Supplement to the "Queensland Agricultural Journal," February, 1934.

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QUEENSLAND AGRICULTURAL JOURNAL.

VOL. XL. PARTS 1 TO 6.

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ANNUAL RATES OF SUBSCRIPTION.

Farmers, Graziers, Horticulturists, and Schools of Arts, **One Shilling.** Members of Agricultural Societies, **Five Shillings,** including postage. General Public, **Ten Shillings,** including postage.

VOL. XL. 1 JULY, 1933. PART 1.

Event and Comment.

The Queensland System of Orderly Marketing.

COMMENTING on the published statement of a prominent Southern critic, the Minister for Agriculture and Stock, Hon. Frank W. Bulcock, informed the metropolitan press recently that at the Sydney Conference of Ministers for Agriculture in May, agenda item 56, which was submitted by New South Wales, provided for the introduction, if deemed advisable, of legislation by the Commonwealth and all the States similar to the Federal Act governing the marketing of dried fruits. The Ministerial conference carried a resolution that the Commonwealth Government be asked to introduce legislation, similar to the Dried Fruits Act, providing for the appointment of commodity boards for the control and marketing of farm products. This resolution was subsequently referred to the Hon. F. H. Stewart, M.P., Federal Minister for Commerce, who stated that the policy of the Commonwealth Government had been to assist industry to regulate itself by giving statutory powers to approved control boards in which, after very definite evidence had been adduced, the industry concerned was desirous of such control. He was of the opinion that the Federal Government may lead to this policy rather than adopt a general principle, but he promised to bring before the Federal Cabinet for consideration, as a matter of urgency, the request embodied in the resolution passed by the conference. It would appear from that, said Mr. Bulcock, that the Minister of Agriculture in the Queensland Labour Government is not the driving force urging the general adoption of such legislation. Continuing, he added:—

> It is true that the Theodore Government, some years ago, was responsible for a primary producers' organisation, but my critic is sadly at fault when he suggests, by inference, that a system of organisation was forced on the growers.

No commodity pool is possible in Queensland without the consent of the majority of the growers concerned, and our experience in this State very definitely indicates the advantages of an organised system of marketing. It is significant that chambers of commerce repeatedly urge organisation of the secondary industries, but apparently grudge the primary producer an organisation that he himself controls. Commodity boards do not represent the Crown nor can commodity boards function except with the consent of the producer, and the administration boards are not a charge upon the Crown.

The president of the Associated Chambers of Commerce in the Commonwealth, Mr. Spencer Watts (the critic referred to), makes the statement that "the history of compulsory pools and similar forms of so-called orderly marketing throughout the world has proved calamitous." This, of course, is at variance with the facts of the case. Had they proved calamitous in Queensland, they could not have survived. The fact that they have survived shows that they discharge a need that the grower recognises.

A conference of major importance sitting in London at the present time, dealing with economic world problems of the first magnitude, has devoted quite a lot of its time to the organisation of agriculture, and it is impossible to divorce the organised form of agriculture from organised marketing.

Continuing, Mr. Bulcock said: "State-controlled organisations, so far as pooling is concerned, do not exist in Queensland. They are farmer-controlled in their entirety. I recollect, when Mr. Theodore introduced "*The Primary Products Pools Acts, 1922 to 1923*," the then Opposition suggested just the things that Mr. Spencer Watts has apparently in the back of his mind, including the socialisation of farming. Our first Director of Marketing, Mr. Macgregor, it was alleged, was appointed to socialise primary production, but after several years a change of Government took place and the National-Country Party attained office. During the tenure of office of that party the Primary Producers' Organisation Acts and kindred legislation were not revoked, so that they have definitely stood the test of time and have gained the good opinion of both major political parties in Queensland. Had this legislation been confiscatory in its incidence, or Bolshevik in its tendencies, then is it not safe to assume that the late anti-Labour Government would have displayed great zeal in removing it from the Statute-book?

"Another fact that very clearly emerges is that agriculture in Queensland is on a sounder commercial basis than agriculture in any other State of the Commonwealth. Producers themselves, generally speaking, desire to continue their organisation.

"One of the most important agricultural conferences of recent times assembled in Sydney last month to discuss ways and means whereby agricultural organisation and orderly marketing may be maintained. Would Mr. Spencer Watts suggest that these people do not know their own business, or would he suggest that the farmer must always be a vassal to the commercial interests of a State? However, the policy of the present Queensland Government is to maintain a sound system of orderly marketing, and, in common with Ministers of other States, I very definitely hope that the Commonwealth Government will recognise the magnitude of the issues involved, and will come to the assistance of the States in order that we may consolidate our position. The alternative is economic chaos."

St. Lucia Farm School—Trainees Available for Employment.

AT the end of this month twenty-five boys who will have completed their training will be available for employment in the country; at the end of October another twenty-five will be available for work on farms, and thereafter a similar number will be available every three months. As each group leaves, the place of each member will be filled to keep the strength of the school up to fifty, the prescribed number. At the end of each half-yearly period two boys from each group of fifty will be granted scholarships at the Queensland Agriculturual College at Gatton.

The St. Lucia Farm School was opened under the aegis of the Department of Agriculture and Stock by the Minister, Hon. Frank W. Bulcock, on 31st January, with fifty boys, ranging in age from seventeen to twenty years, all coming from the Greater Brisbane area, and with Mr. F. O. Bosworth, B.A., of the staff of the Queensland Agricultural College and High School, in charge. The Principal has the assistance of a competent field staff, and the curriculum embraces the regular routine of a diversified farm. Practical instruction is also given in all forms of pioneering work, including tree felling, sawing, splitting, fencing, and the general use of bush timber for the hundred and one jobs around a farm. The agricultural and dairying course covers instruction in ploughing, harrowing, sowing, fodder conservation, several branches of animal husbandry, and dairying routine. Officers of the Department of Agriculture and Stock visit the farm daily to give instruction in dairying practice, pig raising, poultry raising, fruit and vegetable growing, botany, soil chemistry, insect and vegetable pest control, and general farming subjects. Besides the farm school proper, a canvas camp has been established in forest land at Moggill, where the boys receive instruction in bush work and obtain and supply fencing and other timber for use at the school. Groups of boys are also sent in turn to Beerburrum, where they receive field instruction in tobacco growing and curing and grading of tobacco leaf. The boys are also taken on occasional visits to the Roma Street produce markets and to the butter factory and piggeries at Kingston.

Piggeries—portable and permanent—have been built by the boys on the farm; five brood sows of the Tamworth and Berkshire breeds are housed there, and litters of pedigree pigs are being raised, chiefly for instructional purposes.

A dairy herd of twenty grade Jerseys is kept. Practical instruction in herd testing is given, and groups of boys visit the Department of Agriculture and Stock in turn for further instruction in this important branch of animal husbandry.

