to its heroic manhood, and true to the greatest traditions of the race from which we sprung.

The Passing of Hinkler.

QUEENSLAND, in common with the rest of Australia, mourns the death of Squadron-Leader Herbert Hinkler, who met with disaster on a flight from Britain to Australia, and whose body was found late in April alongside his wrecked plane on a lonely storm-swept spur of the Apennines, in Italy. Hinkler was one of the distinguished company of Australian aviators whose service to science through their skill, enterprise, and intrepidity has received world-wide acknowledgment, and whose achievements fill many illuminated pages in the annals of air conquest. Of that company, without detracting from the accomplishments of others of the gallant band who conquered time and circumstance in wonderful flights from England to their homeland, Hinkler was in many ways pre-eminent. Since he flew from London to Darwin in sixteen days his time has been improved upon by other riders of the sky, but to him belongs the honour and indelible record of achieving a solo flight in a light aeroplane from Britain to the Antipodes that but a year or so before had been regarded as a physical impossibility. He brought honour not only to himself, but to the Commonwealth, his native State, and his birthplace—Bundaberg. Other great trans-ocean flights he had made since, but none captured popular imagination more than his first epoch-making adventure. Australia mourns the loss of one of the most distinguished of her sons, and, may be, the youth of this young land will continue, while the nation exists, to draw inspiration from the memory of the man himself and the deeds that made his name imperishable.

Tobacco-growing in the North.

ON his return from a visit to the Far North during March, and in the course of which he inspected all the tobacco settlements from Ayr to Cooktown, the Minister for Agriculture and Stock, Mr. Frank W. Bulcock, expressed the opinion that the tobacco-growing industry in Queensland has now passed through the pioneering stage, and is in the commercial phase, but needs nursing. There were, he said, four tobacco growers in the Cooktown district, two of whom had taken up land in the vicinity of Laura, while two pioneers were growing tobacco at a point 30 miles north of Cooktown. In this area tobacco was purely in the experimental stage, and he had arranged that an officer of the department should visit the locality to help the producers during the curing process. The second, or commerical stage of the industry had been reached, and it was apparent that the industry must be carefully nursed and fostered if it was to assume a permanent position in the agricultural activities of the State. The tobacco crops were very variable, ranging from excellent to indifferent. All the growers appeared to be facing the technical side with courage.

Our Export Trade—Economic Danger

RECENT events indicated that Australia was in grave danger of becoming an economic outcast rather than a member of an economic federation, said the Minister for Agriculture and Stock (Mr. Frank W. Bulcock), in the course of comment on recent British trade treaties.

The Minister said that the agreement which had recently been entered into between Britain and Argentine in respect to beef, the agreement made with Denmark in regard to butter, and the further proposed agreement with Sweden were of very great interest to primary producers in Australia generally, more particularly to the meat producers and dairy farmers of Queensland. A review of recent agricultural happenings certainly indicated that the Commonwealth by legislation and administration had attacked the Queensland primary industries, while the Imperial authorities attacked Commonwealth primary industries. Some very significant features appeared to be associated with the new Argentine beef agreement. For instance, if a reduction of the quota became necessary Australia was not to benefit by that reduction; or, in other words, Australia—and this principally meant Queensland in this connection—was placed in a position from which it would be impossible to emerge so long as the agreement was in operation. This meant, in effect, that the present relative statutory quotas would operate for three years.

Producers in Australia would, no doubt, derive but meagre consolation from the fact that certain matters might be submitted to tribunals. Judging by recent experience, tribunals of this description were apparently more prone to consolidate the position from an Imperial point of view than to help Australia to overcome her difficulties.

It was significant, said Mr. Bulcock, that it was reported that meat under the Argentine agreement was promised fair and equitable treatment, but Australia's claims to fair and equitable treatment were not mentioned. A review of the whole agreement very clearly indicated that it was based on the desire of the Imperial authorities to secure payment of the public debt due to Britain by the Argentine. This opened up the very interesting question of the necessity for adjustment so far as the Commonwealth was concerned for such treatment as would allow Australia to discharge her obligations to Britain.

The butter agreement, added Mr. Bulcock, was even more interesting. It would be noticed that it did not restrict Danish butter, and Denmark was guaranteed a market for 115,000 tons of butter annually. While Australia was being asked to agree to a restriction of butter exports to Britain, a treaty was apparently being negotiated that did not provide for any restriction from this foreign source. They were informed that a trade treaty was in course of preparation with Sweden and that other primary commodities were the subject-matter of negotiation.

The whole policy seemed to indicate that if it be persisted in Australia was in grave danger of becoming an economic outcast rather than a member of an economic federation. As debts were paid in goods, every restriction that was placed on Australia's commodities on the Imperial market gravely aggravated the difficulties, and must eventually lead to a realisation by Australia that if she could not sell her goods she could not meet her obligations. They were told from time to time that they must increase production, but the limitation of production was brought about on every occasion when other countries were given additional access to English markets. Conservative opinion appeared to be adverse to the agreement, and suggested a protest against the sacrificing of the home and dominion markets.

The Java Wonder Cane—Warning to Growers.

DISAPPOINTMENT has attended the efforts to establish P.O.J. 2878, the "Java wonder cane" in the North, mainly on account of its susceptibility to disease, and the Bureau of Sugar Experiment Stations has found it necessary to warn growers against planting it extensively—for the present, anyhow. It is a pity, for much was expected of this cane as an influence on the economics of cane production in Queensland.

This variety was bred at East Java about ten years ago, and quickly gained a reputation for yield and other qualities that gave it a decided advantage over all other standard varieties in the country of its origin. Under a wide range of soil, environment, and seasonal conditions, its consistent superiority was maintained, and in the course of five years 95 per cent. of the cane lands of Java were planted with it. The influence, by the way, of this cane on Javan crop returns is an excellent illustration of what can be done in the breeding of new varieties by sustained effort along carefully planned lines.

Three sets of this cane were brought to Queensland in 1928, and propagation proceeded as rapidly as possible with a view to finding out its value under Queensland conditions. It aroused high hopes, especially after it had made a promising start in some districts. The discovery has been made, however, that it is seriously susceptible to disease. This is unfortunate, for the cane gives, in general, a quick strike and a good stool, besides being a good ratooner. Though rather slow of growth in its early stages, it later develops at a rapid rate, and under favourable conditions high tonnages have been recorded on trial plots. The variety is, however, a late maturer, and this is a serious matter in areas where a succession of dry months in the winter and early spring may result in a collapse of the crop before it has attained maturity. Such conditions have been experienced in the Mackay district with a related cane—P.O.J. 2714. As regards c.c.s. content, the variety is inferior to our better-class canes.

It is from the point of view of disease susceptibility that the "wonder" cane is particularly disappointing. In areas were downy mildew is prevalent, practically all the propagation plots have been condemned on account of disease. In the pathologist's opinion, P.O.J. 2878 and 2714 are the varieties most susceptible to this disease at present in Queensland. When it is remembered that further plantings of this cane in proximity to B. 208 will probably intensify the proportion of disease in the latter cane, it is felt that it would be suicidal to jeopardise the value of this early-maturing cane for one whose worth has not been established and which cannot be expected to show superiority under local conditions.

In the far northern areas, where top rot disease makes its appearance under favourable climatic conditions, P.O.J. 2878 is certain to suffer considerable damage. With this disease the variety has proven to be one of the most susceptible known, and heavy losses may be expected with spring plant cane or late ratoons. Under these conditions April planting is practically essential if serious damage is to be averted, should later conditions prove favourable to the development of the disease.

Fiji disease is also sure to take a heavy toll of this cane in areas where the malady is present. In parts of the Fiji Islands where the disease occurs the variety has been practically wiped out.

As regards pokkah boeng, the "wonder" cane exhibits the same susceptibility as its kindred cane—P.O.J. 2714. Although this disease is of minor importance with most of our standard varieties, it is liable to become serious with this cane. The entry of fungus diseases through "knife cuts" in the stem, often caused by pokkah beong, results in the development of rots which seriously reduce the sugar content of the cane at harvest time.

It is only in the case of Mosaic and, particularly, gumming disease control, that P.O.J. 2878 is a very useful variety, for in all the resistance trials conducted to date it stands at the head of the list of canes highly resistant to gumming. It is for this reason that an attempt is being made to propagate rapidly the variety in the southern sugar areas, and results to date are very encouraging. This year yield trials on a fairly extensive scale should give a definite indication of its superiority or otherwise. Of course, its success could not be regarded as a solution of the gumming-disease problem; the shortcomings of the variety in respect to its lateness of maturity is a serious handicap, and it is absolutely essential that a resistant early maturer be found of satisfactory yielding capacity before it can be said that the disease is effectively under control.

From what has been said about it, the conclusion must be that the new cane does not measure up to the earlier anticipations of its merit. The cane is worth a thorough trial, and, except in the areas where the diseases mentioned are prevalent, plantings on a modest scale will be made this year. As the result of further observations, it is hoped that sufficient specific data will be available to warrant a definite statement as to its suitability or otherwise over the wide range of canegrowing conditions in Queensland.

Bureau of Sugar Experiment Stations.

CANE PEST COMBAT AND CONTROL.

FINAL DESTRUCTION OF CANE STOOLS BY FULLY MATURED GRUBS.

By EDMUND JARVIS.

It is proposed to publish each month a short paper describing the movements of this insect, either above or below ground, according to the time of the year; together with descriptive details of a nature calculated to assist canegrowers in the study of this pest in every stage of its life cycle. Mr. Jarvis's entomological notes are always interesting, and this additional monthly contribution will be welcomed by our readers who are engaged in the sugar industry.—EDITOR.

GRUBS COMMENCE TUNNELLING DOWNWARDS TO CONSTRUCT PUPAL CELLS.

DURING the earlier weeks of this month greyback grubs can still be found under stools which they have totally destroyed, busily engaged in devouring the underground basal portions of any remaining sticks, while should the crop be plant-cane the sets also are usually attacked and more or less hollowed out (see illustration). Towards the end of May the full extent of the damage wrought in our canefields by this cane beetle becomes apparent. The percentage of such injury is generally greatest on deep soils of a light, friable character, such as occur, for instance, at the Greenhill Estate near Hambledon, where the ground happens to be of volcanic origin, or on much of the so-called high lands met with in the Cairns and Babinda districts.

With regard to the economic status of this pest, it may be mentioned here that, unlike several closely related beetles occurring in other countries the grubs of which inflict maximum damage to roots of cane and other plants at intervals of from two to three years apart, the complete life-cycle of the Queensland cockchafer (from laying of the eggs to appearance of adult beetles) occupies a period of only twelve months; so that we are compelled to combat the ravages of its grubs every year.

It is probably to this fact, coupled with the large size, voracity, and long continuance of the grub condition, that we must attribute those capabilities for destruction which during seasons of normal rainfall have enabled this insect to obtain first place amongst our pests of sugar-cane. Being, moreover, an indigenous species, it naturally proves very difficult to cope with, seeing that much of our acreage under such crop is more or less surrounded by virgin scrub or forest country, comprising enormous tracts of land over which this native insect continues to breed and multiply as of old, and from which it may extend its range of flight to adjoining cultivated areas.

Cane grub damage is in evidence during a period of three months—from March to May—the greatest injury being effected about the end of the former month, and continuing practically throughout April and May.

Attitude of Canegrowers Towards Fumigation.

On selections where only one or two blocks happen to be lightly grub-infested many farmers prefer to chance results, rather than incur the expense of fumigating their land.

In such cases the element of chance proves more or less attractive, especially on farms where certain fields of early-planted cane are nearing maturity, and there appears a possibility of obtaining sufficient rain to enable the stools to replace any roots being eaten, and of maintaining an upright position until commencement of the crushing season.

In cases of heavy infestation (an average of ten or more grubs per stool) the future of such crops should never be left to chance, and remedial treatment then becomes imperative. One hears much talk about the cost of fumigants and their being too expensive for use against cane grubs. Such erroneous opinions, however, generally come from those who have not given them a trial; those who have done so being, on the contrary, enthusiastic in praise of this form of grub control. Certainly, a grower who happens to suffer losses each season cannot afford to disregard the merits of soil fumigation. Let us suppose, for instance, that he has

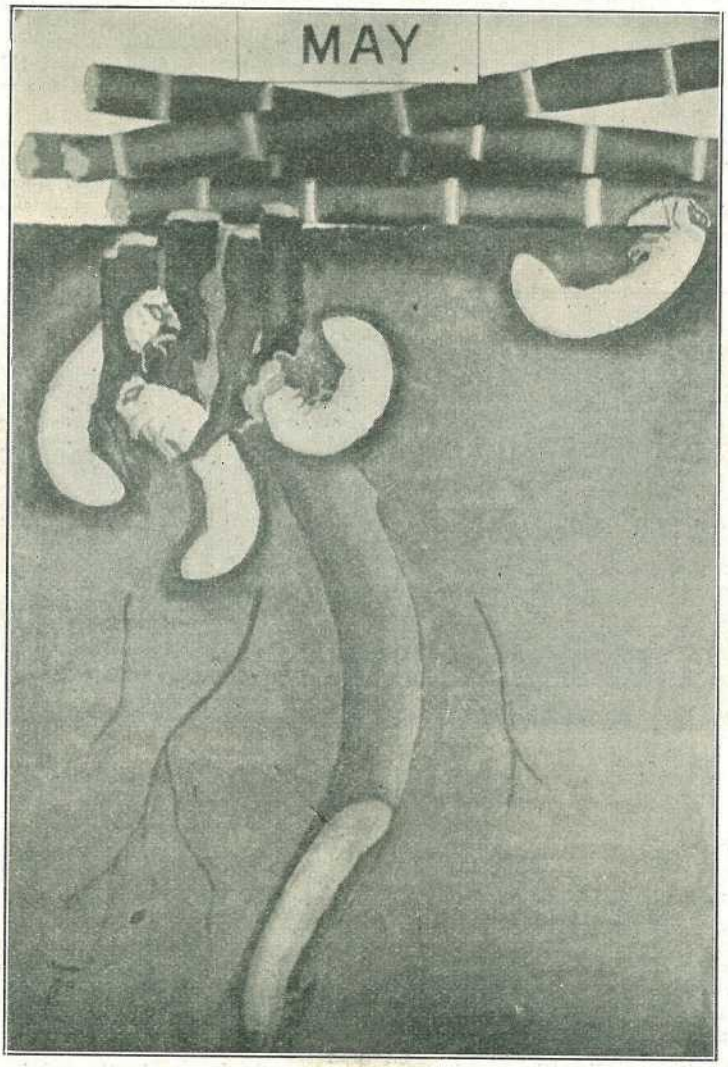

PLATE 40.—Cane Sticks eaten out of the ground by Grubs of the Greyback Cockchafer. A fully matured grub is seen tunnelling downwards to construct its pupal cell.

a crop estimated to yield 25 tons per acre. Would he not be wise to sacrifice five of them in order to make sure of harvesting 20 tons? The 5 tons would pay for the expense of fumigating the acre in question, and not only ensure him a return of 20 tons of cane, but also a crop of ratoons for the following season. On the other hand, by neglecting to fumigate he runs a risk of losing the entire 25 tons and incurring the additional expense of replanting the acre, to say nothing of the cost of cane sets for planting this acre twice over, and the loss of much valuable time.

Tenacity of Life in Cane Grubs.

During our wet season the cane on low-lying river flats is sometimes completely submerged. In the event of such crops remaining covered for a couple of days, 75 per cent. or more of the grubs present would succumb to the immersion. In this connection it will be of interest to mention the following experiment:—Full-sized grubs were placed singly in glass test tubes containing rain water, in which, after struggling a few seconds, they sank to the bottom. About an hour later all motion had ceased, and they lay in doubled-up position with legs widely extended. Grubs taken out of the water after intervals of five and a-half, twenty-six, and thirty-two hours' submergence ultimately recovered, while those subjected to forty hours' immersion did not revive.

In repeating this experiment grubs were found to recover from a submergence of forty-one hours; but others, although regaining slight movement after forty-seven hours under water, did not live more than three days. Again, others subjected to sixty-six hours' immersion continued motionless for a time, and then started to decompose.