Both disc and mouldboard ploughs are used on the farm, and the boys have been very quick to learn the elementary principles of cultivation. Already they have laid down 2½ acres of lucerne and an acre each of rye and barley. In addition, they have prepared 15 acres for summer crops.

Elementary blacksmithing, handling and care of farm machinery, and the running of internal combustion engines also forms part of the general training.

A fine football field has also been cleared and laid out, also a tennis court.

As to the general character of the boys, no one could meet a brighter lot. On a visit to the farm one is immediately struck with their manly bearing. They are keen, intelligent, and eager to learn all about each job. In short, they represent the average type of healthy Australian young manhood with a high standard of conduct, a good educational grounding, a strong spirit of self reliance, cheerful outlook on life, and a determination to succeed if given the opportunity.

From the foregoing the value of the training received and the character of the boys themselves will be appreciated readily by farmers in need of intelligent and willing assistance on their holdings, and it is believed that there will not be the slightest difficulty in placing the boys in rural employment on completion of their training term. Any farmer needing the services of one or a couple of trainees should place himself immediately in communication with the Lads Employment Bureau, Box 1448T General Post Office, Brisbane. Already a very strong demand for the boys' services has set in, so early application is advised.

The Quality of Queensland Butter.

PROMINENCE has been given to certain figures dealing with the percentages of choice butters exported from the different States, and that these figures, to the uninitiated, reflect on the quality of Queensland butter is the opinion of the Minister for Agriculture, Hon. Frank W. Bulcock, as expressed in the course of recent comment on the butter position.

An analysis of the position shows, he remarked, how really misleading these figures are. The quantities of butter dealt with have reference to the export quota only, and have no bearing on the total production. There is a wide variation in the quantities of butter submitted for export by the different States in comparison with their production. The Commonwealth grading officers examine only the butters submitted for export overseas, and consequently in some of the States they review the quality of a comparatively smaller percentage of the output. All that the Commonwealth figures can really guarantee is that they have found 25.7 per cent. of the production of New South Wales, 32.1 per cent. of Victoria and Tasmania, and 24.8 per cent. of Queensland production to be of choice grade.

All butters sold on the Queensland and interstate markets is of first quality. A more reliable comparison of the efficiency of the industry in this State is obtained by a perusal of the following figures, representing the results of the grading of all butters submitted for export, together with the grading of butters for State and interstate markets, during the past year:—

Choice and first grade, 87.3 per cent.; second grade, 8.4 per cent.; third grade, 4.3 per cent.

There has been a considerable improvement in the output of our factories during recent years, while the fact that our butter factories compare more than favourably in structure, equipment, and management with similar establishments in any other part of the world is the considered opinion of many visitors to our shores who have been in a position to judge.

We realise, however, that there is still room for improvement, and we shall not feel satisfied until practically the whole of our output is of choicest quality. We realise, too, the difficulties associated with the attainment of this objective in a young country of scattered settlement and vast distances. Notwithstanding the difficulties associated with pioneering, much has been done to maintain the high quality of our products.

Bureau of Sugar Experiment Stations.

CANE PEST COMBAT AND CONTROL.

THE GREYBACK BEETLE.

TERMINATION OF GRUB CONDITION.

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.

COMMENCEMENT OF PUPAL LIFE-CYCLE STAGE.

THE coming of July usually denotes cessation of the larval phase of this cane beetle, and the consequent final departure of all third-stage fully-grown grubs from among the cane roots to various depths below basal portions of affected stools in order to assume the pupal stage of growth.

Appearance and Coloration of the Pupa.

The pupa of the greyback is quite the largest of those occurring in plough furrows, full-sized specimens being 1½ inches long by nearly ¾ of an inch across the widest portion, as shown in the illustration (Plate 1). Its general colour is reddish-yellow, which gradually darkens as final transformation into the adult beetle approaches.

Ordering Grub Fumigants for the Coming Season.

Early this month canegrowers should place their orders for carbon bisulphide or paradichlorobenzene with the accountant of the sugar-mill to which their cane is assigned, the quantities asked for depending, of course, in each case on the number of acres to be treated on individual farms.

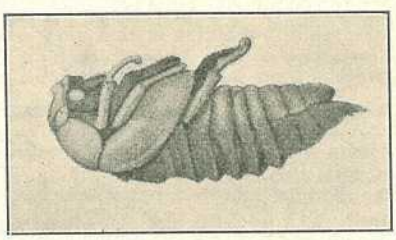


PLATE 1.—Pupa of "Greyback" Cockchafer. (Natural size.)

From £8 to £9 per acre, including labour, is usually allowed for the cost of fumigating a crop. Allowance must also be made for the sacrifice of about 6 tons of the yield of cane expected from the acre to be fumigated. Thus, if the estimated yield be 36 tons per acre, a farmer can, by means of such control work, make sure of ultimately harvesting 30 tons of good mature cane, and of saving next year's ratoon crop. On the other hand, by neglecting to fumigate he not only risks the loss of the entire 36 tons and his ratoons for the following season, but incurs an additional expense of replanting a few months later, to say nothing about the cost of his own time and labour for the past twelve months or more. The price of Dank's hand injector is about £7 5s., plus insurance, packing, &c.; if taken care of these injectors will last for years and give good service.

Destroying Pupae of the Greyback Cockchafer.

Laboratory experiments conducted at Meringa in August, 1921, proved conclusively that pupæ of this insect when lying in compact soil quickly succumb to fumigation with carbon bisulphide. Preliminary field tests conducted in September of the same year demonstrated that these fumes also penetrate the walls of the subterrancan pupal cell of this beetle, injections made at a depth of 8 inches from the surface in ploughed ground proving fatal to pupæ lying at an average depth of 11 inches. Subsequently, in 1923, it was found that ½ oz. injections of carbon bisulphide administered on both sides of the rows of cane which had been destroyed by grubs, and placed 15 inches apart—6 inches from centre of stools and 8 inches deep—yielded excellent results on elevated cane lands which had been ploughed about 9 inches deep. Examination of infested ground twenty-four hours later revealed that the fumes had entered the pupal cells situated fully 18 inches below the surface, and in those where transformation from pupa to perfect insect had taken place had also killed the greyback beetles.

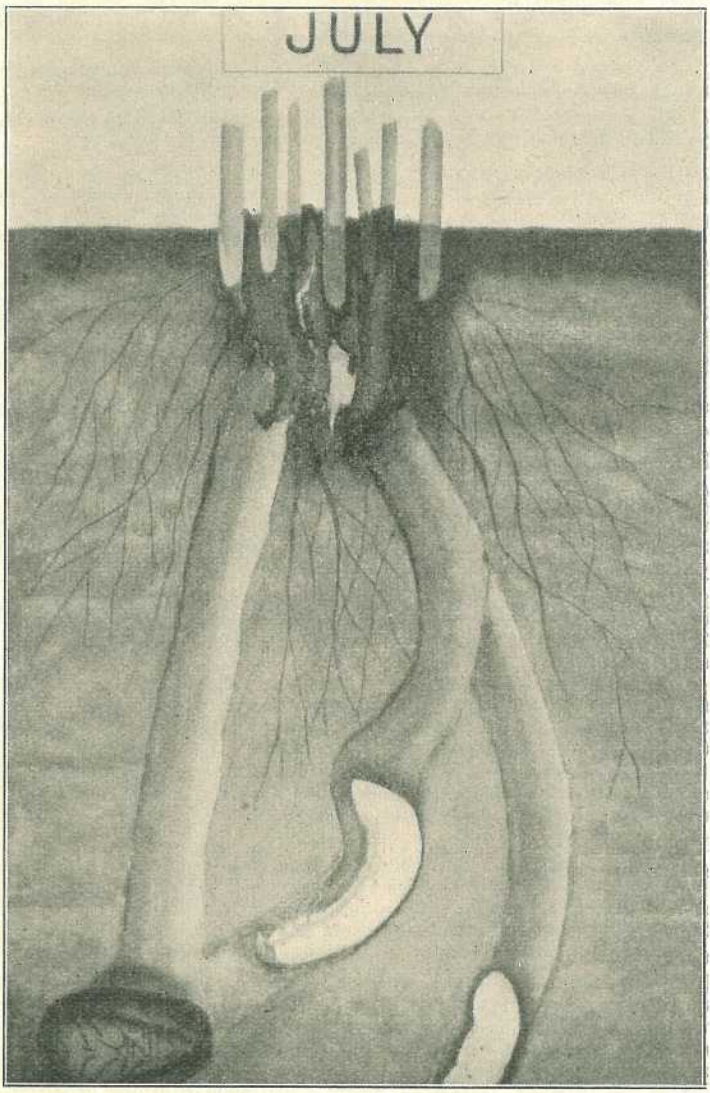


PLATE 2.—Grubs of the "Greyback" Cockchafer tunnelling into the ground to transform into pupæ.

On poor cane land that may have become badly pupa-infested, an application of carbon bisulphide, in addition to killing the pupæ and beetles of this cane pest, would help to restore primitive fertility to the soil, by destroying certain bacterial and fungoid parasites which live underground and are known to be destructive to plant life.

The plate for July indicates greyback grubs tunnelling downwards to transform into pupæ, one of which is shown at the corner of the plate. The cane stool above is throwing weak young ratoon shoots.

SUGAR-CANE QUARANTINE DISTRICTS.

Mackay.—Sugar-cane growers and others in the Mackay district are hereby notified that under "*The Diseases in Plants Acts, 1929 to 1930,*" the following areas were declared Sugar-cane Quarantine Districts:—

Proserpine and Mackay.—The area lying between a line drawn due west through Bowen on the north, and Alligator Creek on the south.

Plane Creek.—The area lying between Alligator Creek on the north, and a line drawn due east and west through Rockhampton on the south.

Under the provisions of the Acts, the removal of sugar-cane plants from these districts, or their introduction into these districts from outside areas, is prohibited unless a permit in writing has first been obtained. Any person desirous of obtaining such permit during the current year is accordingly requested to make application to the Director, Bureau of Sugar Experiment Stations, Brisbane, before 20th June, 1933, in order to enable the necessary inspections to be made.

Bundaberg-Childers.—Sugar-cane growers in the Bundaberg-Childers district are hereby notified that under "*The Diseases in Plants Acts, 1929 to 1930,*" the following area was declared a Sugar Cane Quarantine District:—

The area lying between a line drawn due east and west through Rockhampton on the north, and a line following the Burrum River to its junction with the North Coast Railway, near Howard, and thence due west, on the south.

Under the provisions of the Acts the removal of sugar-cane plants from these districts, or their introduction into these districts from outside areas, is prohibited unless a permit in writing has first been obtained. Any person desirous of obtaining such permit is accordingly requested to make application to the Director, Bureau of Sugar Experiment Stations, Brisbane, before 15th July, 1933, in order to enable the necessary inspections to be made.

Maryborough-Bauple-Moreton.—Sugar-cane growers and others in the Maryborough-Bauple-Moreton districts are hereby notified that under "*The Diseases in Plants Acts, 1929 to 1930,*" the following areas were declared Sugar-cane Quarantine Districts:—

Maryborough.—The area between a line following the Burrum River to its junction with the North Coast Railway, near Howard, and thence due west, on the north, and a line drawn due west from Hook Point (on the southernmost end of Great Sandy Island) on the south.

Moreton.—The area lying between the southern boundary of the Maryborough district on the north, and a line drawn due east and west through Brisbane on the south.

Under the provisions of the Acts, the removal of sugar-cane plants from these districts, or their introduction into these districts from outside areas, is prohibited unless a permit in writing has first been obtained. Any person desirous of obtaining such permit during the current year is accordingly requested to make application to the Director, Bureau of Sugar Experiment Stations, Brisbane, before 15th July, 1933, in order to enable the necessary inspections to be made.

Sugar-cane growers and others are notified that owing to the presence of Fiji disease, the parishes of Maryborough, Bidwell, Tinana, Walliebum, and Young have been proclaimed a quarantine area, and no sugar-cane plants may be removed from this area unless a permit in writing has first been obtained. Any persons desirious of obtaining such permit during the current year are accordingly requested to make application to the Director, Bureau of Sugar Experiment Stations, Brisbane, before 15th July, 1933, in order to enable the necessary inspections to be made.

Dr. KERR'S CAREER.

The appointment of Dr. H. W. Kerr to the position of Director of the Bureau of Sugar Experiment Stations, as successor to the late Mr. Harry T. Easterby, is approved generally in sugar circles. As Acting Director from time to time Dr. Kerr proved his capacity for such an important post, to which he brings an abundance of youthful energy with a brilliant academic and official career as a background. The new Director was born at Randwick, Sydney, on 18th May, 1901. He received his early education at the Central State School at Charters Towers, from which in 1914 he gained a scholarship entrance to the Ipswich Grammar School. In 1917, after obtaining an excellent pass in the Junior University examination, he entered the public service as a cadet in the laboratory of the Agricultural Chemist under Mr. J. C. Brünnich. Attending the University of Queensland as an evening student, he graduated in Science with first-class honours in Chemistry.

PLATE 3.—Dr. H. W. Kerr, M.Sc., Ph.D., Director, Bureau of Sugar Experiment Stations.

With two other brilliant young students, Messrs. Arthur Bell and Norman Bennett, he was awarded a travelling scholarship, enabling him to spend four years abroad studying agriculture and soil science and visiting the sugar-producing countries of the world as an observer of modern agricultural practice relating to every phase of cane cultivation. All three young men have since given, and are continuing to give, notable service to the Queensland sugar industry.