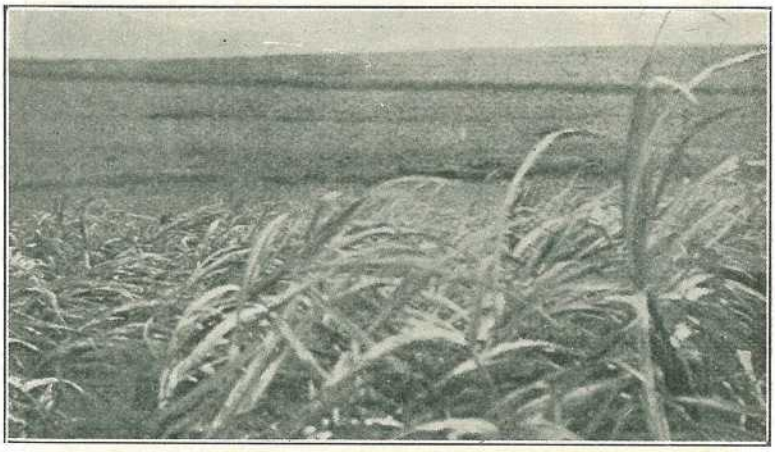

PLATE 41.—View of Portion of Cane Crop devastated by Grubs of the Greyback Cane-beetle.

Grubs Commence Pupating.

Towards the end of this month the fully-developed grub tunnels to a depth of from 18 to 24 inches, where it prepares a cavity in the subsoil to undergo its slow change to the winged adult or beetle. The period of pupation extends from July to September, reaching its completion towards the end of the latter month, by which time greybacks will have practically disappeared, and when digging or ploughing deeply one finds only pupæ of this beetle. These lie quietly in their smooth-walled cells in horizontal position, and if touched lightly will generally wriggle the abdominal portion of the body.

Details regarding the pupal state of our greyback cane beetle and its control will be described under the month of August.

Common-sense Control of Grubs.

Economic entomologists the world over have long realised the value of systematically collecting the various injurious species of root-eating grubs. In Porto Rico, for example, this method has proved very successful, and is considered to be one of the best ways of preventing such insect pests from increasing. Similarly, in cane-growing districts of Queensland it has yielded good results in the past and is still being followed up with advantage in various centres. The method usually adopted consists in picking up the grubs from behind ploughs and in collecting them from under trash or other debris whenever possible.

The plate for May shows a third-stage mature grub tunnelling downwards to pupate, while three others are engaged in devouring the basal remains of ruined cane sticks, and one is on the surface enjoying the juicy sweetness of a fallen cane.

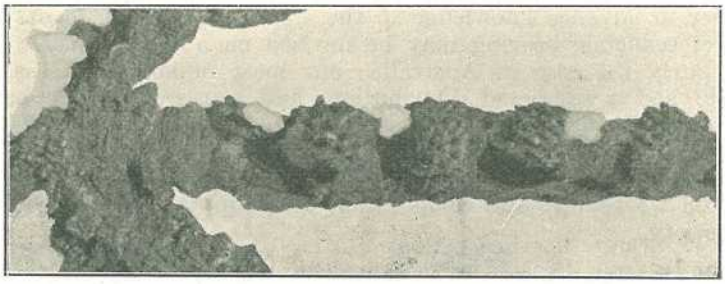

PLATE 42.—Portion of an old Cane Set, badly eaten into by Grubs of the Greyback Cockchafer. (About one-third natural size.)

TO SUBSCRIBERS—IMPORTANT.

Several subscriptions have been received recently under cover of unsigned letters. Obviously, in the circumstances, it is impossible to send the Journal to the subscribers concerned.

It is most important that every subscriber's name and address should be written plainly, preferably in block letters, in order to avoid mistakes in addresses and delay in despatch.

The Control of Sugar Cane Diseases.

By ARTHUR F. BELL.*

THE ultimate aim of all plant pathological investigations is the reduction or elimination of the economic losses caused by the diseases under consideration. Naturally, a very great deal of the work carried out has no immediate economic value but must be undertaken in order to advance knowledge to the stage where experiments having a direct economic bearing may be devised on a sound basis. This is particularly the case in Australia; our most important diseases have hitherto had a restricted distribution, and consequently we have not had the benefit of researches conducted in older sugar lands. The object of this paper is to set out for your information examples of the broad principles upon which we are working, and to indicate certain points at which we require the co-operation and support of a body such as this Society.

Apart from legislative measures in the establishment of various types of quarantine, the control of sugar cane diseases may be divided into three main modes of attack, as follows:—

1. Prevention, or what we might term escaping a disease, by the careful selection of disease-free planting material;
2. Reduction, either wholly or in part, of losses due to disease by modification of agricultural practices;
3. The breeding or introduction of suitable cane varieties which are resistant to the diseases of the locality.

The last-named is purely a matter for the plant breeder and pathologist, but, after the necessary knowledge has been obtained and disseminated, the application of the first two methods must rest mainly upon the efforts of the cane producer.

Disease control in countries where the estate system obtains, such as in Hawaii, and control in countries where the small farm system is the rule, such as in Australia, are two vastly different propositions, and the relative importance of the methods outlined above varies accordingly. The former are, naturally, in a much better position to combat diseases and their work is greatly simplified. For example, the estates, with unified control and command of finance, can easily place the important factor of the selection and maintenance of supplies of disease-free planting material under the control of a specially trained technologist, and, of equal importance, can ensure that the conditions laid down by this man are fulfilled to the very letter. Again, we have a comparatively newly found disease in North Queensland, which, like Sereh disease in Java, appears to be readily controlled by hot water treatment of cuttings. In such treatments there must necessarily be rigid control of temperature, as a rise of 2 degrees would cause the death of cuttings, but it is a relatively simple matter for an estate to instal a plant to carry out the treatment effectively and expeditiously. On the other hand

* In a paper read in the course of proceedings of the Fourth Annual Conference of the Queensland Society of Sugar Cane Technologists, at Ayr (Q.), March, 1933.

it is manifestly impracticable for the farmer to instal such a plant, and, similarly, the farmer cannot be expected to be an expert in the many phases of scientific agriculture. We do not criticise him for this; in view of the multiplicity of his activities it must be accepted as inevitable. But it must be emphasised that these and many other disabilities now attendant upon the farm system may be overcome by co-operation, and we urge it as the duty of members of this Society to stress the necessity for co-operative effort in agriculture and to foster its development as much as lies in their power.

PREVENTION.

The extent to which the practice of plant selection may be successfully employed will naturally depend upon the type of disease, the manner in which it is spread, and local conditions. In most parts of Queensland mosaic disease is very easily controlled by plant selection, but in a few restricted areas the rate of secondary spread is so rapid as to render this method useless, and recourse must be had to the use of highly resistant varieties.

The basic essential in the selection of disease-free planting material is the ability to recognise in the early stages any diseases which are likely to be encountered. Well illustrated pamphlets describing the symptoms of all the diseases found in Queensland have been published at various times and are re-published as occasion demands. Museum collections of preserved specimens have been established at various centres, officers of the Bureau disseminate information by lectures and visits to individual farmers, and as a later and important development a series of lectures on sugar cane diseases has been included in the curriculum of the sugar technology course of the Central Technical College.

When the symptoms are permanent and uniform, as in the case of mosaic and Fiji disease, it has proved quite easy to teach farmers to recognise these diseases, but it is unfortunate that many diseases, including our two most important, have symptoms which are frequently inconspicuous and transient, particularly in the early stages, and which vary a good deal in form throughout the life of the plant. In such cases it is almost impossible to obtain satisfactory diagnoses unless the observer has had special instruction and has been enabled to make first hand inspections of diseased plants in all stages.

While satisfactory plant selection may be made in the field in the presence of some diseases, the majority, owing to masking or inconspicuousness of early symptoms, require that plants shall be taken only from disease free fields. As an example of the latter type let us consider leaf-scald disease which may be found on practically every farm in the far North. Our investigations have proved that the symptoms of this disease may remain masked for quite long periods, so that a series of very thorough inspections is necessary before a field can be declared disease-free. Fortunately, we are also finding that *in the absence of knife infection* the rate of secondary spread of this disease is for the most part very slow and, provided a field is planted with healthy plants and harvested with sterilised knives, the cane will remain healthy for reasonably long periods. We have every reason to believe that this and similar diseases may be controlled in all but the most highly susceptible varieties by the use of disease-free plants from small well-tended farm nursery plots which are in turn periodically replanted from isolation nursery plots.

Economic pressure bears yearly more heavily upon the cane sugar producer and has every indication of continuing so to do. It is rapidly becoming imperative even in the most favourably situated districts, to obtain the absolute maximum crop yield for a given monetary outlay, but maximum yields cannot be obtained when diseased and inferior cane is used for planting. We therefore submit the following scheme as the simplest method of ensuring satisfactory supplies of suitable planting material, particularly in tropical Queensland. A central authority, such as the management of a co-operative mill, should engage and equip a qualified man capable of conducting a disease control compaign. Under his supervision the central authority should purchase or lease a small area of land in an isolated position and cultivate up to about 10 acres of suitable cane. This small area could be inspected frequently and thoroughly cultivated in accordance with the best agricultural practice, and irrigated if necessary. Under the direction of the controlling officer the cane would be harvested and distributed to farmers for planting in farm nursery plots which would in turn supply the cane for commercial field plantings. These plots should be established on the farm as far from other cane as possible; they would not require to be more than an acre in extent, and so could be given the best care and attention, and precautions taken against accidental infection. As the chief precaution special knives would require to be kept for the harvesting of the nursery plot cane and cutting it into plants, these knives being sterilised periodically in boiling water or disinfectant.

The central isolated nursery plot should be practically self-supporting, and the expenses of the officer for the time spent in disease control would be small, since he could also be engaged upon pest control, agricultural experimentation, and other important and productive work. The direct expense to the average farmer through the purchase of plants might be as much as £1 per annum.

MODIFICATION OF AGRICULTURAL PRACTICE.

It is more or less a truism that any practice which will improve the vigour and vitality of the plant will also reduce the virulence of the disease, and in that respect improved agricultural conditions are a desirable aid in the control of any disease. At this juncture, however, we will consider only those diseases which are profoundly affected by modifications of cultural practice.

It is characteristic of the living organism that it lies heir to many ills of senility, and sugar cane is no exception. The obvious treatment for such diseases, then, is to harvest the cane before the advent of this period of senility, or, in other words, harvest the cane before it passes beyond the point of maturity. Red rot and the sour rot of the Burdekin district may be considered as typical diseases of senility. Red rot is one of the most widely distributed of sugar cane diseases, and the causal fungus may be found with the greatest ease in practically every Queensland canefield. Therefore, in so far as this disease is concerned, plant selection is of little avail; we have found experimentally that red rot diseased cuttings germinate poorly, but such plants as do result are not more liable to contract the disease than are plants from healthy cuttings. The source of infection is ever present, and awaits only the suitable condition of the cane before launching its attack. The disease is rarely seen in immature cane, but once the cane attains maturity and begins to lose vitality the tissues are rapidly invaded by the fungus, the peculiar reddish rot results, and the sucrose content falls with alarming rapidity.

The solution of the difficulty is intimately associated with modification of our existing methods to the extent of instituting a rational maturity testing campaign, which will enable the date of the commencement of crushing to be determined by the stage of maturity of the cane and ensure that the individual fields are harvested at the most favourable time. Bad outbreaks of red rot may be taken as a symbol that either there is an undue preponderance of early or mid-season maturing canes, or that the crushing season did not commence as early as it should have done.

Some modification of the above statement is necessary in the case of a very late maturing variety in the presence of droughty conditions during the later part of the season. In this case the unfavourable conditions may bring about a premature loss of vitality before the cane can attain maturity, and red rot is almost certain to make its appearance.

At the other end of the scale we have diseases which are greatly influenced by the time of planting as, for example, mosaic and red stripe (top rot) diseases. Mosaic is a virus disease transmitted from diseased to healthy plants by an aphid (*Aphis maidis*) which is most abundant in late summer and autumn. The cane plant becomes progressively less susceptible to mosaic with advancing age and, consequently, the older the plants are at the height of the aphid infestation the better chance they have of escaping the disease. In several countries, therefore, we find that part of the mosaic disease control programme consists in autumn planting. Red stripe disease, which is also known as "top rot" and "Burdekin top rot," is commonly found in Badila in North Queensland, and has come somewhat into prominence during the past few years. As in the case of red rot the causal organism is very widely distributed, and attacks susceptible varieties immediately conditions are favourable. So far our investigations have been confined mainly to Badila, since this is the only important commercial variety concerned as yet. We have found that in this variety the disease may be very simply controlled by the adjustment of the time of planting (or ratooning). Badila planted in March-May and given a good start off will be found to escape the disease, while immediately adjacent cane planted in the following spring may suffer a mortality of upwards of 25 per cent. during the succeeding January-March. As an interesting example of the efficacy of this form of control I would refer you to an experiment conducted at South Johnstone last year:—Two rows of Badila, one planted in April and the second in August, were planted side by side in well-trenched ground, and as far as possible were grown under ideal conditions of moisture, drainage, and plant food supply. Throughout the period of growth no sign of top rot could be seen in the cane planted in April, whereas at the end of March death of stalks had occurred in the August plant cane to the extent of over 25 per cent. Some five or six years ago top rot in Badila was causing some concern in the Burdekin district, but in later years the amount has grown steadily less. This is no doubt due to the average earlier planting and the very considerable improvement in field practice which has taken place during the last five years.

Unfortunately, it is not always possible to practice autumn planting, or to harvest all the fields which are to be ratooned in early or mid-season, and we are faced with the problem of reducing the losses due to top rot in spring plant cane or late cut ratoons. At this point, however, it would be well to emphasise the fact that the losses from top rot are never as great as is popularly supposed, and a 10 per cent. death

of stalks must not for a moment be taken as representing a 10 per cent loss of crop. We have conducted experiments which demonstrate that the loss of one or more stalks in the stool is compensated by the increased vigour of the remaining stalks in the stool. If the greater part of the death occurs moderately early in the rainy season it is probable that the death of as much as 10 per cent. of the stalks will cause a negligible loss of crop.

Statistical inquiries have so far confirmed our earlier observations on late-planted fields, viz., that the greater the number of stalks per acre the greater the likelihood of death due to top rot. In fertilizer trials the increased tonnages in the treated plots have been found to be due in part to the greater stalk production per acre, and the amount of top rot is likewise found to be somewhat greater than in the control plots. The increased amount of top rot in the Johnstone district during the past five or six years is therefore possibly due to increased use of fertilizers in late-planted crops during that period. It would seem then that the desideratum is the improvement of tonnages of late plant or ratoon crop by an increase in the size of the individual cane stalks rather than by increasing the number of stalks per acre, and this is one aspect of the problem now being investigated.

Cleanliness of the fields may be a very important consideration for two reasons:—(1) Certain weeds may be alternative hosts of the disease, and so act as sources of infection, thus largely nullifying the advantages of having used healthy planting material; (2) a disease may be transmitted by an insect which only feeds on cane by accident and would not breed on cane but which thrives on various types of weed. Both these factors operate in the case of mosaic disease, and thus control is greatly aided by clean fields and clean headlands.

A number of the organisms responsible for diseases are weak parasites, that is to say they are incapable of attacking a plant in full vigour, but should the host plant receive a set-back by adverse conditions, they become established and thereafter take toll of the host. The root diseases found in Queensland are of this type. They must be considered primarily as indicative of the existence of unfavourable conditions, and in the absence of drought are controllable by improvements in planting material, fertilization, or cultural conditions.

BREEDING OR INTRODUCTION OF RESISTANT VARIETIES.

In the absence of the estate system and in the absence of a co-operative and co-ordinated agricultural policy, the development of resistant varieties must constitute the chief mode of attack in the control of cane diseases in Queensland. This method has the advantages of being permanent, automatic in operation, and imposing no direct expense—in short, something for nothing—and thus in full accord with the commonly held view that disease control is something that should entail neither time, labour, thought, nor expense. The disadvantages lie in the fact that the original search for resistant varieties is often a slow, tedious business, and many excellent varieties of superior yielding power must be discarded through not quite attaining a fool-proof standard of resistance. Of course, circumstances may permit of no choice of methods, and in the Southern districts, where the rapidly transmissible gumming disease is so widely distributed, we must have recourse to highly resistant varieties at least until the situation has improved very considerably.

Up to the present our chief efforts have been directed towards finding varieties resistant to gumming disease, and a description of the methods used will serve to illustrate the principles as applied to other diseases. During the conduct of resistance trials it has been observed that the progeny of particular crosses could be readily classified according to the general standard of resistance exhibited. For example, it would be found that the progeny of the cross A x B contained a high proportion of resistant seedlings, while the majority of the seedlings from the cross C x D proved highly susceptible. Accordingly, our disease-resistance trials are now of two types:—

(*a*) About two stools, each of up to 100 selected seedlings represented each new cross to determine whether or not the particular cross has a reasonably good chance of yielding disease-resistant seedlings. If only a very low proportion of resistant seedlings are produced the cross is naturally discarded.