In the course of his period of study abroad Dr. Kerr spent two years at the University of Wisconsin in soil research work, and graduated with the degree of Doctor of Philosophy. He was Queensland delegate at the 1927 Conference of the International Society of Soil Scientists and at the Imperial Agricultural Conference in the same year. After a further course of research work at the Rothamsted Experiment Station (England), Wisconsin University (U.S.A.), Hawaiian Islands, and Java, he returned to Queensland in 1928, and was appointed Soils Chemist to the Bureau. On the reorganisation of the Bureau he assumed control of the Division of Soils and Agriculture, and has since directed all the agricultural investigation work of the Bureau, including farm experimental plots and the planning of the work of the three experimental stations—South Johnstone, Mackay, and Bundaberg.

A New Implement—The Stubble Shaver.

By H. W. KERR.

THE comparatively unsatisfactory nature of ratoon crops in Queensland is appreciated by most canegrowers. This is particularly true for the drier areas of the State, and the irrigated Burdekin district is included in this class. Undoubtedly there are a number of causes contributing to this effect, and one of particular interest is the difficulty of keeping the stools well set in the ground. Any practice which encourages the growth of the stool in the dry surface layer of the soil will act detrimentally to the production of good ratoons. This is especially noticeable where irrigation methods involve the practice of hilling-up. In such cases it is desirable that the land surface be levelled down at ratooning time, and the development of the ratoon shoots from the bottom eyes of the stubble encouraged. Those growers in the Burdekin area who are producing profitable ratoon crops pay particular attention to this point.

Even where "level" cultivation is practised, the benefits which followed the destruction of the top eyes of the stubble are reflected in the resulting ratoons. The need for a suitable implement to enable this operation to be effected expeditiously and satisfactorily has been keenly felt, and it is appreciated that the bumper disc harrows are only partially successful in their work in this connection.

It is pleasing to announce, therefore, that an implement especially designed for the purpose has recently been imported to Queensland. It comes through the courtesy of the Onomea Sugar Company of Hawaii, who designed the implement for use on their plantations, where its results were entirely satisfactory. This "Stubble Shaver" as it is called, is being despatched to the Burdekin district, where it will be thoroughly tried out. Later, it will be transferred in turn to the chief cane districts of the State, and growers will be afforded an opportunity of studying the machine and its work.

The accompanying photograph (Plate 4) shows clearly the essential features of the implement. It is mounted on four wheels, which is a decided advantage on land of uneven surface as it allows for better control of the cutting discs. These latter are revolved about a vertical axis by a chain drive from the rear axle. The drive is thus transmitted from the two rear wheels and should ensure positive action. The discs are each 24 in. in diameter, and the depth at which they work is readily controllable by the operator, through the lever provided. In this way satisfactory work may be done on fields where the stubble is set at irregular heights or the land surface is uneven. Further, the depth below the surface at which the shaving is done will depend on the nature of the stools, which again is a function of the variety and cultural practices, as well as the soil and the nature of the crop harvested.

The implement is designed for draught by a light tractor, but it could also be adapted for horse work.

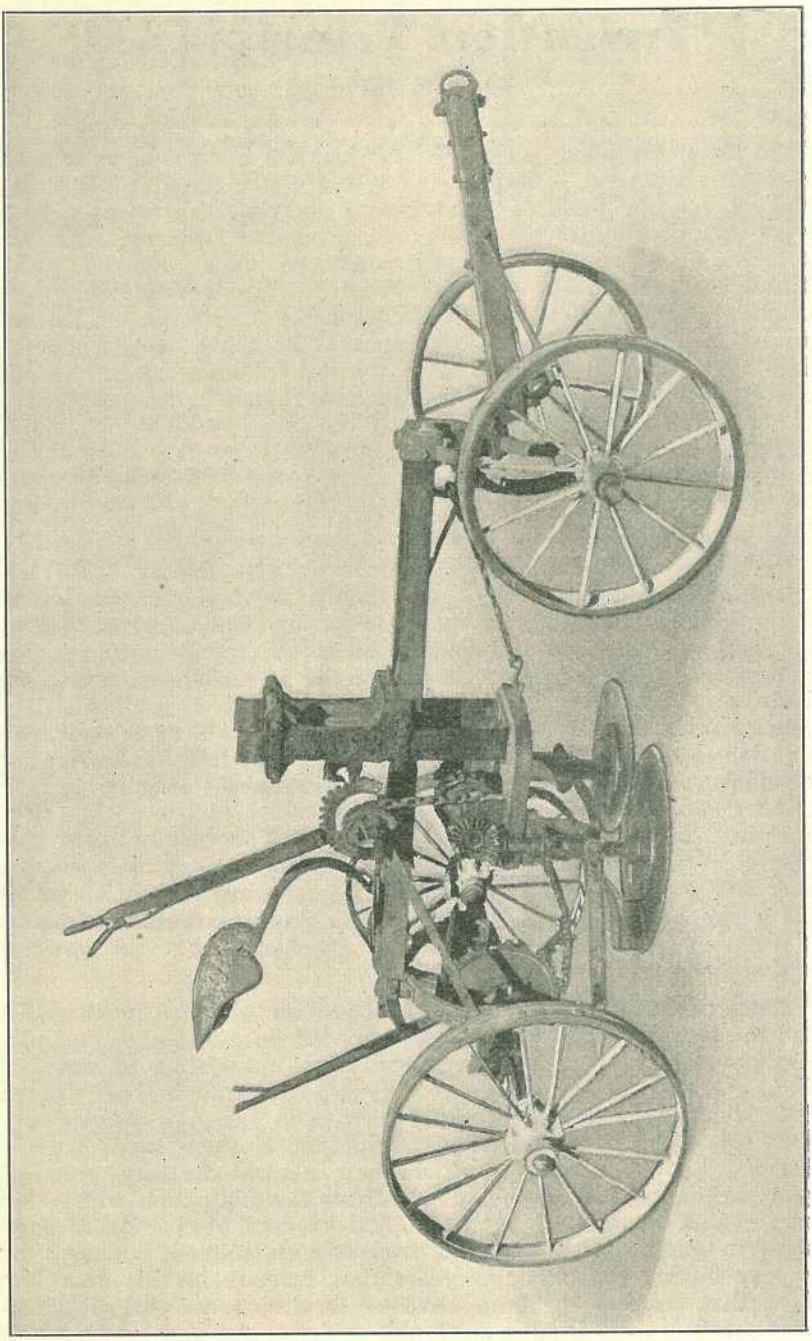


PLATE 4.—THE STUBBLE SHAVER.

Irrigation Principles.

By H. W. KERR.*

RECENT events indicate that our sugar industry is again entering one of those troublous periods with which its history is punctuated. The present situation is largely the result of depressed times following closely on the heels of a few years of relative prosperity which saw a tremendous expansion in the area devoted to the crop. A sudden contraction in the price of locally consumed sugar, coupled with a collapse of world market values for the surplus production have created a situation which will inevitably inflict many hardships on the producer before the necessary adjustments may be made. Little hope can be held out for an improvement in the Australian price, while even the most optimistic would not hazard the forecast of an immediate recovery in world values to a level which would make it possible for the Queensland producer to compete profitably on the open market. Stability will be restored then, largely as a result of decreased production costs, and it is this aspect of the problem which will be discussed in the present paper.

In the ensuing struggle, the grower is undoubtedly faced with the most profound difficulties; and this is particularly true of the "small" farmer who employs but little labour, and to whom reduced sugar values mean a severe contraction in the family income. Any reduction in production costs, as far as he is concerned, must come entirely as a result of individual initiative, and a modification of present farming methods to ensure a return which will more than cover cultivation costs. This will be particularly difficult in those areas where a combination of depleted soils and uncertain seasons conspire to make farming a hazardous undertaking; and a careful review of the situation shows clearly that no single factor will contribute more to a successful reconstruction than to place the business of cane growing beyond the reach of climatic vagaries. A growing realisation of the truth of this observation is clearly evident throughout the central and southern areas, and one is led to the conclusion that the dawn of extensive irrigation farming is at hand.

Those members of our agricultural section who are privileged to attend the present Conference will be afforded an excellent opportunity of seeing what can be done by the judicious application of water, to enable the cane crop to maintain steady growth through those drought periods common to all cane areas. Growers in the Ayr district early realised the absolute necessity for irrigation if their lands were to realise the high productivity which their natural fertility promised. They are, therefore, able to point proudly to the distinction which their district enjoys of maintaining the highest average production of sugar per acre in Queensland. It should be clearly understood, however, that it is only during the past few years that farmers in this area have realised that keeping the crop alive by irrigation, in anticipation of the wet season's rain, is not a profitable undertaking, and results rather in an increase in production costs. Hence it will be observed that leading

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

growers have turned their attention to the maintenance of vigorous growth by artificially applied water, and their results promise to revolutionise farm practice in the area.

This latter fact is emphasised to clear up a point which many growers are inclined to advance as a serious objection to irrigation proposals; they argue that if the added cost of irrigation will guarantee an average yield of only 20-25 tons of cane per acre, no reduction in the cost of producing a ton of cane will be effected. But on studying the returns from those farms of the district where cane is literally grown by irrigation, assisted, of course, by the application of the necessary fertilizer, it will be found that the average yield is nearer 40-45 tons per acre. Further, these returns are generally independent of the season, while the profitable increase shown from the use of artificial manures makes it possible to maintain soil fertility and thus preserve the productivity of the land. Though the latter aspect of the agricultural problem is one which our farmers would gladly forget in times of adversity, it is nevertheless true that past failure to appreciate the importance of maintaining the "working capital" of the land—its fertility—is probably contributing as much to the present reduced crops as the absence of favourable climatic conditions.

A second objection which is often raised against irrigation proposals is that of the difficulty of financing the scheme. It is agreed that this problem is a real one in many cases; but it is remarkable how many enterprising farmers have been able to provide themselves with a satisfactory water supply at very little cost. The success of the venture generally provides the means for installing more adequate equipment in the course of a few years.

Although these preliminary remarks might appear to be addressed chiefly to growers who are farming in the central and southern districts, it must be emphasised that they apply with equal force to those who are producing cane in the northern areas also, where nature is more liberal in the bestowal of her favours. During the past year a small scale irrigation trial was conducted at the South Johnstone Experiment Station, under conditions which were made as nearly as possible ideal for cane growing. It was found that the natural rainfall distribution of even the Innisfail district is quite incapable of maintaining steady cane growth, and the irrigation water applied during the growing season resulted in a tremendous increase in crop yield. Truly, the conditions of the trial referred to are not capable of realisation in farm practice, and therefore the yield per acre as calculated on the basis of the produce from this small plot (144 tons of cane per acre) is quite fictitious. But even a yield of one-half this value would be greatly in excess of the normal plant crops which are harvested from lands of this type under first-class farming methods. Considering the facilities which are so admirable for irrigation on large areas of the far North, it is most surprising that in no instance has the writer seen any pretence at exploiting these natural resources.

IRRIGATION PROBLEMS.

For the benefit of those who are seriously considering the development of such irrigation facilities as are at their command, a few of the important inherent difficulties of irrigation practice will be pointed out, and suggestions offered for obviating such as may be

avoided. First of all, it must be realised that irrigation water differs, in general, from natural precipitation. The latter is essentially nature's own pure distilled water, until the moment it reaches the surface of the earth. Thence the surplus moisture either runs off and finds its way into natural watercourses or percolates into the depths of the porous sub-soil stráta, where it may again be tapped and brought back to the surface by artificial means. The latter method provides the bulk of the irrigation water employed in the Burdekin area. Now, in the course of its passage over or through the earth, the original pure water exerts a greater or lesser solvent action on the mineral particles with which is comes in contact. It is found, moreover, that certain substances which are dissolved in this way possess properties which may render the water distinctly unsuitable for irrigation purposes, and therefore, the *quality* of the water which it is proposed to employ should first of all be determined. Of these contaminating compounds, the chief are excessive amounts of salt, and carbonate of soda. The upper limit of the concentrations of each of these substances which may be present without producing harmful effects is a matter which can be decided only after due regard has been paid to the nature of the soil on which it will be employed. When impure waters are employed, certain irrigated soils show a pronounced tendency to develop unfavourable sticky characteristics, which after a time make it very difficult to produce and maintain a condition of good tilth. In such cases the proportion of the above impurities which may be tolerated is decidedly low. On the other hand, the red volcanic soils possess the peculiar property that concentrations of even a hundred grains or more of salt per gallon may be present in the irrigation water without effecting serious damage. Of course, it must be remembered that the accumulation of salt in the soil moisture will ultimately inhibit growth due to the inability of the plant roots to absorb water under these conditions; and where the water employed is rich in salts, care must be exercised to provide for adequate subdrainage, which will enable the soluble salt to be washed from the soil. Carbonate of soda is a particularly troublesome substance, for in concentrations of even a few grains per gallon it acts as a definite plant poison, while its effects on the soil are cumulative, and definite steps must be taken to neutralize this influence. Fortunately, this consideration of water quality may be readily cleared up by an analysis, which will be conducted free of charge for canegrowers by the Bureau. The water from our coastal streams is usually of high quality, except where tidal influences prevail; and growers can be reasonably assured that such sources will be entirely satisfactory for irrigation purposes.

Adequacy of Supply.