(*b*) Six to ten stools of seedlings which show commercial promise or varieties which have been imported from abroad.

The trials are carried out in a locality where conditions are favourable to the full development of the disease. Included in each trial are several varieties of graded resistance or susceptibility whose performance under field conditions is well known, and the resistance of the unknown varieties is then determined by reference to these known standards. Every second or third row in the plot is a guard row consisting of a mixed planting of susceptible varieties, so that every unknown variety is in contact with guard row cane of two or more varieties. When the cane is 2-3 feet high the plants in the guard rows are inoculated by means of needles dipped into a suspension of the gum. This susceptible cane soon develops the disease, and thereafter serves as a constant source of infection for the experimental varieties. Inspections are made periodically, and the progress of the disease in each variety is recorded and, at the conclusion of the trial, all doubtful canes are dissected and examined. The results obtained are clear cut and remarkably consistent, and in most cases there need be little hesitation in accepting the results of a single trial with any one variety. The effects on the cane vary to a remarkable degree, ranging all the way from the practical immunity of Uba to a consistent 95-100 per cent. death in the case of the seedling S.J.4.

In order to find varieties to combat gumming disease, about 80 selected varieties were imported from Hawaii, India, and Java in 1928-9, and after growing in quarantine for a year were planted in resistance trials in 1929 and 1930, together with fifty to sixty varieties which were already in the country. As a result of such trials we have found some fifteen varieties of sufficiently high resistance to be grown in the presence of gumming disease with impunity. Some of these are now in a yield trial, and the remainder are being propagated for inclusion in yield trials as soon as possible. Some of these canes show considerable promise, and it is confidently expected that they will be the means of eliminating all losses due to gumming disease in Southern Queensland.

Gumming disease lends itself to this type of investigation rather more than most diseases, but the principles are gradually being applied to other important diseases, of which leaf-scald is now receiving chief attention.

Bureau of Sugar Experiment Stations,
Brisbane.

Hints to Beginners in Beekeeping.

By HENRY HACKER, F.E.S., Entomological Branch.

THE feeling that there is room for expansion in Queensland for beekeeping has been reflected by the numerous inquiries addressed to the Department of Agriculture and Stock during the last year. Many of these letters were received from persons without any previous experience with bees, and it is to this class that the following remarks are chiefly directed.

Although apiculture is extremely fascinating to most people who have a taste for the study of nature, the income to be derived from it is generally the chief factor in leading one to undertake the care of bees. Where large apiaries are planned, they require much hard labour and great watchfulness; the performance of the work at stated times is imperative, and the beekeeper has few opportunities of making a leisurely study of their natural history and habits, his time being almost wholly taken up in attending to the most apparent wants of his charges.

Returns to be Expected.

Many people ask for information regarding the profit to be derived from beekeeping, but it is very difficult to answer this question except in a general way. Even the best situations, like all others, are subject to reverses—the result of drought or excessive wet. Under these adverse conditions the beginner must bear in mind that much experience is necessary to enable him to turn to the best account seasons below the average, while during periods of severe drought it will take considerable understanding of the subject, energetic action, and some sacrifice to tide over without disaster. On the whole, there should be expected from beekeeping only fair pay for one's time, good interest on the small capital invested, and a sufficient margin to cover contingencies.

Where to Commence.

Any place where farming or fruit-raising can be successfully followed is suitable for the profitable keeping of bees, in a limited way at least. It is evident, therefore, that, if the bees are not to be the main source of income, the place where one happens to be situated is quite suitable, as the ability of the bees to draw their sustenance for 2 or 3 miles around must be taken into account in estimating the possibilities of a locality.

On the other hand, when bees are to be kept more extensively as a sole means of livelihood, one must be prepared to go into the "bush" as soon as the elementary knowledge and some experience in handling bees has been acquired. Queensland possesses a splendid honey-producing flora in her forests, of which enormous areas still remain unoccupied by the beekeeper.

Having decided on the district in which to commence, the prospective apiarist should examine as many places as possible within it, weighing the advantages or otherwise of each site before coming to a final decision. Probably the best sites are those consisting of good

mixed *Eucalyptus* forest situated a little inland from the coast. The greater the variety of trees the better, as most eucalypts flower well about one season in three, and only moderately during the other two.

The nectar-producing flora will be found to vary considerably in different districts, according to their soil, rainfall, and elevation. For instance, the Darling Downs, which is rather sparsely timbered, more than balances this deficiency by a rich ground flora, consisting of weeds and low herbage which flower profusely during the spring months. Later in the season there is usually a good honey flow from lucerne, which appears to produce more nectar after it has had one or two cuttings. Apiaries suitably situated in these districts will produce quantities of high-grade honey.

In the coastal belt the conditions are somewhat different. The chief nectar-producing trees are *Leptospermum, Melaleuca,* and other swamp shrubs in the spring, various mangroves and eucalypts during the summer months, and tea-tree during the autumn. The honey produced is darker in colour, and consequently realises a lower price, than the Downs honey. This disadvantage, however, is offset by a more certain crop, due to the greater rainfall, the longer nectar-gathering season, and the much milder winters which are experienced in the coastal districts.

In certain localised areas, such as river flats and creek banks, trees other than eucalypts often occur in sufficient numbers to make a honey flow. These are silky oak, bean-tree, and river myrtle, as well as other representatives of the genus *Eugenia,* all of which are good honey-producing trees. In other districts where prickly-pear still exists, it is considered to be a most useful plant.

Jungle or rain forest sites are not favoured as honey producers, chiefly owing to the lack of any outstanding nectar-producing tree. Moreover, the moist, shady conditions cause the bees to be backward in building up in the spring, for bees require warmth and sunshine to produce a satisfactory honey crop. When these areas have been cleared, however, and laid down in pasture, white clover is sometimes sown with the grasses. This plant grows vigorously in the virgin soil, whitening the paddocks with its flowers in early summer. Scotch thistles usually abound in such localities, growing from self-sown seed. If some of the land around is being cultivated with crops of maize, pumpkins, &c., these districts may be classed among the best for keeping bees.

In selecting a bee site, consideration should be given to the following two points:—Firstly, see that there is a permanent water supply within a short distance of the apiary. The quantity of water fifty to one hundred colonies will dispose of would surprise many people. Secondly, if the beginner intends keeping bees on a large scale, he should ascertain that no other bees are being kept within 4 miles of the selected site, as an otherwise suitable foraging ground may prove to be already occupied by a neighbouring beekeeper.

How to Commence.

A beginning is usually made in one of the following ways, or by all of them combined:—

Full Colonies of Bees.—These may be purchased from established apiaries or bought up here and there until the desired number have been

obtained. They should be carefully examined before purchase, as there is some risk of getting neglected colonies containing old or poorly drawn-out combs. When a number of colonies have been acquired in this manner, it is advisable to purchase a full colony from a reputable queen breeder or bee-supply firm. It will be guaranteed high-grade Italian, and possess a tested queen. From this colony all the other colonies should later on be requeened, thus improving the strain of the entire apiary.

Swarms.—In the spring arrangements may sometimes be made for the purchase of swarms from beekeepers who do not wish to increase their number of colonies, or the beginner may see a swarm or two himself. Hives with frames of foundation should be bought and prepared beforehand. When a swarm has settled or clustered it should be hived in an ordinary box fitted with a lid, and, as soon as the bees are in, carried to the spot which the frame hive is to occupy. Towards evening when the bees are not likely to rise in the air again, the frame hive is placed in position, a bag or cloth spread out in front of the hive entrance in such a way as to provide an easy passage-way into the hive, and the swarm shaken or dumped out of the box on to the cloth. If the bees are slow in entering the frame hive, or if a considerable number remain outside, they may be gently driven in by blowing a little smoke on them; none, however, should be blown into the hive.

Nuclei.—Beekeeping may also be commenced in the spring by purchasing nucleus colonies. These consist of small hives holding three frames, and contain a queen accompanied by a few hundred workers, together with some stores. As the season advances, these nuclei will quickly build up, and may then be transferred to full-size hives provided with sheets of foundation.

Wild Bees' Nests from Trees.—When commencing on a new site, the first procedure is to find and remove all bees from bee-trees in the neighbourhood. By doing this the competition from the wild bees is eliminated, and a number of hives may be stocked at very little expense. The easiest way to find them is to make a systematic search of all water-courses and other sources of water, and any bees found obtaining water should be carefully sight-lined and their home found. The tree should be felled and the nest cavity cut open. Sometimes the shock of the fall may so disorganise the colony that it will offer little or no resistance, and may easily be transferred to a frame hive. The following is a good method for transferring the brood comb from box hives, and as a modification of this method—by omitting the drumming process to drive out the bees—is also most suitable for transferring the brood comb from wild bees' nests, it will be described in some detail.

Transferring from Box Hives and Wild Bees' Nests.

Before commencing, the following necessary articles should be at hand:—A bucket of water, as the operator should wash the tools and his hands frequently to keep them free of honey. The hive must, of course, be ready, and the smoker lighted. A hammer and cold chisel are needed for opening the hive. A ball of thin string, a large knife, and two hammers or heavy sticks for drumming on the box hive are also required.

Smoke should be blown into the entrance of the box hive, after which it should be removed and the new hive, preferably with at least one drawn comb in it, placed exactly on the old stand to receive the returning bees. The bottom should be removed from the box hive, which

should then be placed on its side close to the new hive. With two sticks or hammers the beekeeper raps on the sides of the box hive with regular and continuous strokes. After a few raps, the bees will begin to run towards the open end and enter the new hive. The drumming should be continued for ten or fifteen minutes, until three-fourths of the bees have entered. If the queen is not seen as the bees pass in, the drumming should be continued a little longer.

One side of the box hive is now removed to expose the combs, which are cut out and laid aside until the brood is reached. A large piece of brood comb is laid flat on paper or a board and the frame (unwired) placed loosely on top. The outline of the inside of the frame is marked on the comb with the point of a knife, the frame is set aside, and the comb is cut to fit tightly in the frame. Smaller pieces may be fitted to suit, and the whole tied with a few turns of string. When all the brood comb has been transferred in this manner, the remainder of the frames to fill the hive should be filled with full sheets of foundation.

When transferring the brood comb from trees, as outlined in the preceding paragraphs, as many of the bees as possible should be shaken into the frame hive; then, if the hive is placed on or near the spot where most of the remaining bees are, they may be induced to go in with the help of a little smoke. In the evening the hive should be closed by tacking a strip of wire gauze across the entrance, after which it may be removed to its permanent position. Should the queen have been killed, the bees will make several queen cells, and another queen will hatch out about the sixteenth day.

After transferring is finished, all scraps of comb and wax should be cleaned up to prevent robbing, and, if necessary, some of the honey should be given back to the bees for stores. After a few days the bees will have securely fastened the combs, and the strings may be removed. As the bees become established on the newly-built combs, the frames of transferred comb are gradually worked to the outside of the cluster of bees, then finally withdrawn and melted for wax.

Moving Colonies of Bees.

Bees remember a location so well that some difficulty is encountered by the beginner in moving them to a new stand. They may, however, be moved to a distance of 1½ miles or more without danger of their returning, because they will have to learn their surroundings before they can venture far from the hive. When it is desired to move them to a fresh spot a short distance from their old position, much more difficulty is encountered. For instance, if the hive should be moved 30 or 40 feet away, the returning field bees will fly straight to the spot previously occupied by their hive and hover there, hopelessly lost. There are two methods for successfully moving colonies a short distance. One is to move the hive a few inches daily, when the bees do not realise that they are being moved; the other method is to shift them several miles away for a week or two, by which time they will have forgotten the old site, after which they may be returned to any desired position in the old yard.

Bees excited by moving or any other disturbance generate a great deal of heat. During hot weather the hive cover should be removed and a "moving screen" substituted. This consists of a screen wire top

in the place of a regular hive cover. It allows the escape of excess heat that might melt the combs and kill the bees. The temperature may be greatly reduced and the bees quieted if a litle water is squirted into the hive through the screen.

Feeding Bees.

In many Queensland localities January appears to be a sterile month. If the spring honey flow has been extracted and is followed by a shortage for a month or so, about January the colonies begin to get weak. It is quite probable that the flow will again come on in the autumn, and, unless the bees receive some help, they will be too weak in numbers to gather any surplus. The only remedy is immediate feeding, either with honey or sugar syrup. Owners of bees in this condition have communicated with the Department, being under the impression that the bees were diseased. A visit to their apiaries, however, showed that the bees were quite healthy, but literally starving.

For summer feeding, half sugar and half water by measure will do very well. This should be fed to the colonies at the rate of half a pint a day, to keep brood-rearing going.

Beekeeping an Exacting Calling.

In conclusion, emphasis should be placed on the fact that it is not sufficient merely to buy some colonies of bees and let them forage for nectar, robbing all their surplus honey whenever they have accumulated any. This treatment will only lead to failure, which almost always results from a lack of study of the needs of the bees combined with neglect to perform the necessary manipulations on time. The successful beekeeper is a student of bees, adapting his practice to changing seasons, and knowing what to expect from his bees under a given set of conditions.

QUEENSLAND SHOW DATES, 1933.

Dalby: 5th and 6th April.
Beenleigh Campdraft: 8th April.
Oakey: 8th April.
Chinchilla: 11th and 12th April.
Boonah Campdraft: 17th April.
Miles: 19th April.
Nanango: 20th and 21st April.
Tara: 26th April.
Kingaroy: 27th and 28th April.
Goondiwindi Campdraft and Show: 28th and 29th April.
Taroom: Campdraft, 1st; Show, 2nd and 3rd May.
Wondai: Campdraft, 1st and 2nd May; Show, 4th and 5th May.
Boonah: 3rd and 4th May.
Monto: 3rd and 4th May.
Blackall: 9th to 11th May.
Charleville: 9th and 10th May.
Beaudesert: 10th and 11th May.
Mundubbera: Abandoned.
Murgon: 11th to 13th May.
Ipswich: 16th to 19th May.
Mitchell: 17th and 18th May.
Gayndah: 17th and 18th May.
Goomeri: 18th and 19th May.
Kilkivan: 22nd and 23rd May.
Roma: 23rd to 25th May.
Gympie: 24th and 25th May; Campdraft, 27th May.
Biggenden Sports: 26th May.
Toogoolawah: 26th and 27th May.
Kalbar: 27th May.
Maryborough: 30th and 31st May, and 1st June.
Callide Valley: 2nd June.
Marburg: 3rd to 5th June.
Childers: 5th and 6th June.
Wowan: 8th and 9th June.
Bundaberg, 8th, 9th, and 10th June.
Lowood: 9th and 10th June.
Gladstone: 14th and 15th June.
Rockhampton: 20th to 24th June.
Mackay: 27th to 29th June.
Laidley: 28th and 29th June.
Kilcoy: 29th and 30th June.
Bowen: 5th and 6th July.
Gatton: 5th and 6th July.
Woodford: 6th and 7th July.
Ayr: 7th and 8th July.
Cleveland: 7th and 8th July.

IMPORTANCE OF SUBSOIL MOISTURE IN COTTON-GROWING.

By W. G. WELLS, Director of Cotton Culture.

THE greatly reduced yields which many cotton-growers are obtaining in the 1932-33 season as compared to what it appeared they might get, based on the prospects for the crops earlier in their development, amply demonstrate the necessity for successful cotton-growing of a good supply of moisture in at least the upper 18 to 24 in. of soil. Broadly speaking, while the rainfall was somewhat light and irregular in many sections of the cotton belt, in nearly all the main districts ample rain fell in some parts to have been sufficient to produce good yields of cotton. Unfortunately, periods of severely high temperatures were experienced at three critical stages in the development of the plants, which seriously affected not only the yield but the quality of the fibre produced. Undoubtedly, if there had been ample subsoil moisture many crops would have withstood the heat waves sufficiently to have produced much better yields of cotton of good quality than were obtained. The problem confronting the growers is, therefore, what method of preparation of the seed-bed for the next crop will offer the greatest assistance in preventing a repetition of the disastrous results of this season.

Moisture Requirements of a Cotton Plant.