The next consideration is that of the volume of available water. On more than one occasion the water-loving characteristics of sugarcane have been emphasised. The growth of a 40-ton crop involves the absorption of practically 50-55 acre-inches of water from the soil; when allowance is made for the fact that much of the rain which falls on the land in times of heavy downpour is lost by surface run-off, a further proportion is removed from the range of the crop roots by deep percolation, and appreciable quantities are lost by evaporation from the moist land surface, probably not less than 100 acre-inches of moisture are utilised or dissipated in the process. Where

cane irrigation is contemplated in the drier areas of our State, it may be assumed that at least 40 acre-inches of water will be applied artificially per annum. In round numbers, this means 1,000,000 gallons of water per acre; or, for 40 acres of cultivation, 40 million gallons. Carrying the calculation a little further, let it be assumed that this volume of water will be applied over a period of 100 days. The average daily consumption will then be 400,000 gallons. These figures will show that it is extremely important to have access to an adequate supply of water before the project is embarked on. Where a small open flow is being drawn upon for the supply, a further important point must be observed. October and November are probably the two months of the year when irrigation water will be in greatest demand. In Queensland the spring is usually the driest period of the growing season, and, by the same token, the flow of water in natural watercourses is at its lowest ebb. In making a survey of streams of limited capacity it should, therefore, be remembered that estimates of supply must be made at this season.

Distribution of Water.

Assuming that an adequate volume of water is available, the next consideration is the problem of its application. When natural rainfall is received by the land, the even distribution of the water is automatically taken care of; but when water is applied artificially considerable skill must be exercised in this regard. Irregularities in the land surface are frequently present to complicate the problem, and even under the most favourable circumstances the supply of water to the margin of the field where the water enters is inevitably greater than at the distant end of the water furrows. For the former problem something may be effected by judicious grading, but this is a project which must be undertaken only with the greatest care. Where the soil is shallow, the removal of even an inch or two of the surface layer might be decidedly detrimental to the fertility of the land; and grading may be effected successfully only where a good depth of surface soil is available. To prevent gross irregularities in the distribution of water as between opposite ends of a field, the remedy is to restrict the length of water furrows. The mistake is still made in some cases of attempting to run the furrows for 15 chains or more; and under these conditions it will be found that whereas the near border of the field may receive 12 inches at one watering, the distant end may get less than two. Not only does this result in a tremendous wastage of water, with the consequent addition to irrigation costs, but the danger of water-logging the soil where sub-drainage is not highly favourable may cause serious injury to both soil and crop. Where water costs are relatively low, it is considered that to effect a saving in labour by this method, is sound economy; but the wisdom of the policy is highly hypothetical.

Employment of short furrows—say, from 3 to 5 chains—will undoubtedly lead to increased demands on labour; but it is felt that careful comparison of the respective methods and the results obtained will show that the shorter furrow system is superior. The water saving which will be effected and the consequently increased speed with which the entire farm may be irrigated, will probably outweigh any advantages offered by the alternative system, without reckoning any increased value for the superior crops produced. When

pumping costs are relatively high—for example, where deep wells are employed or where the water must be raised above a high river bank—the above-mentioned conditions might be entirely reversed, and it will pay the farmer better to increase his labour costs to enable a given supply of water to be spread over a larger area.

Need for Sub-drainage.

The danger of water-logging any soil devoted to cane-growing has been repeatedly emphasised; and under irrigation practice where the water contains a proportion of dissolved salts, the damage done is much more serious than with natural rainfall. If free sub-drainage is not provided, the accumulation of soil moisture which is slowly evaporated both by the crop and from the soil surface, may lead to a serious concentration of salt. It has already been pointed out that the crop is critically injured under these conditions.

Where the sub-soil contains a reasonable proportion of clay—and this is usually the case under conditions of poor drainage—the mole drainer may often be used to advantage. It obviates the excessive cost of tiles, which are practically the only alternative. The necessity for paying detailed attention to soil drainage is especially important for an area such as Mackay, where the alluvial lands are practically level, and of these the older types of soil possess naturally an impervious sandy clay sub-soil layer frequently associated with ironstone nodules.

Frequency of Watering and Amount Applied.

One of the most important questions in irrigation practice is that of the frequency of water applications and the amount of water which should be applied at one irrigation. At the present time in Queensland, irrigation must be considered essentially as an *art*, in that the farmer is guided mainly by intuition in determining when a further watering is called for, and also in judging the volume which should be applied. Obviously it is highly desirable that the practice of irrigation be placed on a sound *scientific* basis. Extensive researches in this connection have been undertaken in overseas cane countries, and some of the more recent results are extremely interesting and valuable.

First of all, we should be able to determine definitely the point at which active crop growth ceases due to soil moisture deficiency. The method of carrying out this work is by making systematic growth measurements on selected cane stalks, at frequent intervals following an application of water. Where the results show that growth has practically ceased, a sample of soil representative of the area under review is taken and its moisture content determined. It is a well established fact that a given soil is capable of holding a definite percentage of moisture in its natural thoroughly-drained state in the field. Of the water held in this way, only a fixed proportion is available for the maintenance of vigorous growth, and tests show that the amount of moisture still present in the soil when growth ceases is quite appreciable. This point must be definitely understood if one of the fundamental principles of irrigation practice is to be clearly grasped. As an illustration of the order of moisture percentages measured in this way, a series of studies carried out on a red volcanic soil might be taken. The results show that this soil retains as a maximum 32 per cent. of its weight of moisture after draining,

and when the growth rate of its crop falls to a minimum, it still contains 20 per cent,; that is, moisture equal to only 12 per cent. of the weight of soil is available for the maintenance of vigorous cane growth. It is generally conceded that the crop draws the bulk of its moisture from the uppermost 3 feet of soil, and obviously the distribution of roots in this layer is not so uniform that all portions of the soil will be dried out at the same rate. A typical series of moisture studies is the following:—

1st foot of soil—22 per cent. moisture

2nd foot of soil—25 per cent. moisture.

3rd foot of soil—28 per cent. moisture.

It is now quite a simple matter to calculate the amount of water which should be applied to bring the soil back to a uniform moisture content of 32 per cent. From the above data it is found that a 3-inch irrigation would restore this particular soil exactly to that condition, while allowing no excess water to be lost by deep percolation.

The problem is not quite so simple as the foregoing remarks would indicate, and so far as the determination of the soil moisture characteristics is concerned, an extensive series of tedious tests is involved. Once the work has been completed, however, the knowledge gained is of immense value to the grower.

Nothing has been said as yet regarding the rate at which the soil loses its moisture. It is found that this factor is governed principally by (*a*) the stage of development of the crop, (*b*) the season of the year. A young plant with its restricted root and leaf development will obviously not utilise water as vigorously as one which has attained its peak of leafy growth supported by a root system which thoroughly permeates the soil. Again, temperature considerations are very important in determining the rate of crop growth, and consequently the rate of water consumption. The problem is further complicated by such factors as the degree of atmospheric humidity, incidence of winds, the soil type itself, and the same considerations also govern the rate of moisture loss by direct evaporation from the soil surface. As an instance, it might be pointed out that in the early summer months the Ayr district usually experiences high temperatures associated with strong, dry winds. Under these conditions the rate of water consumption by the crop is excessive, and the unfavourable atmospheric conditions are so distressing to the cane plant that crop growth is severely hampered. At the corresponding season in the more humid north, the rate of growth is phenomenal where soil moisture is available (see Plate 5).