Before discussing this problem, it is pointed out that the rooting system of the cotton plant is of the tap-root type, and therefore removes considerable moisture from the subsoils. It follows, therefore, that where cotton is grown on the same land for several years in succession, a good replenishment of subsoil moisture is required each season, either prior to planting the crop or during the early period of growth before sufficient bolls and squares are developed to cause much stress to the plant during dry periods or heat waves. In an endeavour to ascertain how severely a cotton crop would lower the moisture content of the soils, a plot at the Cotton Research Station, Biloela, which was fallowed all the season of 1931-32, was planted—half to cotton and half clean fallowed in the 1932-33 season. Soil moisture determinations made throughout the 1931-32 season, when the whole plot was in clean fallow, indicated that there were no significant differences existing between the moisture contents of the two length-wise halves of the plot. These determinations were continued throughout the 1932-33 season, and the graphs in fig. 1 illustrate quite definitely how the cotton crop lowered the moisture content at the 4-6 in., 10-12 in., and 16-18 in. levels, where the soil samples were taken.

It is pointed out that this cotton crop was grown on land fallowed for about fifteen months. Had it followed a cotton crop, there would have been less moisture at all levels at the commencement of the season, for only light winter rains occurred in 1932, hence much lower percentages would have been shown all the season on the graphs for the two lower levels in the cotton portion of the plot in 1932-33. It can be realised, therefore, just what the subsoil moisture situation is now in most fields where cotton has followed a cotton crop of last season.

How to Obtain Subsoil Moisture.

It would appear that the best way to overcome this deficiency of subsoil moisture for the coming season, unless a very wet winter is experienced, would be to plant cotton on either newly cleared land where the timber has been dead for some seasons, or on old cultivated land which has been either in clean or grassy fallow or in some summer-grown fodder crop. In many of these three classes of cultivation not only is it highly probable that much more moisture will be found at ploughing time in the upper 18 in. of soil than in land where cotton has been grown this season, but there is the added advantage that ploughing can be done before the winter rains occur. Marked gain of subsoil moisture is obtained where this practice is followed, for not only is some of the late summer rainfall conserved, but the early winter rains penetrate the upper soils to better advantage than is the case with unploughed land.

Benefits Obtained by Early Ploughing.

The benefits to be gained through ploughing in late March, April, or May have been studied over a series of seasons at the Cotton Research Station. The results obtained there indicate that with ordinary June rains of 2 to 3 in., increased yields may be realised through ploughing in the abovementioned months, especially if only light rainfall is experienced during the following season. In dry winters or wet springs the advantage of early ploughing may be reduced, depending on the nature

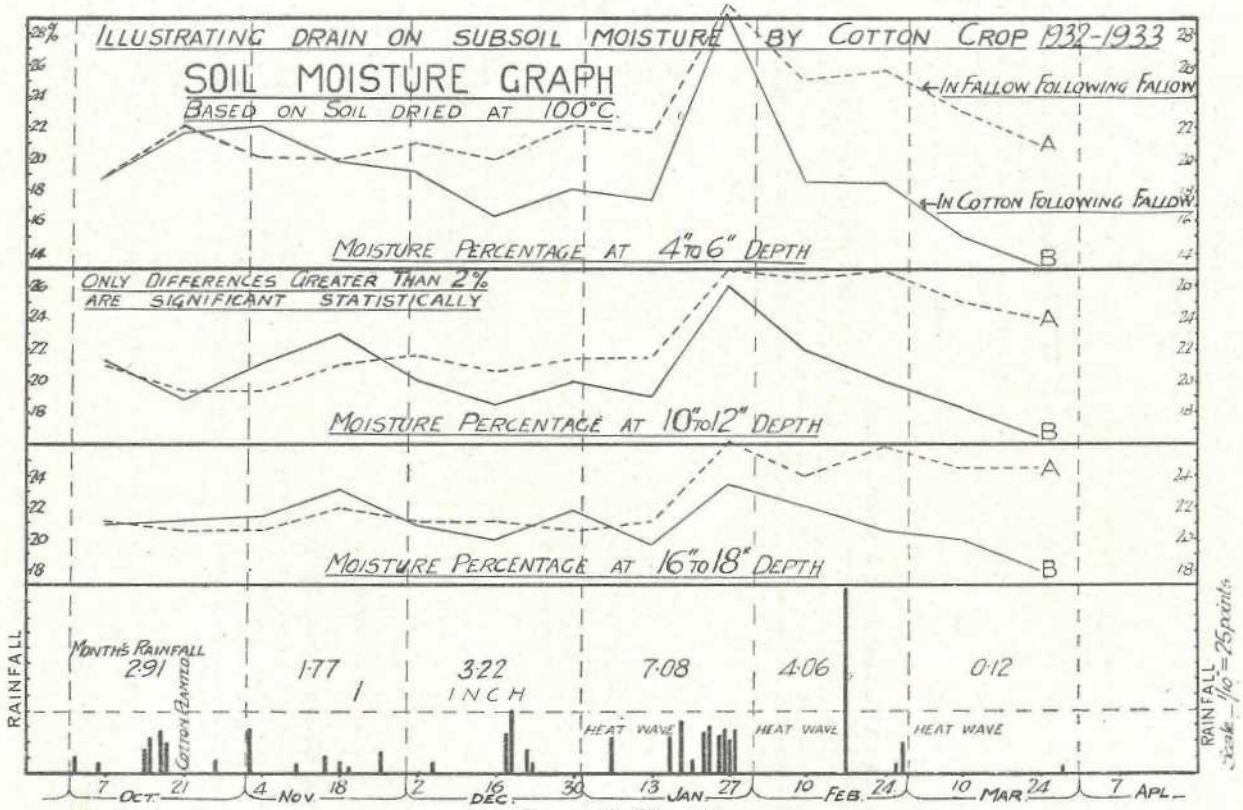

PLATE 43 (Fig. 1).

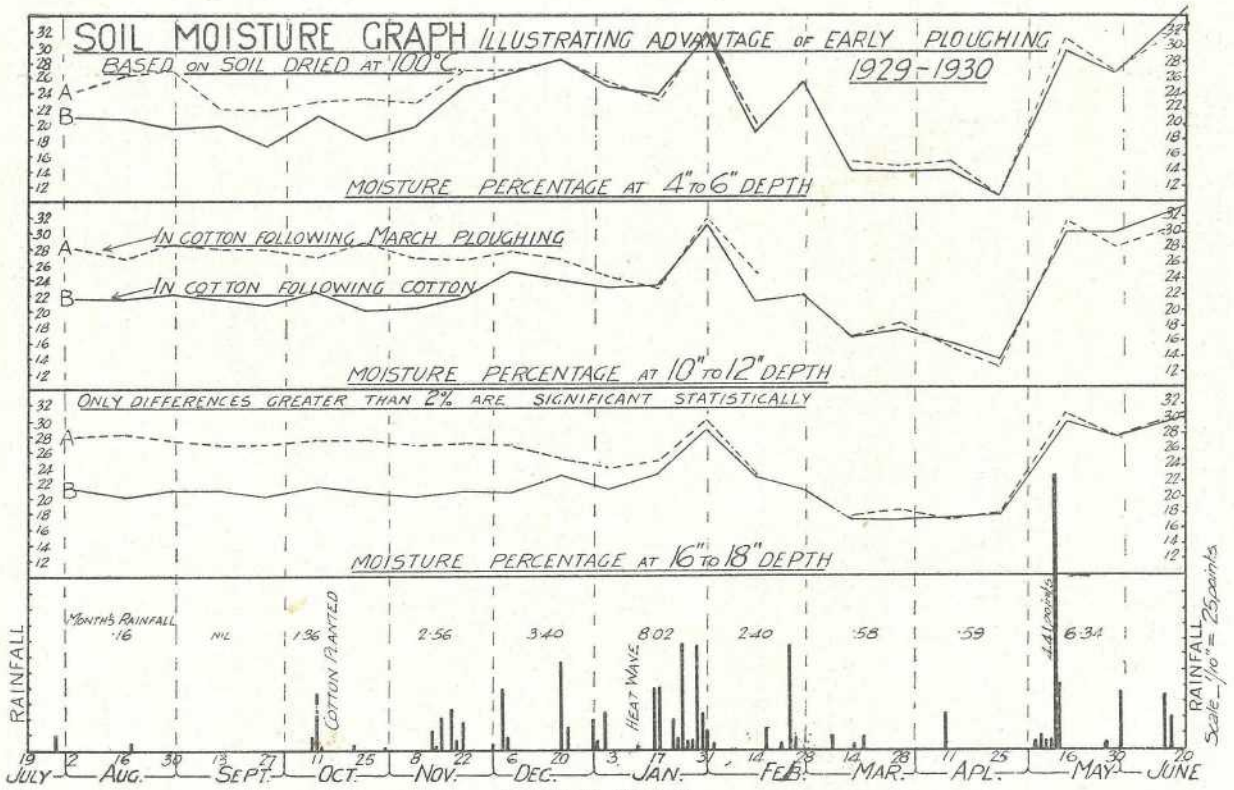

PLATE 44 (Fig. 2).

of the soil and the mid-seasonal rainfall. The graphs in fig. 2 show the marked gains obtained at the 4-6 in., 10-12 in., and 16-18 in. levels in the early ploughed plot prior to planting and during the early period of development of the plants in the 1929-30 season, although only 1.83 in. of rain occurred in June, and a total of .44 in. in July, August, and September. Planting was done on 15th October following 1.26 in. scattered over five days. Good stands were obtained, which were maintained with a good steady growth in the early ploughed plot, but were lost so severely through drought and false wire worm attack in the cotton following cotton plot that it was necessary to replant this in mid-November. The plants on the early-ploughed plot maintained their superiority all season, and outyielded the other plot by 550 lb. seed cotton per acre.

Grow Cotton in Rotation with other Crops.

It is strongly advocated that cotton be grown in a system of crop rotation, whereby it will be possible to plough the land for the following cotton crop not later than in April or May. It is appreciated that where growers have acreages of 80 to 100 acres, this may entail growing too much summer crops for their requirements, and in such cases it is recommended that at least half of their cotton acreage be planted on early-ploughed land following a summer fodder crop. Where this is done, it will be necessary to plough only 40 to 50 acres of the old cotton land, and in most seasons, if the removal of the old crop is hastened, ploughing of this acreage could be effected in time to conserve a considerable amount of the winter rains. Where growers intend planting less than 40 acres of cotton, it is believed that over a series of seasons decided gains will result if the cotton crop is planted on land that has been ploughed in late March, April, or May, especially if good winter rains occur.

Suitable Rotations for Cotton-growing.

The most suitable crops for growing in rotation with cotton depend on the soil types and the system of farming with which it is combined. If with dairying, it appears that on rich alluvial soils cotton can follow sorghums, panicums, and maize, or any grass crops. It is pointed out that in many of the alluvial loams or clay loams of the older cultivations, especially in the Callide Valley, the Upper Burnett, and the coastal areas, the nitrogen content is somewhat high for successful cotton-growing in a season of late planting and very heavy mid-seasonal rains. Cotton should not follow lucerne, peanuts, cowpeas, or any legume on such soils, as these crops definitely increase the nitrogen content to the point where the plant foods are in too unbalanced a condition. The grass crops use a lot of nitrogen, however, and where a soil is suspected of being too rich for cotton, several crops of saccaline, imphee, or sudan grass should be grown to reduce the nitrogen content. A nice illustration of the benefit to be obtained from following such a practice was seen this season in a commercial crop where each row was partly on land which had grown sorghums for several seasons, and partly on land which had been under lucerne. The plants on the sorghum land were heavily fruited, red stalked, with light-yellowish green leaves, of a desired open type, free of serious insect attack, and would have been even better with a heavier seasonal rainfall. The plants on the lucerne land were in marked contrast, being taller, of coarser denser growth, with large dark-green succulent leaves, and bore practically no bottom or lower middle crop due to heavy rough boll worm and corn-ear worm attacks, and a wetter season would probably have ruined the yield entirely.

It is not recommended that rotations including only fodder crops and cotton be used on the poorer clay and clay loam forest slopes, such as those originally covered with ironbark or a mixture of ironbark and box-trees, particularly in the South and Central Burnett and Central Districts. These soils appear to be admirably suited for the production of hardier big boll types of cotton, but the heavy mid-seasonal rains undoubtedly wash an appreciable amount of their fertility into the alluvial flats. Growing only cotton and sorghums or panicums on these soils would, therefore, further reduce their fertility to the point where plentiful and regular rainfall would be required for the production of profitable yields of any of these crops. It is suggested, therefore, that on such soils, after they have been in cultivation for some time, a rotation of cowpeas followed by a sorghum or panicum to reduce some of the nitrogen developed when the cowpeas were growing is advisable before planting cotton.

Suitability of "New Country" Cultivations.

An interesting result has been obtained in all of the main cotton-growing areas whenever cotton is grown on new cultivation, either in forest or scrub soils. The usual practice is to burn out the old stumps and grass, and skim-plough to destroy the grass roots, after which, in about four to six weeks, another ploughing to a depth

of 6 in. is made to turn under all trash, &c. Sometimes the seed-bed is not prepared until nearly planting time, yet provided good planting rains are obtained, excellent strikes are secured, which nearly always produce profitable yields, either in seasons of light rainfall or ones with very heavy rains, although adjacent old cultivations on similar soil may yield very unprofitably. The explanation of such results is not entirely clear. Investigations conducted at the Cotton Research Station indicate that the new soils have a markedly lower nitrate content and a much higher carbon-nitrate ratio than after they have been under cultivation for four or five years. It is also possible that the humus in the new land may help to increase the moisture-carrying capacity of the upper soils. The value of planting on the new cultivations is most marked, however, even in the second, and sometimes third, season. It is possible that a rotation of grass land and cotton on the richer forest and scrub clay and clay loam soils may be one of the best that dairymen can use. Investigations are now being carried out to ascertain the value of growing cotton on land that has been growing Rhodes grass for three years, following several years of cotton. It is appreciated that the cost of cultivation will be higher in the first season on account of the grass seedlings, but if the "new country" effect can be obtained with such a rotation, it is believed that it will be highly advisable to practice it, for Rhodes grass is a valuable asset on any farm. Where newly stumped scrub country that has been in Rhodes grass for several seasons is brought into cultivation, good yields of cotton are nearly always obtained, and it is possible that this rotation may be the solution of the problem of overcoming the tendency for cotton crops to "bolt" on the rich soils during seasons of heavy rainfall.

It may also be of decided value in respect to time of planting. Experiments lasting over several seasons have shown conclusively that on the older cultivations of the richer alluvial loams and clay loams, September and October plantings offer much better chances of producing heavy yields than do plantings in November and December. In a wet season the latter plantings often are so seriously attacked by corn-ear worm that nearly complete failure results. The later plantings on newly cleared land, however, generally produce profitable crops, and appear to be able to withstand the occurrence of a wet mid-season to a marked extent.

Value of Long Fallows.

It has been suggested at different times that the cotton-growers would be well advised to practice long fallowing, such as is carried out by the wheatgrowers in the Southern part of Australia. The results obtained from experiments conducted at the Cotton Research Station do not bear out these recommendations, and it is doubtful if any monetary advantage would be gained by growing cotton in rotation with a long fallow. During dry seasons on some soils a substantial gain in yield per acre would undoubtedly be obtained. It is pointed out, however, that the cost of the fallowing has to be borne by the cotton crop, and this will be considerable, for it is necessary to maintain a clean fallow, otherwise couch grass will become well established on most alluvial soils. It is likewise possible that long fallowing the fertile alluvial soils may excessively increase the nitrates, and if a wet season should be experienced in the following year, rank growth, accompanied by corn-ear worm and sucking insect attacks, would probably result.

It is not recommended, therefore, that long fallowing be practised. While, undoubtedly, the rainfall during the period 1929-30 to 1932-33 has been such as to put a heavy premium on the method giving the greatest storage of subsoil moisture, it is believed, based on the rainfall records of the last sixty years, that a system of rotation of crops such as has been suggested will provide ample subsoil moisture. Not only is it advisable from this aspect to grow cotton in rotation with other crops, but good farming practices likewise demand it. The ill effects from not following proper systems of crop rotations, that are being experienced in other countries with older cultivations than here in Queensland, amply demonstrate the dangers of growing the same crop on a soil for several years in succession. There, soil erosion and crop depletion of the plant foods have reduced the fertility of the soils to the point where applications of as much as 1,000 lb. of fertilizer per acre yield profitable results in some parts of the cotton belt in the United States of America.