As a general rule, however, it may be assumed that a young crop requires rather infrequent light waterings, while a well advanced crop will respond to heavy irrigations at ten-day intervals during the height of the growing season. It is a well established irrigation principle that at the time of planting any crop, it should be the aim of the grower to have his soil at the so-called "optimum" moisture content, and *defer* irrigation until the crop is definitely showing symptoms of soil moisture deficiency. From the time irrigation is begun, the development of the crop should be continued uninterruptedly throughout its lifetime. Serious growth checks act highly detrimentally to crop yields, and add materially to production costs.

Time of Planting.

In attempting to follow this principle, it is obvious that the planting season will be important. Remembering again that the spring months are so frequently dry, autumn planting would appear to be most favourable in this respect. In point of fact, it has been found by experience in the Burdekin area that March-April planting usually yields the most favourable results. There is a further point which requires stressing in favour of this policy, and one which is not often appreciated. When the cane sett is planted, it yields, first of all, a primary shoot which in the course of time gives rise to secondary (and possibly tertiary) shoots which originate from the base of the original parent. This "stooling" process, as it is known, is essentially a slow one, due to the limited leaf surface of the young crop, and consequently its restricted capacity for the production of sugars and other foods essential for growth. Seeing that this stage is necessarily one of slow development, the question arises—what are the relative rates at which it proceeds for autumn and spring planted crops? Obviously, the former will be passing through this stage during the autumn, winter, and early spring months, while the latter will utilise the spring and early summer months for the purpose.

Some interesting facts in this regard are afforded by the small irrigation trial carried out at South Johnstone. The growth rate measurements which were made on this crop at three-day intervals showed that the April planted cane germinated more rapidly and maintained its early growth at a greater rate than that for the August planted cane, for a period of about ten weeks after planting. Thereafter the August plant cane showed an accelerated growth rate, and at exactly five months after planting the two crops showed the same stage of development. That is, the April crop had attained this point in September, while the later crop had not attained its peak of leaf development until January. As a result, the former showed millable cane in November, and during the month of December, with its long, hot days, showed a greater rate of cane production than during any other period of its life. This point is clearly shown in the diagram for the April plant (Plate 4). The spring planted crop, on the other hand, did not produce millable cane until mid-January, and the more favourable early summer months were entirely lost in this respect.

Under the climatic factors which prevailed for that particular year, at least, there can be no doubt that the autumn planted crop was vastly superior to that which was planted in the spring, provided soil moisture conditions were at all times favourable. It is probable that similar results would also be experienced in most of the cane areas of the State under adequate irrigation, with the exception that in the southern districts February-March planting would be substituted for April. Modification of the plan would be necessary, of course, if excessive rainfall during these months were to render planting impracticable.

Position of Water Furrows.

The position occupied by the water furrow is a matter of considerable importance. It is the usual practice in the Burdekin area to utilise the planting drill for the purpose, so long as this is available. But the light cultivation which is essential, after watering,

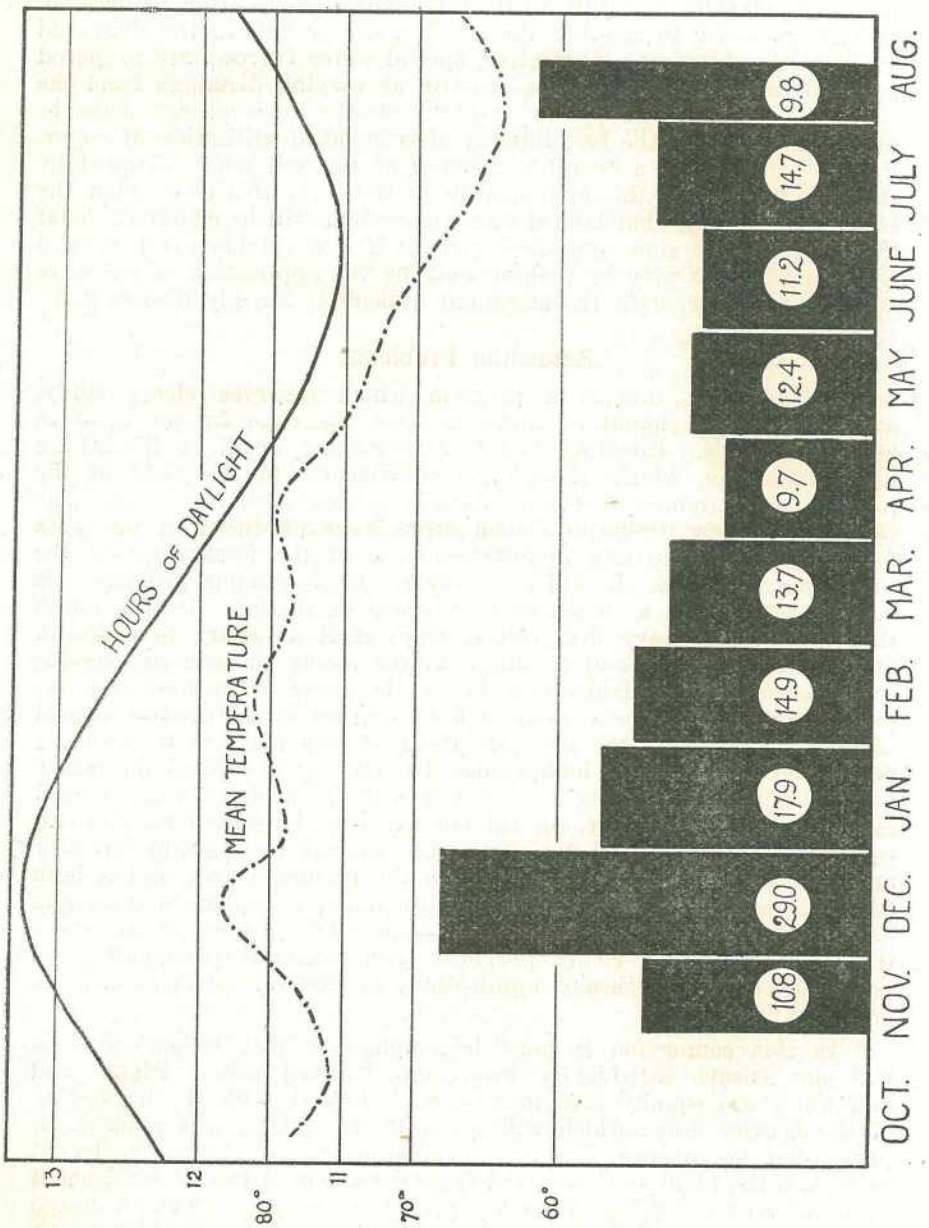


PLATE 5.