In addition to this feature of crop rotation, it is also pointed out that in seasons when heavy attacks of the false wire worm (*Gonocephalum* sp.) are experienced, considerable protection is given to the young cotton seedlings on soils where crop rubbish, such as maize stalks, panicum stubble, &c., is ploughed under. The larvæ of this pest feed on decaying vegetable matter, and where early ploughing has conserved moisture with the vegetable matter little damage is usually experienced. This was nicely demonstrated at the Cotton Research Station in the 1929-30 season, when all the cotton plots following summer fodder crops escaped with little or no damage, while in adjacent cotton following cotton plots the stands were either destroyed or so badly reduced as to prevent the maximum yields being obtained.

Conclusions.

1. The cotton plant has a root system of the deep tap-root type, which exhausts the subsoil moistures to a marked extent, especially during a season of light rainfall following a dry winter.

2. It is advisable, therefore, to grow cotton in rotation with shallow-rooted fodder crops, which can be harvested in time to allow of ploughing in late March, April, or May.

3. Experiments at the Cotton Research Station have demonstrated that ploughing during this period not only helps to conserve the late summer rainfall, but assists most decidedly in obtaining greater benefit from any winter rains that may occur.

4. Where large acreages of cotton are grown, it is advisable that at least half of the area be planted on early-ploughed land following a summer crop. Only half of the old cotton land would thus be required for the new crop, and usually this could be ploughed in time to conserve an appreciable amount of any winter rains occurring.

5. Rotations of either sorghums and cotton, panicums and cotton, or maize and cotton are suitable for the rich alluvial soils.

6. Rotations of either cotton, cowpeas, and sorghums, or cotton, cowpeas, and panicum are suitable for the poorer alluvial soils and clay or clay loam forest slopes.

7. During the first two or three seasons after either forest or scrub soils are brought under cultivation, profitable yields of cotton can be confidently expected under a wide range of climatic conditions.

8. It is possible that on the rich alluvial and scrub soils a rotation where three years of Rhodes grass is followed by one year cotton, one year maize or panicum, and one year cotton, after which the land will be put back again into Rhodes grass for three years, may likewise be of marked value under a wide range of climatic conditions.

9. Ploughing early to a depth of 6 in. and preparing the seed-bed by the end of July, if possible, will give gains in yields over a series of years.

10. Late cross-ploughing should be avoided, if possible—it drys out the upper soils, and thus necessitates very good planting rains being experienced if the cotton seedlings are to be able to withstand early dry conditions.

11. If it is necessary to follow cotton with cotton, it is advisable to cut and burn the old stalks, and plough as early as possible. The new crop should be planted in the middles between the old rows, rather than again on top of them.

WHEAT PRICES.

The following table, compiled from figures supplied by the New South Wales Government Statistician, show the average yearly price for wheat on the Sydney market since 1890:—

Year.	Average Price for Year.	Year.	Average Price for Year.	Year.	Average Price for Year.	Year.	Average Price for Year.
	s. d.		*s. d.*		*s. d.*		*s. d.*
1890 ..	3 7¼	1901 ..	2 8	1912 ..	4 1	1923 ..	5 3½
1891 ..	4 3	1902 ..	4 5	1912 ..	3 2¼	1924 ..	5 5
1892 ..	4 8½	1903 ..	5 1¾	1914 ..	4 1½	1925 ..	6 2¼
1893 ..	3 6½	1904 ..	3 2	1915 ..	5 5	1926 ..	6 2
1894 ..	2 9½	1905 ..	3 5	1916 ..	4 10	1927 ..	5 5
1895 ..	3 4	1906 ..	3 3½	1917 ..	4 9	1928 ..	5 1¼
1896 ..	4 3¼	1907 ..	3 10	1918 ..	4 9	1919 ..	4 6¼
1897 ..	4 5¾	1908 ..	4 3½	1919 ..	5 1½	1930 ..	3 10¼
1898 ..	3 8	1909 ..	4 9	1920 ..	8 7¼	1931 ..	2 4½
1899 ..	2 9	1910 ..	3 10	1921 ..	8 8	1932 ..	3 0¾
1900 ..	2 8½	1911 ..	3 6	1922 ..	5 8		

ABNORMAL FERMENTATIONS IN MILK AND CREAM.

By O. St. J. KENT, Dairy Branch.

Each month an article dealing with one of the milk fermentations will be published, in order that the dairy farmer may gain information about those processes which continually militate against him in his efforts to produce high-quality milk and cream.—Ed.

MILK and cream, along with other dairy products, are very susceptible to processes known as fermentations. These processes may produce lactic acid, gassiness, ropiness, colour change, differences in flavour and aroma, sweet curdling, and other defects which are usually so detrimental to the quality of the milk and cream as to convert them into second or lower-grade products. Milk and cream of low grade mean lower prices to the farmer and lower quality butter and cheese.

A fermentation in milk may therefore be described as a process which brings about one or more of the changes mentioned above, as a result of the activity of microbes.

Normal and Abnormal Fermentations.

Fermentations may be divided into two groups, the normal and abnormal. The most common change occurring in milk is the souring of milk or the development of lactic acid, with its subsequent coagulation of the casein. The process which brings about the change is known as the lactic acid fermentation, and on account of the regularity with which this change takes place it is looked upon as the normal fermentation of milk. Those processes which bring about other changes in milk, such as gassiness, ropiness, &c., are known as the abnormal fermentations of milk.

It frequently happens that milk or cream may develop more than one type of fermentation. Gassiness may occur along with a bad flavour, or ropiness may appear at the same time as a bad flavour. Such mixed fermentations may be caused by the one organism or as a result of the combined efforts of more than one organism. The activity which one group of microbes may display is exemplified by the Escherischia-Aerobacter group. This one group has been shown to produce acidity, gassiness, off flavours and aromas, and even ropiness in milk.

ROPINESS OR THE ROPY FERMENTATION.

Ropiness in milk and cream is brought about by bacteria or microbes, which so change the consistency of these products that they can be drawn out into threads or masses. The extent of this defect varies considerably. Sometimes the change is so slight that it can scarcely be detected, whilst in other cases the milk or cream can be drawn out into long threads a yard or more in length and as fine as silk. Sometimes it assumes a doughy consistency, and is so viscous that a vessel containing it can be inverted without spilling. If ropiness is at all pronounced in cream it can be detected by passing a fork or spoon through it, when the threads will be readily observed.

Ropy and Gargety Milk.

It is essential to point out the difference between ropy milk and milk infected with garget. Gargety milk is milk from abnormal udders, and is due to masses of fibrin and leucocytes thrown out by the udder tissues in response to an infection. In ropy milk the consistency is due solely to the growth of bacteria in what was originally a normal product. Gargety (or stringy) milk shows the abnormal condition at the time it is drawn, and if not evident from the appearance of the milk itself, it is commonly recognised by the material collecting on the strainer cloth.

Ropiness does not show until at least twelve hours after the milk has been drawn.

Importance of Ropiness.

Ropiness is one of the common abnormal fermentations of milk and cream. It causes annoyance to all persons concerned, but mostly to the producer himself. In case of delivery of milk for household consumption, the milk may appear quite normal when delivered, but ropiness may show up after being held for a time by the consumer. The consumer very often assumes that the ropy condition is brought about by some disease in the producing animal, and unless the producer can quickly control the trouble, a big loss of customers is likely to take place. As a matter of fact the organisms causing ropiness appear to be harmless to human beings. In butter and cheese manufacture ropy milk and cream are undesirable on account of the serious defects in quality they are likely to produce.

Organisms Causing Ropiness.

The organism usually causing this defect is *Bacterium viscosum*, which was first isolated from water. It has been often isolated from ropy milk, and is considered to be the most common cause of ropy milk. *B. viscosum* is an organism that requires air for its development, so that ropiness is more often detected in the cream on milk which has been allowed to stand. The organism grows at fairly low temperatures, such as 50 degrees F., although growth is faster at higher temperatures. It has been shown that the organisms secrete gums and mucins, substances which are responsible for the ropy condition which is characteristic of this fermentation.

In addition to *B. viscosum* there are other organisms which produce ropiness. The Escherichia-Aerobacter group have been shown to be the cause of many epidemics of ropiness. This group also produces acid and gas, but when ropiness is present the acidity and gas is not very greatly pronounced.

Quite a number of other organisms have been shown to produce ropiness, but their importance is not so great as *B. viscosum* and the Escherichia-Aerobacter group.

Sources of Ropiness.

The source of the organism is of great importance in any epidemic of ropiness. The original source is often difficult to trace, because once the organism becomes established it contaminates all utensils and material that come in contact with the milk. Many sources have been examined during investigations of ropiness. Milk within the udder has been shown to be free of ropy oroganisms, and is not considered to be a likely source. The organism therefore infects the milk from some external source.

Surface waters have been shown to be a frequent source of ropiness. The coats, flanks, and udders of cows become contaminated, and during milking material falls into the milk from the flanks and udders. In addition to surface water on the farms, water from troughs, cooling tanks, and similar places must be considered as likely sources. The utensils naturally become a source of the trouble unless great care is taken in the cleaning and scalding of them.

Control of Ropiness.

It is necessary to deal with the original source of the trouble before ropiness can be effectively controlled. Thorough cleansing and scalding of utensils will only give temporary relief unless the original cause is removed. It is necessary then, first of all, to move all cows from low-lying lands holding surface water to higher and better drained paddocks. Having done this, attention should be given to the utensils. Thorough cleaning and scalding with plenty of boiling water will usually get rid of this trouble. Attention should then be given to the flanks and udder of the cow, which should be properly cleaned with a clean rag and non-odourous disinfectant solution. The control of a ropy milk outbreak is not an easy matter, as there is very likely to be a recurrence of the epidemic if attention to details is neglected.

Pasteurisation of milk will prevent the development of the organism, but pasteurisation plants do not like accepting ropy milk on account of the trouble it is likely to cause. Pasteurised milk has been known to develop ropiness, but it has been traced to contamination from the plant equipment. As on the dairy, the method of control in factory or milk plant involves thorough cleansing and disinfection of the parts affected.

ONION TRIALS IN CENTRAL QUEENSLAND.

By C. S. CLYDESDALE, Senior Instructor in Agriculture.

IN Central Queensland the seasonal period suited for the production of onions is of shorter duration than in the southern portion of the State, and invariably terminates during the plant's latter stages of growth with warm to hot weather and a pronounced scarcity of rain.

The object, consequently, in establishing onion trials in the Central District was to discover a variety of early maturing habits and reasonably good keeping qualities. Early maturity was desired to allow of maximum bulb development during the cool winter and more congenial months, and to provide supplies of onions for the Central and Northern markets in advance of Southern consignments.

1930 Trials.

The varieties experimented with were as follows:—

Brown Spanish;
Extra Early Golden Globe;
Silver King;
Early Barletta;
Odourless.

Two American varieties were also included in the original trials, but the seed, unfortunately, arrived late in the season, and was planted on land which could not be irrigated. A good germination was secured, but the resultant bulbs only attained a diameter of approximately 1¼ inch. Since the area under crop was materially very small, the yields were not computed.

Six plots were arranged for on the following farms, in the respective districts:—

R. E. Wilmott	Theodore
J. A. Bowman	Theodore
J. E. Freeman	Theodore
R. A. Lees	Theodore
Brown and Sons	Archer
A. E. Fisher and Sons	Gracemere

The Archer plot was watered by the spray irrigation while those in the Theodore district were watered by the flood system. These plots were planted during the latter end of March, and the Gracemere area was sown in May.

With the exception of Odourless, which failed, a very satisfactory germination was obtained from the respective varieties in all plots. The rainfall during growth was the best received for several years and, forced by irrigation, a large proportion of the crop developed thick necks and ran to seed, several of the trials thus being rendered valueless, and were not harvested.

The seeding appears to have been characteristic of the crops in other portions of the State, and may have been the result of seasonal conditions accentuated, in the case of the trial plots, probably by very early planting.

Results.

R. E. WILMOTT, THEODORE.

Sown	25th March, 1930
Harvested	17th November, 1930

Variety.	Tons per Acre.	Smaller Ill-shaped.	Marketable.
Brown Spanish	14·12	·10	14·02
Extra Early Golden Globe	15·8	1·5	14·3
Silver King	8·2	3·6	4·6
Early Barletta	Not harvested		

Rainfall: 15.81 inches.

Irrigated previous to planting and six weeks previous to harvesting.

A. E. FISHER AND SONS, GRACEMERE.

Sown .. .. 3rd April, 1930
Harvested .. .. 7th December, 1930

Variety.	Tons per Acre.	Smaller Ill-shaped.	Marketable.
Brown Spanish	8·4	Negligible	8·4
Extra Early Golden Globe	11·8	Not computed	11·8
Silver King	7·4	·5	6·9
Early Barletta	6·8	·3	6·6

Rainfall: 20.24 inches.

Of this total 15.25 inches fell within seven weeks of sowing.

Remarks.

Brown Spanish.—Fairly uniform, firm, and good keeper; good marketable shape.

Extra Early Golden Globe.—Fairly high percentage of oversized and split bulbs, lacking uniformity, but firm.

Silver King.—Large proportion thick necks, split, and bad shape; soft and poor keepers.

Early Barletta.—This variety and Silver King being very prone to seed; poor keepers; only serviceable where immediate local sale is available.

These trials confirm results obtained from previous season's trials, and the conclusion drawn from such plots seems to indicate that, even under favourable Central Queensland weather conditions, the growing of onions, except where irrigation is practised, is too precarious to be recommended.

It was also observed that the strains of seed used in Departmental trials varied from the results obtained by the use of other strains and planted commercially, and the 1931 season's trials were designed to test strains from various sources. The trials were confined to irrigated areas, and were located on the properties of Messrs. R. E. Wilmott and J. B. Freeman, respectively. Strains of the variety Brown Spanish were used.

1931 TRIALS.

R. E. WILMOTT, THEODORE.

Sown .. .. 6th April, 1931
Harvested .. .. 11th November, 1931

Strain.	Origin.	Strike per Yd.	Yield. Tons per Acre.	Percentage.	
				Large.	Small.
Hunter River Early	A	7·5	15·62	88	12
Ditto	B	6·0	10·93	41	59
Ditto	C	7·6	15·64	76	24
Ordinary	A	5·4	8·98	66	34
Ditto	B	Not harvested			
Long Keeping	A	Failure—Ran to neck			

Rainfall: 13.89 inches.

Irrigated previous to planting and on 30th August, 1931. Bulbs having formed during August.

J. E. FREEMAN, THEODORE.

FIRST PLANTING.

Sown .. .. 5th May, 1931
Harvested .. .. 12th November, 1931

Strain.	Origin.	Strike per Yd.	Yield. Tons per Acre.	Percentage. Large.	Percentage. Small.
Hunter River Early	A	7·8	13·68	74	26
Ditto	B	7·3	13·68	73	27
Ditto	C	8·6	13·32	75	25
Ordinary	A	Ran to neck, unsuited for market, and not harvested.			
Ditto	B				
Long Keeping	A				

Rainfall: 11.84 inches.

Irrigated previous to planting, and on 2nd July, 1931, 3rd August, 1931, and 1st September, 1931.

SECOND PLANTING.

Sown .. .. 5th June, 1931
Harvested .. .. 14th January, 1932

Strain.	Origin.	Strike per Yd.	Yield. Tons per Acre.	Percentage. Large.	Percentage. Small.
Hunter River Early	A	7·3	10·21	85	15
Ditto	B	7·5	10·43	85	15
Ditto	C	8·1	11·12	90	10
Ordinary	A	Ran to neck.	Not harvested.		
Ditto	B				
Long Keeping	A				

Rainfall: 14.04 inches.

Irrigated after sowing (5th June, 1931) and 10th August, 1931, 11th September, 1931, and 13th October, 1931.

COLLECTIVE RESULTS.

Strain.	Origin.	Average Yield.
Hunter River Early	A	13·17
Ditto	B	11·68
Ditto	C	13·36
Ordinary	A	8·98 (one plot only)
Ditto	B	—
Long Keeping	A	—

Conclusion.

Summarising the results of the trials of the different strains and varieties, the final figures prove conclusively that the Hunter River Origin C strain has produced onions of good marketable quality and high yielding capacity.

If you like this issue of the Journal, kindly bring it under the notice of a neighbour who is not already a subscriber. To the man on the land it is free. All that he is asked to do is to complete the Order Form on another page and send it to the Under Secretary, Department of Agriculture and Stock, together with a shilling postal note, or its value in postage stamps, to cover postage for twelve months.

WOOLCLASSING FOR MARKET.

By J. L. HODGE, Instructor in Sheep and Wool.

SHEARING time is harvest time for the grazier, and the utmost care should be taken to see that the clip is so prepared for market as to ensure full value.

It may be taken as a definite fact that the employment of a first-rate man is not only necessary, but profitable to the grower. Apart from the technical knowledge necessary, it is essential that a classer should have other qualities just as important for the smooth and profitable working of a shed. He should be a good man over men, tactful but firm, and with full shed experience. A correct interpretation of classing would be to state that the classer is there to so display the wool for sale honestly that the best financial results will accrue to the owner, and that the buyer, acting for his principals, may, with the least trouble possible, value the wool offered. Should faulty fleeces creep into the lines through indifferent classing, the value to the owner is depreciated by virtue of the fact that the buyer will estimate value on the worst wool in a line displayed for sale. Hence, it is safe to say that when in doubt of the merits of a fleece that fleece should be classed down and not forced up. This practice should follow right through the clip from top lines to stains and locks.

The classes should be determined by the wool available, and every endeavour should be made, where possible, to avoid star lots.

Employ only first-class men in the capacity of woolclassers. Others cost the owner the same amount of money, and may do the clip much harm financially. A good man makes for the owner a great deal more money than his wages.

The Classer's Job.

It should be the endeavour of the classer to get his lines of fleece wool as even as possible, having regard to condition, quality, yield, colour, length, &c.

The number of fleece classes depends entirely upon the size of the flock operated upon and the evenness or otherwise of the wool cut. With a station clip as many lines may be safely made as the conditions demand, on account of the fact that one has the quantity of wool to work on. This does not always apply with the selector's clip, and overclassing in this case is a distinct mistake. Five bale lines, however, should be turned out when this is possible. Some of the most faulty work in a shed nowadays is to be noticed in the skirting, and this does not only apply in the matter of careless work, but also in the matter of overskirting. This work is often, too often, performed by unskilled men who treat every fleece in the same manner unless checked by the classer. Every pound of wool needlessly removed from the fleece means a distinct loss per lb. of the amount of the difference between the prices realised for broken and fleece wool. Too often one sees a clip so classed that the number of bales of broken and pieces taken together aggregate as much as the fleece wool. In ninety cases out of one hundred this is wrong, and may be put down to overskirting. Certain circumstances demand different treatments. For instance, in the case of burr or seed in wool it becomes necessary to free the fleece, if possible. Here heavy skirting is right, but there is a definite reason for it.

Piece-picking.

Piece-picking is an important part of the operation to which, generally speaking, insufficient care is given. Here, again, in many cases, the work is carried out by unskilled hands. It is the duty of the classer to carefully watch this work. Badly picked pieces showing stains are a direct loss. As this phase of the work is probably the most hurried in the shed, it is a distinct advantage to employ, when possible, men accustomed to the work.

The belly wool should be carefully gathered from the board and shaken free of locks and fribs. In the case of wether and ram bellies the pizzle pieces should be carefully removed and placed in boxes or baskets, to eventually find their class in the stained pieces. Where time permits and it is thought worth while by the classer all belly wool should be skirted, the skirts removed going to the stained pieces.

Locks consist of two sorts. Table locks are those which fall through the rungs of the tables used for skirting and rolling. Board locks consist of the sweepings from the board. In these latter are generally many stained pieces, and these should be carefully taken out and conveyed to their proper places. In most cases the board locks remaining go with the table locks.

Lambs' Wool.

Lambs' wool should be separately treated. The wool tables are specially prepared for this work by placing sheets on same with the idea of preventing any of the wool falling through. Generally speaking, the wool is picked up between two boards joined loosely together. If the lambs are anything like even in age it will be found that two classes are sufficient. The one class consists mainly of the body wool containing the longest and brightest wools. The second class is made up of that wool rejected.

With a large flock of lambs, and where the drop has been uneven, the ages of the lambs may make another class necessary.

Pressing the Clip.

Woolpressing is an important item in the general get-up of a clip. The fleece wool should be removed from the bins with as little tearing about as possible. It is not wise to press high-class fleece wools too heavily, but the bale must weigh over 200 lb.

A nice weight for good fleece wools would be anything between 250 and 300 lb.

It should be the endeavour of the classer to see that all bales are as even in size as practicable. This facilitates loading, and is another point in the general get-up of the clip. Neat and careful branding also comes under this heading. The brand should indicate the station and station brand, if desired, the quality of the wool, the sex from which same was derived, and the number. Some selling agents like the brand on the bottom of the bale as well as the side, but this is optional. Correct weighing is important, and to save mistakes it is preferable to weigh all bales immediately they leave the press. Full particulars should be entered in the rough shed book, and at the completion of work for the day copied into the station register. The correct and up-to-date keeping of the register greatly helps the classer in the matter of his periodical reports to the selling agent for the station. The completion of each flock is a handy time for such report, and every endeavour should be made to see that such report arrives at the selling centre before the wool is received into store, thus facilitating the work of the broker.

Unjustifiable Complaints of Faulty Classing.

There has been much newspaper talk lately about faulty classing. There is no doubt that in some cases there is cause for complaint. A visit to the wool stores when the wool is on exhibition before the sales will produce evidence that better work could be done in the cases referred to. However, the complaints have gone too far, and it is ridiculous to suppose that Australian wool in general, or Queensland wool in particular, compares unfavourably in the classing with any other wool in the world. That there is room for improvement in some cases is undoubted, but taken by and large the Australian clip is pre-eminently the best prepared for market in the whole industry.

To a great extent faulty classing, where it exists, is due to the generally depressed prices. Some owners have made the mistake of thinking that any preparation will do whilst prices are so low. This is an obvious error. Now, particularly, is the time when every penny should be striven for, and scientific classing is essential to achieve maximum financial results.

A good classer is always worth very much more to the owner than his actual wages. Therefore, employ only the best in this capacity.

FARM PRODUCE AGENTS ACTS.

A Proclamation has been issued under the Farm Produce Agents Acts, bringing into force the Amendment Act passed last Session.

Regulations under the abovementioned Acts have also been approved, and these embody the Regulations originally in existence, together with additional ones giving effect to the provisions of the amending Act of 1932.

A Regulation has also been inserted, providing that where a farm produce agent has made to a purchaser of bananas sold by such agent, any allowance, whether for short counts, breakages, or immature fruit, he shall clearly show the amount of the allowance and the reason therefor on the account sales rendered by him.

The new Regulations prescribe the Form of Application for a farm produce agent's license, and fix the amount of the bond or security to be given when applying for a license.

In Memoriam.

HENRY WILLIAM MOBSBY, F.R.G.S., F.R.S.A.

THE death of Henry William Mobsby, formerly Artist and Photographer in the Department of Agriculture and Stock, at his home at Indooroopilly on Sunday, 9th April, is recorded with very deep regret. He was in his seventy-third year when the end came after but a brief hour's illness.

A native of Brighton, England, the late Mr. Mobsby received his early education at Hampton Place High School in his home city. He studied art and design at the School of Arts, Brighton, and decorative art under the late A. G. Greysmith, of Brighton and London. A subsequent course in chemistry was followed by a general commercial training. In company with the late W. Jenner, the well-known artist, and his family—Mrs. Mobsby was the eldest daughter of Mr. Jenner—he came to Queensland in 1883 and settled in Brisbane. For some years he taught decorative art at the Central Technical College. In 1897 he was appointed Government Artist and Photographer and was attached to the Department of Agriculture and Stock.

For many years his photographic work was a distinctive feature of this journal, as well as other Government publications. As an exhibition designer and scenic photographer he achieved an Australian reputation, besides becoming well known overseas through his association with Commonwealth displays of primary and other products in Great Britain and other countries. In successive years he

designed and helped in the organisation of Queensland exhibits for the great annual shows in the southern capitals. At the Royal National Exhibition in Brisbane each year his work in court design and layout invariably won high commendation. In 1908-9 Mr. Mobsby designed the Queensland Court at the Franco-British Exhibition, and travelled as State representative to London with the late J. M. Campbell to supervise the construction of the layout, design trophies, and formulate a colour scheme.

While in England he exhibited Queensland products at Newcastle, Lincolnshire, and Gloucestershire; also at Aberdeen in Scotland and Dublin in Ireland. When Sir H. Tozer was Agent-General he transposed Gattis Restaurant, in the Strand, to the present Agency-General, supervising fitting up, furnishing, and laying out the first display of Queensland products in London.

In 1915 Mr. Mobsby designed and supervised Queensland's Court at the Panama-Pacific Exposition at San Francisco, and was afterwards appointed Acting Commissioner in Charge by the Queensland Government. He was also appointed by the authorities of the Panama-Pacific International Exposition to act on the jury of awards in the wine section, for which he was awarded a medal for special services. While in America Mr. Mobsby gained a diploma and medal for photography, also a certificate of efficiency in motion picture work.

After assisting in the Australian Natives' Association Exhibitions at Melbourne and the Peace Exhibition at Adelaide, Mr. Mobsby was in 1924 appointed by the Government to the Wembley Commission as State organiser for the Exhibition at Wembley, England. He then went to London by appointment of the Federal Government as display officer at Wembley.

In intervals between exhibitions Mr. Mobsby visited all parts of the State as official photographer, obtaining pictures of the industries associated with his Department, also scenic views which have been used for technical and other publications and lectures all over the world; as well as supplying the Tourist Bureau with pictures for advertising Queensland's productive wealth and scenery, also Departmental record and specimen work in animal and plant pathology by ordinary and micro-photography.

1925-26 Mr. Mobsby was appointed by the Government to organise and design the Queensland Court at the New Zealand and South Seas Exhibition at Dunedin, New Zealand, and afterwards supervised its construction. He also acted as the Queensland Government representative in charge during the currency of the Exhibition.

The late Mr. Mobsby was a Fellow of the Royal Geographical Society and a Fellow of the Royal Society of Artists. In his art he also held a Senior Diploma of the Chamber of Commerce, London; Senior Diploma, City and Guilds, London; Senior Diploma, Cripplegate Institute, London (for theoretical and practical photography); and was a medallist in a world's photographic competition. He was for many years honorary lanternist to the Royal Geographical Society of Queensland. On occasions he was associated with the visits to Queensland of high dignitaries, among whom were the Prince of Wales and the Duke and Duchess of York.

The late Mr. Mobsby was endowed with a personality that attracted friendship wherever he went, and in the course of his travels in other parts of the Commonwealth and abroad he sought every possible opportunity of giving appropriate publicity to the great natural advantages and resources of Queensland by means of picture, pen, and the lecture platform. He was also an ardent seeker after information of advantage to Queensland in the extension of its commercial activities, both interstate and overseas. He was personally instrumental in securing many valuable settlers for Queensland, and generally he gave of his best to the State in his long career of useful public service.

In the presence of members of his family, many old colleagues in the Public Service, and a large gathering of other representative citizens, the late Mr. Mobsby was laid to rest on Monday, 10th April, in the Toowong Cemetery on the brow of a high knoll overlooking the winding river and the city of hills he loved so well. At the funeral Mr. Sydney S. Hooper, of the Department of Agriculture and Stock, represented His Excellency the Lieutenant-Governor (Sir James Blair, Kt.); the Minister for Agriculture and Stock (Hon. Frank W. Bulcock) was represented by Messrs. E. Graham and R. Wilson, Under Secretary and Assistant Under Secretary, respectively. Expressions of sympathy were received by the bereaved relatives from many parts of the Commonwealth, and also from New Zealand.

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Book of Australian Illawarra Shorthorn Society, Jersey Cattle Society, and Ayrshire Cattle Society, production charts for which were completed during the month of March, 1933 (273 days period unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORNS.				
MATURE COWS (OVER 5 YEARS), STANDARD 350 LB.				
Kilbirnie Ethel III.	Macfarlane Bros., Radford	14,176·75	628·843	Mowbray of Darbalara
Kilbirnie Violo V.	ditto	13,807·5	549·893	ditto
Westbrook Violet 8th	C. O Sullivan, Greenmount	11,079·07	458·443	Sheik of Upton
Laura of Happy Valley	R. R. Radel, Coalstoun Lakes	8,246·3	377·223	Molly's Hero of Glenthorn
Jean 2nd of Euroa	H. T. Lindenmayer, Binjour	9,261·4	370·098	Dandy of Homelea
SENIOR, 4 YEARS OLD (OVER 4½ YEARS), STANDARD 330 LB.				
Ursula of Cedar Grove (251 days)	W. J. Freeman, Rosewood	10,210	483·126	Mabel 2nd Victor of Coral Grove
Favourite 3rd of Morden	R. Mears, Toogoolawah	11,259·35	449·828	George of Nestles
Gentle Lady of Coral Brae	W. J. Freeman, Rosewood	8,747·5	348·309	Fussy's Charmer
SENIOR, 3 YEARS OLD (OVER 3½ YEARS), STANDARD 290 LB.				
Lorna of Greenfields	S. Henry, Goomboorian	12,552·25	423·412	Darcy of Springdale
JUNIOR, 3 YEARS OLD (UNDER 3½ YEARS), STANDARD 270 LB.				
Princess of Trevlac	W. J. Freeman, Rosewood	9,088	337·586	Butter Boy
SENIOR, 2 YEARS OLD (OVER 2½ YEARS), STANDARD 250 LB.				
Cosey Camp Nanny 14th	C. O Sullivan, Greenmount	7,939·5	363·344	Handsome's Beau of Cosey Camp
Happy Valley Lovely 2nd	R. R. Radel, Coalstoun Lakes	5,535	251·55	Molly's Hero of Glenthorn

JERSEY.

MATURE COW (OVER 5 YEARS), STANDARD 350 LB.

Trecarne Rose II.	D. R. Hutton, Cunningham	8,170·25	403·939	Oxford Palatines Sultan

SENIOR, 3 YEARS OLD (OVER 3½ YEARS), STANDARD 290 LB.

Pineview Jewel	J. Hunter and Sons, Borallon	6,593·46	431·329	Oxford Buttercup Noble
Rosevale Pet Fox	H. T. Rowe, Kenilworth	6,196·05	331·229	Prince Victor of Banyule

JUNIOR, 2 YEARS OLD (UNDER 2½ YEARS), STANDARD 230 LB.

Creamlass of Rosedale	Wakefield Brothers, Atherton	5,149·9	293·299	Carnation Lad
Glenview Twylight	F. P. Fowler and Sons, Coalstoun Lakes	4,108·35	259·203	Carlyle Larkspur 2nd Empire

AYRSHIRE.

JUNIOR, 2 YEARS OLD (UNDER 2½ YEARS), STANDARD 230 LB.

C. F. Jessie	J. C. Mann, Yarranlea	6,934·93	256·966	Longlands Roland

Answers to Correspondents.

Cape Cotton.

P.P.A. (Lamington)—

The specimen is *Gomphocarpus fructicosus*, a native of South Africa, now a common naturalised weed in Queensland and New South Wales. It is commonly known as Cape Cotton or Balloon Cotton. It is quite an ornamental plant and is sometimes seen in gardens, but it can become a great pest. We have seen farms on the near north coast almost smothered with it. The plant belongs to a dangerous family, the *Asclepiadaceæ*, and although stock rarely touch it, we have little doubt that the plant is poisonous.

Thorn Apple.

J. H. McC. (Hughenden)—

The specimen forwarded is *Datura metel*, a species of Thorn Apple, a native of tropical America, but now naturalised in many warm countries. It is much less abundant in Queensland than the allied *D. stramonium*. We have no particular knowledge regarding the properties, but should say that there is little doubt that, like other members of the genus, it would be decidedly poisonous.

BUTTER BOARD.

CONSTITUTION AMENDED.

AN Order in Council has been issued under the Primary Producers' Organisation and Marketing Acts amending the constitution of the Butter Board in certain particulars. The Order provides for the rescission of certain clauses in the Order in Council constituting the Board and for the substitution of new ones therefor. A new clause provides that the Board shall consist of six representatives and the Director of Marketing, and that the existing Board members shall continue to hold office.

At present the Board members are elected from six divisions arranged according to factories—that is, the supplier votes for the division in which is included the factory to which he sends his cream.

Another clause will now provide that at future elections of growers' representatives the State shall be deemed to be divided into six geographical divisions, consisting of Northern, Central, South-Western, Southern, North Coast, and South Coast Divisions.

The present constitution provides that the electors shall be—

(*a*) The individual suppliers to the various factories;

(*b*) The factories.

The amended clause provides that the voters in an election or referendum shall be—

(*a*) Factories holding a license to manufacture;

(*b*) Cream suppliers.

Every butter factory shall be entitled to one vote, and every cream supplier to one vote in the division in which the factory is situated. In the event of a cream supplier having supplied cream to two or more factories in different divisions, he shall elect in which division he shall exercise his vote, and give notice of such election to the Returning Officer three days before the date of the election or referendum.

It is further provided that, for purposes other than a referendum or election, the persons who shall be deemed to be growers of the commodity shall be those who produce the commodity—that is, the factories only.

In the present constitution, the Board is empowered to make levies upon butter factories, and an amendment empowers the Board to make levies upon such companies, associations, firms, and persons as are necessary.

General Notes.

INEXPENSIVE FARM PAINTS AND LIMEWASHES.

Farmers who wish to paint portions of their own premises but are not certain about the method of mixing the paint may find the following information useful:—

Water Paint Recipes.

One of the most enduring, preservative, handsome, and inexpensive paints for outhouses and for rough structures that it is possible to prepare is a paint that costs little more than whitewash, unless the skim milk used has a special value. The following is the recipe:—

Stir into one gallon of whole milk, skim milk, or even sour milk or buttermilk, about 3 lb. of Portland cement. Add to this Venetian red or any other dry colouring pigment to produce any tint desired. The milk will hold the pigment or paint powder in suspension, but the cement, being very heavy, will sink to the bottom, so that it is necessary to keep the mixture well stirred with a clean flat stick. There are only two drawbacks to this paint; the one is that it has to be stirred frequently and nthe other is that it eeds to be made afresh for each day's work. Six hours after painting this composition can neither be rubbed off nor washed off, unless special and extraordinary means are taken to that end. In America there are buildings twenty years old, the wood of which has been well preserved and the surface of which is still clean and uniform in colour. Whole milk is better than skim milk, because there is more oil in it, and this is the constituent that sets the cement.

When Milk is Scarce.

Another good whitewash recipe for use where milk is scarce or expensive is the following:—

Take 6 lb. of quicklime and sprinkle on this by degrees about a gallon of water; when it becomes hot and the quicklime swells and cracks sprinkle more water. A little later pour on 4 or 5 gallons of fresh water and mix the whole with a stick. Then take about 1 lb. of alum, break it into small pieces and melt it over a fire with a little water. The alum makes the whitewash stick well to the wood so that it does not come off on one's clothes or hands. In the absence of alum ordinary cooking salt can be used, but alum is preferable. This whitewash can be applied quickly with a broad whitewash brush.

Clean, Bright Whitewash.

A clean, bright whitewash that will not wash off an outside wall with rain is made up as follows:—

Twenty-eight lb. of unslaked lime, 14 lb. of salt, 3 lb. ground rice, ½ lb. powdered whiting, 1 lb. pipeclay, 5 gallons of hot water. Slake the lime with warm water and keep it covered during the process to keep in the steam. Strain the liquid through a fine sieve. Add the salt dissolved in warm water. Boil the rice to a thin paste with water and stir it in boiling hot. Then add the whiting, the clay dissolved in water, and also 5 gallons of hot water. It must then be heated again and applied hot.

For Indoor Work.

A whitewash that is reliable and particularly suitable for indoor work is made as follows:—

Make a paste of 50 lb. of hydrated lime in boiling water, or about 5 lb. of quicklime may be slaked in 7½ gallons of water, keeping the vessel well covered and stirring occasionally. To this is added about 10 lb. of common salt dissolved in hot water, 3 lb. of rice flour boiled to a thin paste, which should be stirred in while hot, ½ lb. Spanish whiting, and 1lb. of glue thoroughly dissolved in boiling water. Mix well in the order mentioned above and allow the mixture to stand several days before it is applied. It should be put on with a brush or spray as hot as possible.—"Farmer and Settler."

Staff Changes and Appointments.

Constable V. G. W. Tuckey, Walkerston, has been appointed also an Inspector under the Slaughtering Act.

Acting Sergeant G. Beale, Windorah, has been appointed also an Inspector under and for the purposes of the Brands Acts.

Mr. K. V. Henderson, Field Assistant, Cotton Section, Department of Agriculture and Stock, has been appointed also an Inspector under the Diseases in Plants Acts at Monto.

Levies on Apples and Grapes.

Regulations have been issued under the Fruit Marketing Organisation Acts empowering the Committee of Direction of Fruit Marketing to make levies on growers of apples and grapes in the Stanthorpe district. The district referred to comprises the area within a radius of 40 miles from Wallangarra, and containing the railway stations of Wallangarra to Dalveen, both inclusive, and Amiens to Fleurbaix, both inclusive. The levies will operate for twelve months from the 1st February, 1933.

In the case of apples, the levy is at the rate of 10s. per ton (40 bushel cases or 80 half-bushel cases to be computed as a ton, and other containers at actual weight) or proportionately for each fraction of a ton railed from any of the abovementioned stations, or marketed otherwise. A minimum of twopence will be payable in respect of any consignment. The levy is not payable on consignments to the C.O.D. of apples in cases for export, or factory apples railed in bags. The levy is payable to the Railway Commissioner on behalf of the C.O.D.

The sums raised by the levy will be expended in payment of costs attached to the collection of the levy, and the balance shall form part of the Apple Stabilisation Scheme Fund for the benefit of the Stanthorpe district growers.

Regarding the grape levy, this is at the rate of 6s. 8d. per ton (80 half-bushel cases computed as 1 ton), and a proportionate part of such amount for each fraction of a ton railed from the stations in the area described. A minimum levy of 1d. is imposed. No levy will be payable on grapes in cases for export if consigned to the C.O.D., Brisbane. The levy is payable to the Railway Commissioner on behalf of the C.O.D.

The C.O.D. will advertise all particulars of the levies.

The sums raised by the grape levy will be expended, firstly, in payment of expenses, and the balance shall form part of the Grape Export Scheme Fund for the benefit of the growers concerned.

Removal of Grape Plants within the Brisbane Area Prohibited.

An outbreak of grape phylloxera has been reported in the Pinkenba district, and in order to take steps to cope with the pest, a Proclamation under the Diseases in Plants Acts has been issued, declaring the area of the City of Brisbane as a quarantine area for the purposes of the Acts, and also prohibiting the removal from any nursery, orchard, or place within the boundaries of such area, of all plants of the genus Vitis, with the exception of the fruit.

The Sheep Blowfly Problem.

It is estimated that in a year when sheep blowfly is bad upwards of £4,000,000 is lost by Australia as a result of infestation, and it may safely be said that there is no subject on which sheepowners are more urgently in need of authoritative information and advice. There should be a wide demand, therefore, for the joint report just issued by the Council for Scientific and Industrial Research and the New South Wales Department of Agriculture. Both have investigated different phases of the blowfly problem, and the report represents the efforts of a committee established to co-ordinate the work of the two bodies and to advise generally in regard to the initiation of investigations into other aspects of the main problem. It summarises and discusses in popular terms all the known methods of prevention and treatment of fly strike, and is the most significant and comprehensive contribution on this subject to date.

The report comprises 136 pages of subject matter, together with a number of text figures of larvæ, traps, &c., a number of photographs of interest and a coloured frontispiece showing each individual species of blowfly associated with strike. By reference to this frontispiece and to the accompanying descriptions, it will be possible for anyone to determine the nature and importance of any blowfly.

The various sections of the report deal with such matters as primary, secondary, and tertiary flies, factors influencing fly abundance, the susceptibility of individual sheep, crutching, jetting, swabbing, dipping, dressings, breeding to reduce susceptibility, fold removal operation, biological control, trapping, and carcase treatment, as well as a number of other matters of importance in the control of the pest.

The publication is being issued as Science Bulletin No. 40 of the Department and Pamphlet No. 37 of the Council. Copies, price 1s. 6d., post free, are available on application to the Council of Scientific and Industrial Research, 314 Albert street, East Melbourne.

Rural Topics.

Combating the Cattle Tick.

Queensland cattlemen will be interested in the subjoined cutting from a recent issue of the "Kansas City Times" (U.S.A.):—

"Splenetic or tick fever in cattle is practically a thing of the past. In fact, ticky cattle have not been even a minor market factor here since 1927, and not an important factor since before the war.

"Of the area originally quarantined, 88 per cent. will have been freed by systematic eradication under the supervision of the Department of Agriculture when the most recent federal order becomes effective—5th December. This order will remove from quarantine 20,290 square miles in Arkansas, Florida, and Texas.

"This release of territory in Arkansas makes it the twelfth State to gain freedom from the quarantine embargo. The States previously released were—Alabama, California, Georgia, Kentucky, Mississippi, Missouri, North Carolina, South Carolina, Oklahoma, Tennessee, and Virginia. After 5th December the area remaining under quarantine will be confined to parts of Florida, Louisiana, Texas, and Puerto Rico."

The Farm Home—Goat's Milk as Food.

Goat's milk can be used wherever cow's milk can; it is in every way as suitable an article of diet as cow's milk. Moreover, goats never suffer from tuberculosis, they are cheaper to buy than cows are, and they can be kept under many conditions where it is impossible to keep cows.

Goat's milk needs to be kept just as carefully from contamination by harmful germs as cow's milk; these germs are generally carried by flies or dust. It therefore needs to be kept *clean, cool,* and *covered.* It should be brought to the boil directly it is received, poured straight into a freshly-scalded jug, cooled down quickly, and kept in the coolest possible place—preferably standing in water in a draught with a saucer resting on a piece of butter muslin covering it. The corners of the muslin should be dipping into the water, thus keeping the milk cool by evaporation. Milk treated in this manner should keep perfectly fresh for at least twelve hours, even in the hottest weather.

To Cleanse Muddy Water.

Water containing mud in suspension is easily clarified by the addition of certain chemicals that cause the minute particles of silt to collect into larger aggregates that settle to the bottom. These flocculations enclose and carry down with them many micro-organisms, eggs of hydatids, &c., and leave the water bacterially purer.

When cheapness and chemical efficiency are considered, the chemicals suited to the purpose are limited to alum, ferric chloride, lime, and an impure sulphate of aluminium called "alumina ferric." Lime is only included in the above list on account of its cheapness, and though not nearly so effective in its action as any of the others, its use is still practical. The proportion of lime to be used will vary according to circumstances, but is approximately 1 lb. to one to two thousand gallons of water. The best agents for the purpose are ferric chloride and alumina ferric.

Experiments carried out with muddy water in an open waterhole showed that, in one case, water was cleared in one night by the addition of ferric chloride at the rate of 1 lb. to 1,000 gallons of water, while in another, five hours only were needed, though in this case 2 lb. of ferric chloride were used to 1,900 gallons of water.

Alumina ferric has also been found to be very effective when used at the rate of 1 lb. to 3,000 gallons of water. Alum is less effective than ferric chloride, pound for pound, experiments indicating that 2 lb. alum is equivalent to 1 lb. ferric chloride.

Ferric chloride and alumina ferric should be applied by dissolving in water, diluting to the required strength, and then throwing the solution over the surface of the water to be cleansed as evenly as possible. The surface layers of the water should be stirred gently with a long pole.—A. and P. Notes, N.S.W. Dept. Agric.

The Home and the Garden.

TOMATO SEED SELECTION.

In selecting tomatoes from which seed is to be saved, only that from the best yielding plants which conform strictly to the characteristics of the variety, both as regards type of vine and type of fruit, should be chosen. Several fruit should be cut open to be sure of the quality. A plant should be chosen that produces a large number of average size tomatoes rather than a plant with two or three large fruits and a number of small ones. Care should be taken to see that the plant is free from disease, as several tomato diseases are transmitted by the seeds.

The best method of separating tomato seed from the surrounding pulp is as follows:—Cut the fruit in halves and scoop the contents into a bucket, and when the latter is about half full, fill up with water. Stand the bucket aside and allow the contents to ferment, which will take from two to six days, according to the warmth of the weather. A froth forms on top of the water when fermentation is sufficiently advanced. Wash the contents of the bucket on a fine sieve or a layer of hessian and the pulp will come right away from the seed, which must be spread out in a thin layer to dry. Rapid drying is important to prevent moulding. When dry, rub the seed in the hands to separate the individual seeds. Seed harvested in this manner has averaged 94 per cent. germination.

As already indicated, selection from a plant which is free from disease is important, but as a further precaution the seeds should be dipped for ten minutes in a solution of mercuric chloride, 1 part in 1,000 parts of water, before planting. Proper precautions must be taken with mercuric chloride where there are children or animals, as it is highly poisonous if taken internally.

THE FARM VEGETABLE GARDEN.

The question of drainage should be considered in relation to all classes of soil, but especially in relation to those that are at all heavy. Neglect to make the necessary provision on such soils explains many failures to get good results from them during the winter months. Now is the time to think of the question of treatment.

Briefly, the objects of drainage are (1) to enable as much water as possible to percolate through the soil, and (2) to prevent the lodgment and stagnation of water on the soil surface by enabling excess quantities of water to be carried away with ease. It is especially necessary, of course, to drain clay soils. If water is allowed to remain on these for long they tend to "puddle," but if the water is drained away the soil does not become so compacted, retaining, instead, a more friable (crumbly) and porous condition.

Drainage may be of two kinds—surface or underground; the latter is the more effective, but it entails more labour and expense. A simple surface drainage scheme consists of shallow trenches running between plot and pathway, and connected up to an outlet at a suitable point. A modified form of surface drainage is expressed in a system of raised beds. Where some form of drainage is necessary, and the installation of the underground system is impossible, either of these methods is to be commended.

Underground drainage necessitates a considerable amount of trench digging. On what plan it is advisable to set out the drains will depend upon the size and contour of the area. In some cases a herring-bone design may be applicable, the main trench forming the backbone, so to speak, and running through the lowest portion of the land and the smaller contributory trenches spreading upwards from this. In other cases it may only be necessary to feed the main trench from one side, while in others again main trenches may best be laid at the edges of the area and fed from the centre. These trenches may then be partially filled with broken stones, and the surface of the filling protected with a layer of tin or brushwood, so that the earth with which it is subsequently overlaid may not drop through and destroy the porous character of the filling.

A drain provided with this rubble filling is usually the most convenient to make, and is quite effective; but a roughly-built conduit or channel may take the place of the broken stones, if desired. This may be made of flat stones or bricks, or (failing either of these) of boards. Only the sides and top need be formed of these materials, the trench floor serving for the bottom. The stones or bricks, or

whatever is used, should only be loosely laid together, so that water may fall into the trench through them and be carried off. In country gardens, where saplings are easily available, these may be used effectively in the bottom of the trench (say a foot deep), covered by a 6-inch layer of brushwood.

The depth at which the drain should lie will depend upon the class of soil, but, needless to say, it should be sufficiently deep to allow of cultivation above it. If there is difficulty in arranging this the scheme should be so adjusted that the drain runs underneath the garden pathways, and not under the beds proper; 2 ft. 6 in. to 3 ft. is usually a satisfactory depth at which to lay a drain in the ordinary household plot.

There is little necessity for drainage on sandy soils, but gardeners working on land of a heavier character should set to work now to repair any deficiency in this direction. If the contour of the plot is regular it is not necessary to do the work all at once. As a section of the plot becomes vacant opportunity may be taken to carry out drainage work on it prior to preparing it for another planting. Then, when each section of the garden has been dealt with, the scheme can be connected up.—A. and P. Notes, N.S.W. Department of Agriculture.

KITCHEN GARDEN.

Cabbage, cauliflower, and lettuce may be planted out as they become large enough. Plant asparagus and rhubarb in well-prepared beds in rows. In planting rhubarb it will probably be found more profitable to buy the crowns than to grow them from seed, and the same remark applies to asparagus.

Sow cabbage, red cabbage, peas, lettuce, broad beans, carrots, radish, turnip, beet, leeks, and herbs of various kinds, such as sage, thyme, mint, &c. Eschalots, if ready, may be transplanted; and in cool districts horse radish can be set out.

The earlier sowings of all root crops should now be ready to thin out, if this has not been already attended to.

Keep down the weeds among the growing crops by a free use of the hoe and cultivator.

The weather is generally dry at this time of the year, so the more thorough the cultivation the better for the crops.

Tomatoes intended to be planted out when the weather gets warmer may be sown towards the end of the month in a frame where the young plants will be protected from frost.

A REMINDER TO ONION GROWERS.

Onion seed growers should, by this, have gone through their selected onions with the object of picking out the best keepers for the production of seed. The bulk of these onions should have been selected, previous to storing, for early maturity and variety characteristics. At the final selection bulbs that are soft or prematurely shooting, or those showing any indication of being bad keepers, or that are diseased, should be discarded.

The bulbs should be planted in rows at least 3 feet apart and spaced 2 feet apart in the rows. A handy position well protected from the boisterous winter winds should be selected for the growing of onion seed.

Farm Notes for June.

FIELD.—Winter has set in, and frosts will already have been experienced in some of the more exposed districts of the Maranoa and Darling Downs. Hence insect pests will to a great extent cease from troubling, and weeds will also be no serious drawback to cultivation. Wheat sowing should now be in full swing, and in connection with this important operation should be emphasised the necessity of at all times treating seed wheat by means of fungicides prior to sowing. Full directions for "pickling" wheat by copper carbonate treatment are available on application to the Department of Agriculture, Brisbane. Land intended for the production of

early summer crops may now receive its preliminary preparation, and every opportunity taken advantage of to conserve moisture in the form of rainfall where experienced; more particularly so where it is intended to plant potatoes or early maize. Where frosts are not to be feared the planting of potatoes may take place in mid-July; but August is the recognised month for this operation. Arrowroot will be nearly ready for digging, but we would not advise taking up the bulbs until the frosts of July have occurred. Take up sweet potatoes, yams, and ginger. Should there be a heavy crop, and consequently a glut in the market, sweet potatoes may be kept by storing them under cover and in a cool place in dry sand, taking care that they are thoroughly ripe before digging. The ripeness may be known by the milky juice of a broken tuber remaining white when dry. Should the juice turn dark, the potato is unripe, and will rot or dry up and shrivel in the sand pit. Before pitting, spread the tubers out in a dry barn, or in the open if the weather be fine. In pitting them or storing them in hills, lay them on a thick layer of sand; then pour dry sand over them till all the crevices are filled and a layer of sand is formed above them; then put down another layer of tubers, and repeat the process until the hill is of the requisite size, and finally cover with either straw or fresh hay. The sand excludes the air, and the potatoes will keep right through the winter. In tropical Queensland the bulk of the coffee crop should be off by the end of July. Yams may be unearthed. Sugar-cane cutting may be commenced. Keep the cultivator moving amongst the pineapples. Gather all ripe bananas.

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

Orchard Notes for June.

THE COASTAL DISTRICTS.

THE remarks that have appeared in these notes for the past two months apply in a great measure to June as well, as the advice that has been given regarding the handling, grading, packing, and marketing of the citrus crop still holds good. As the weather gets cooler the losses due to the ravages of fruit flies decrease, as these insects cannot stand cold weather, and consequently there is only an odd one about. The absence of flies does not, however, permit of any relaxation in the care that must be taken with the fruit, even though there may be many less injured fruit, owing to the absence of fruit-fly puncture, as there is always a percentage of damaged fruit which is liable to speck, which must be picked out from all consignments before they are sent to the Southern States if a satisfactory return is to be expected. If the weather is dry, citrus orchards must be kept in a good state of tilth, otherwise the trees may get a setback. Old worn-out trees can be dug out and burnt; be sure, however, to see that they *are* worn out, as many an old and apparently useless tree can be brought round and made to bear good crops, provided the trunk and main roots are still sound, even though the top of the tree is more or less dead. The whole of the top of the tree should be cut off and only the trunk and such sound main limbs left as are required to make a new head. The earth should be taken away from around the collar of the tree, and the main roots exposed, any dead roots being cut away and removed. The whole of the tree above ground and the main roots should then be dressed with a strong lime sulphur wash or Bordeaux paste. The main roots should be exposed for some time, not opened up and filled in at once. Young orchards can be set out now, provided the ground is in good order. Don't make the mistake of planting the trees in improperly prepared land—it is far better to wait till the land is ready, and you can rest assured it will pay to do so in the long run.

When planting, see that the centre of the hole is slightly higher than the sides, so that the roots, when spread out, will have a downward, not an upward, tendency; set the tree at as nearly as possible the same depth as it was when growing in the nursery, cut off all broken or bruised roots, and spread those that remain evenly, and cover them with fine top soil. If the land is dry the tree should then be given a good watering, and when the water has soaked in the hole can be filled up with dry soil. This is far better than watering the tree after the soil has been placed round it and the hole filled up. Custard apples will be ripening more slowly as the nights get colder. If the weather becomes unduly cold, or if immature fruit is sent South, the fruit is apt to turn black and be of no value. This can easily be overcome by subjecting the fruit to artificial heat, as is done in the case of bananas, during the cooler part of the year, when it will ripen up properly and develop its flavour. Grade custard apples carefully, and pack in cases holding a single layer of fruit only for the Southern markets.

Pineapples, when at all likely to be injured by frost, should be protected by a thin covering of bush hay or similar material. The plantation should be kept well worked and free from weeds, and slow-acting manure, such as bonedust or island phosphates, can be applied now. Lime can also be applied when necessary. The fruit takes longer to mature at this time of the year, consequently it can be allowed to remain on the plant till partly coloured before gathering for the Southern markets, or can be fully coloured for local use.

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

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

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

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

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

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

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

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

AGRICULTURE ON THE AIR.

Radio Lectures on Rural Subjects.

ARRANGEMENTS have been completed with the Australian Broadcasting Commission for the regular delivery of further radio lectures from Station 4QG, Brisbane, by officers of the Department of Agriculture and Stock.

On Tuesdays and Thursdays of each week, as from the 4th July, a fifteen-minutes talk, commencing at 7 p.m., will be given on subjects of especial interest to farmers.

Following is the list of lectures arranged for July and August, 1933:—

SCHEDULE OF LECTURES.

BY OFFICERS OF THE DEPARTMENT OF AGRICULTURE AND STOCK, RADIO STATION 4QG, BRISBANE (AUSTRALIAN BROADCASTING COMMISSION).

Tuesday, 4th July, 1933—"The Boy Employment Problem." J. F. Reid, Editor of Publications.

Thursday, 6th July, 1933—"Diseases of the Flower Garden." R. B. Morwood, M.Sc., Assistant Plant Pathologist.

Tuesday, 11th July, 1933—"Maize Production on the Atherton Tableland." O. L. Hassell, Instructor in Agriculture, Mareeba.

Thursday, 13th July, 1933—"Diseases of the Vegetable Garden." L. F. Mandelson, B.Sc. (Agr.), Assistant Plant Pathologist.

Tuesday, 18th July, 1933—"Tobacco Leaf Qualities." A. Hamilton, Instructor in Agriculture, Dimboola.

Thursday, 20th July, 1933—"Importance of Sanitation in Chicken Rearing." P. Rumball, Poultry Expert.

Tuesday, 25th July, 1933—"Breeding and Marketing Stud Pigs." E. J. Shelton, Senior Instructor in Pig Raising.

Thursday, 27th July, 1933—"Banana Diseases." J. H. Simmonds, M.Sc., Plant Pathologist.

Tuesday, 1st August, 1933—"The Feeding of Chickens." J. J. McLachlan, Poultry Inspector.

Thursday, 3rd August, 1933—"Phylloxera and other Pests of the Grape Vine." Robert Veitch, B.Sc., F.E.S., Chief Entomologist.

Tuesday, 8th August, 1933—"Household Pests." J. A. Weddell, Assistant Entomologist.

Thurdsay, 10th August, 1933—"The Farmer and his Market." J. F. Reid, Editor of Publications.

Tuesday, 15th August, 1933—"Native Grasses." C. T. White, Government Botanist.

Thursday, 17th August, 1933—"A Review of the Dairying Industry. Season 1932-1933." C. McGrath, Dairy Expert.

Tuesday, 22nd August, 1933—"External Parasites and their Effect upon Chickens." P. Rumball, Poultry Expert.

Thursday, 24th August, 1933—"The Marketing of Cockerels." J. J. McLachlan, Poultry Inspector.

Tuesday, 29th August, 1933—"Lucerne." W. Nixon-Smith, B.Sc. (Agr.), Field Assistant, Townsville.

Thursday, 31st August, 1933—"Accommodation for the Pig." L. A. Downey, Instructor in Pig Raising.

CLIMATOLOGICAL TABLE—MARCH, 1933.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.				Total.	Wet Days.
		Max.	Min.	Max.	Date.	Min.	Date.		
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·82	87	75	91	31	72	19, 21, 28, 30	876	13
Herberton	..	83	63	90	13	57	6,12, 14, 28	128	6
Rockhampton	29·86	93	71	100	13	67	2	11	3
Brisbane	29·93	85	68	97	18	61	23	55	6
Darling Downs.									
Dalby	29·89	90	63	101	19	57	23, 31	5	3
Stanthorpe	..	83	56	97	18, 19	41	23	85	3
Toowoomba	..	82	60	95	18, 19	54	31	27	4
Mid-interior.									
Georgetown	29·78		70	99	12,14,15 17,25,28	62	18	239	4
Longreach	29·78	102	76	107	13, 14, 18, 20	70	28	Nil	
Mitchell	29·86	96	66	105	18, 19	57	22	42	3
Western.									
Burketown	29·79	94	77	102	13	73	31	239	3
Boulia	29·79	100	74	108	13	64	31	21	3
Thargomindah	29·83	97	72	107	17, 18	54	22	17	1

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF MARCH, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING MARCH, 1933 AND 1932, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Mar.	No. of Years' Records.	Mar., 1933.	Mar., 1932.
North Coast.	In.		In.	In.
Atherton	8·48	32	2·53	6·46
Cairns	17·98	51	12·48	20·28
Cardwell	15·82	61	2·87	11·14
Cooktown	15·14	57	8·81	19·25
Herberton	7·65	47	1·28	4·10
Ingham	15·76	41	4·96	15·65
Innisfail	26·17	52	10·05	22·77
Mossman Mill ..	17·32	20	12·23	22·83
Townsville	7·40	62	0·33	·7·04
Central Coast.				
Ayr	6·63	46	0·13	2·65
Bowen	5·64	62	0·24	1·69
Charters Towers ..	3·81	51	0·02	3·20
Mackay	11·99	62	0·88	2·58
Proserpine	11·95	30	6·04	4·69
St. Lawrence ..	5·30	62	0·62	0·89
South Coast.				
Biggenden	3·88	34	0·28	0·49
Bundaberg	5·12	50	0·84	0·12
Brisbane	5·71	82	0·55	1·46
Caboolture	7·67	46	1·85	2·39
Childers	4·55	38	0·21	1·48
Crohamhurst ..	11·27	40	2·00	3·06
Esk	4·82	46	0·04	0·59
Gayndah	3·07	62	0·00	0·11
Gympie	6 20	63	0·33	0·77
Kilkivan	3·92	54	0·00	0·27
Maryborough ..	5·94	61	0·96	0·18

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	mar.	No. of Years' Records.	Mar., 1933.	Mar., 1932
South Coast—continued—	In.		In.	In.
Nambour	9·27	37	2·75	3·00
Nanango	3·45	51	0·04	0·85
Rockhampton ..	4·48	62	0·11	0 30
Woodford	7·94	46	1·50	1·90
Darling Downs.				
Dalby	2·71	63	0·05	0·07
Emu Vale	2·40	37	0·00	0·25
Jimbour	2·58	45	0·00	0·59
Miles	2·69	48	0·86	0·70
Stanthorpe ..	2·65	60	0·85	0·65
Toowoomba ..	3·78	61	0·27	0·42
Warwick	2·52	68	0·00	0·13
Maranoa.				
Roma	2·61	59	0·01	1·05
State Farms, &c.				
Bungeworgorai ..	1·55	19	0·75	0·58
Gatton College ..	3·17	34	0·08	0·04
Gindie	2·62	34	..	2·20
Hermitage ..	2·18	27	..	0 07
Kairi	7·09	19	2·55	8·21
Mackay Sugar Experiment Station	10·84	36	0·96	0.76

GEORGE E. BOND, Divisional Meteorologist.

ASTRONOMICAL DATA FOR QUEENSLAND.

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

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	May, 1933.		June, 1933.		MOONRISE. May, 1933.	MOONRISE. June, 1933.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	p.m.
1	6·22	5·17	6·37	5·1	11·40	12·3
					p.m.	
2	6·22	5·16	6·37	5·1	12·24	12·35
3	6·23	5·15	6·38	5·1	1·1	1·6
4	6·23	5 15	6·38	5·1	1·33	1·37
5	6·24	5·14	6·38	5·1	2·5	2·15
6	6·24	5·14	6·39	5·1	2·37	2·47
7	6·25	5·13	6·39	5·1	3·8	3·50
8	6·25	5·12	6·40	5·2	3·45	4·53
9	6·26	5·11	6·40	5·2	4·24	6·0
10	6·26	5·11	6·40	5·2	5·11	7·10
11	6·27	5·10	6·41	5·2	6·10	8·19
12	6·27	5·10	6·41	5·2	7·14	9·27
13	6·28	5·9	6·41	5·2	8·22	10·33
14	6·28	5·9	6·41	5·2	9·30	11·30
15	6·29	5·8	6·42	5·3	10·37	..
						a.m.
16	6·29	5·7	6·42	5·3	11·41	12·25
17	6·30	5·7	6·42	5·3	..	1·19
					a.m.	
18	6·31	5·6	6·42	5·3	12·40	2·15
19	6·31	5·6	6·42	5·3	1·36	3·10
20	6·32	5·5	6·43	5·4	2·30	4·7
21	6·32	5·5	6·43	5·4	3·26	5·0
22	6·33	5·5	6·43	5·4	4·19	5·54
23	6·33	5·4	6·43	5·4	5·16	6·46
24	6·34	5·4	6·43	5·5	6·11	7·35
25	6·34	5·3	6·44	5·5	7·5	8·20
26	6·35	5·3	6·44	5·5	7·59	9·0
27	6·35	5·2	6·44	5·5	8·49	9·34
28	6·36	5·2	6·44	5·6	9·37	10·6
29	6·36	5·2	6·44	5·6	10·21	10·36
30	6·37	5·1	6·44	5·6	11·1	11·6
31	6·37	5·1	..	..	11·33	..

Phases of the Moon, Occultations, &c.

3 May	☾ First Quarter	8	39 a.m.
10 ,,	○ Full Moon	8	4 a.m.
16 ,,	☽ Last Quarter	10	50 p.m.
24 ,,	● New Moon	8	7 p.m.

Perigee, 11th May, at 3.42 a.m.
Apogee, 25th May, at 9.12 p.m.

The Moon will be passing from west to east of Jupiter at 9 p.m. on the 5th. Jupiter will then be 2 degrees northward of the Moon and nearly an hour past the meridian.

Jupiter, which had been moving westward, apparently amongst the stars of Leo, for some months, will resume its direct course eastward after the 10th.

Saturn will be occulted by the Moon on the morning of the 16th soon after 6 a.m. To an observer with a telescope or binoculars this will be an interesting occurrence if the sky is clear.

Mars will be passing Neptune at 6 a.m. on the 17th. The apparent distance between them will be about 1½ times the diameter of the Moon.

Very soon after sunset on the 25th the new Moon and Venus may both be detected by keen observers in the afterglow.

Saturn, which has apparently been moving eastward amongst the stars of Capricornus, will become stationary on the 27th; it will then retrace its steps till on 7th August it will reach almost the same position as on 21st March.

Mercury will be occulted by the Sun on the 28th. No observation will be possible on account of the intense brightness of the Sun. It is only occasionally that a direct line from the Earth to Mercury passes through the Sun. The distance of Mercury from the Earth will then be more than 123,000,000 miles.

Mercury rises at 4.27 a.m. on the 1st and at 5.17 a.m. on the 15th.

Venus sets at 5.28 p.m., 11 minutes after the Sun, on the 1st; on the 15th it sets at 5.41 p.m., 33 minutes after the Sun.

Mars rises at 2.8 p.m. and sets at 1.13 a.m. on the 1st; on the 15th it rises at 1.23 p.m. and sets at 12.36 a.m.

Jupiter rises at 2.37 p.m. and sets at 2.5 a.m. on the 1st; on the 15th it rises at 1.41 p.m. and sets at 1.10 a.m.

Saturn rises at 11.56 p.m. and sets at 1.9 p.m. on the 1st; on the 15th it rises at 11.3 p.m. and sets at 12.16 p.m.

During the evening hours, before midnight, the most noticeable planets will be Mars and Jupiter, both apparently in the constellation Leo; but later in the month Venus will again reappear as an evening star, but only for a short time after sunset.

1 June	☾ First Quarter	9	53 p.m.
8 ,,	○ Full Moon	3	5 p.m.
15 ,,	☽ Last Quarter	9	25 a.m.
23 ,,	● New Moon	11	22 a.m.

Perigee, 8th June, at 1.24 p.m.
Apogee, 22nd June, at 12.18 a.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 23 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

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

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