The solid blocks represent the tons of cane per acre produced under optimum conditions during each calendar month. The curves for hours of daylight and mean temperature fit very well with the growth rate, and show the particularly favourable growth conditions of December, provided that moisture and plant food are available.

to restore the good tilth of the soil, control weeds, and create a surface mulch, results in a filling of the cane drill. This is often accelerated, in fact, in order to smother the heavy weed growth in the drill and avoid costly chipping. Thereafter, special water furrows are prepared prior to each watering. These are run at varying distances from the cane, but usually occupy the middle of the interspace. This is, undoubtedly not in the best interest of economical utilisation of water. For to bring about a complete wetting of the soil mass occupied by the cane roots—and this area spreads in the form of a cone below the sett—it is assumed that lateral water movement will be effective. That this movement is slow and incomplete is a well established fact, and the desired result may be realised only by the application of excessive amounts of water, with the attendant difficulties already discussed.

Ratooning Problems.

Undoubtedly, this is a problem which deserves closer study, and every effort should be made to keep the cane furrow open as long as possible. Interspace water furrows also result in the hilling up of the cane, which, though not detrimental to the yield of the plant crop, introduces a serious obstacle to successful ratooning. The fact that so few profitable ratoon crops were produced in this area for many years provides definite evidence of the weaknesses of the prevailing practice. Recently, however, the ratooning problem has been attacked with a considerable measure of success. It was found that to produce heavy first ratoon crops it is necessary to make an application of water and fertilizer to the stools as soon as possible after harvesting the plant crop. To get the water to the stool and also to ensure that the ratoon shoots will be well set in the ground instead of on the surface of the dry hill, the first step taken is to level the field down by the use of bumper disc harrows, or sometimes the rotary hoe. Probably a suitably constructed stubble shaver would be even more effective. Naturally, the ratoons will need irrigation and cultivation just as much as did the plant crop, and with respect to fertilizer applications, considerably more so. In the Burdekin area, it has been demonstrated conclusively that heavy dressings of sulphate of ammonia have a profound influence on ratoon yields; while in other areas, where the soils are not so richly provided with available phosphates and potash as are these, heavy applications of general manures will be necessary in addition.

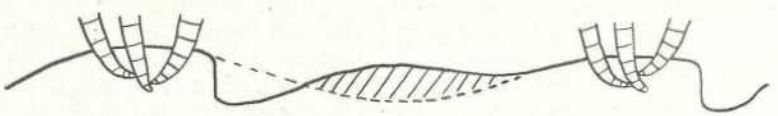
In this connection it must be emphasised that irrigation alone will not ensure satisfactory crops on depleted soils. Plant food and water are equally instrumental, and, indeed, with the harvesting of the heavier crops which will naturally be sought, this point is of paramount importance. As a general guide it may be assumed that to replace the plant food removed from the soil by 1 ton of cane, about 25 lb. of mixed fertilizer must be applied to the land. Thus a 40-ton crop robs the soil of the equivalent of 1,000 lb. of fertilizer per acre, and few, if any, of our cane lands are capable of standing up to this treatment for any period of years without suffering a tremendous reduction in their fertility and productivity.

In passing, it should be mentioned that a recent innovation in ratooning procedure in the Ayr district appears to offer a simple and effective method of ratoon irrigation which will be highly economical on water. This is a most important aspect of the problem for in general

the pumping plants which are in operation are not competent to deliver the water necessary at peak periods to enable both plant cane and ratoons to receive the full supply they require, *when* they require it. The essentials of the method are as follows:—

The initial discing is carried out as outlined above, and the early waterings are given in the usual manner, by creating the customary interspace water furrows. With subsequent cultivation a certain amount of "hilling up" is inevitably brought about; but prior to the last watering after which the crop will be out of hand, a 10-inch swing plough is used to produce a furrow about 6 inches deep, close to one side of the cane row. This operation is usually completed in December, and thereafter this is employed as the watter furrow, no subsequent cultivation being given. The essential effects of the operation are shown by the accompanying sketches (Plate 6).

(a) Before "Ploughing Away"



(b) Furrow Completed.

PLATE 6.

To facilitate tramming, each twentieth line remains untreated.

The advantages claimed for the method are that cane covers in much more rapidly than is the case with the customary practice, probably due to the fact that the water is applied in closer proximity to the point where it is required. For the same reason, the policy is more economical on water, and this enables an irrigation round to be completed in quicker time. Finally, excessive flooding is avoided, so that much of the soil surface remains dry, it retains its condition of good tilth, evaporation losses are reduced, and weed growth is inhibited. The modification should certainly appeal to canegrowers practising irrigation, and the final verdict on its practicability will be awaited with interest.

Conclusion.

So much for a brief outline of certain of the fundamental principles of irrigation. Undoubtedly numerous other questions are in the grower's mind, particularly those on the practical side regarding the installation of suitable equipment, laying out of main supply ditches and laterals, the utilisation of fluming, and so forth. While regretting that this aspect of the problem cannot be dealt with at present, it should be added that there is no better way of acquiring information on these important considerations than by visiting the Burdekin area. Here visitors may be assured that every assistance will be afforded them in obviating many of the practical errors into which pioneers in this field are inevitably drawn.

Termites (White Ants)

By J. A. WEDDELL, Assistant Entomologist.

ALTHOUGH because of common usage the name "white ants" is included in the title of this article, the insects so called are not true ants. They differ markedly from them in many important structural details, and are widely separated in the system of classification of insects. For these reasons it is preferable to use a more accurate common name, and throughout these notes the name "termites" will be used in the hope that it will become more generally adopted.

Importance.

Termites of various species occur in practically all tropical and sub-tropical areas throughout the world, and they are responsible for a tremendous amount of damage annually. In a country such as Australia it is hardly necessary to stress the importance of termites and the degree of damage of which they are capable; and less so in Queensland, where so many homes and other buildings are constructed mainly of timber, and where the risks are fairly generally known. Telephone, telegraph, and electric light poles, fencing posts, railway sleepers, and timber road and railway bridges are also liable to damage, hence the seriousness of the pest in a country of great distances may be quickly realised. Living trees, including forest, fruit, and shade trees, sugar-cane, garden plants, and vegetables, have all been found to suffer at times from termite infestation, and various stored materials such as books, papers, clothing, leather, horn, bone, sugar, and wheat have also been damaged. Perhaps the most surprising fact is that termites may penetrate such apparently safe materials as weak cement and lead sheathing, presumably in exploration for suitable food. Instances are known wherein the operations of the termites in boring into the lead sheathing of underground electrical cables have allowed the entry of moisture, and thus interrupted either power transmission or telephonic communication.

Life History and Habits.

(*a*) *Mound-building Species.*—Termites are essentially social insects; that is, they dwell in colonies such as are exampled by the honey bee and the true ants. The most commonly known group of termites is that comprising the mound-building species. The familiar mounds are honey-combed with galleries (Plate 7, fig. 1), which extend also below ground a considerable distance. Generally at about ground level in the centre of the termitarium, as it is called, will be found a larger chamber in which there usually is lodged a distended-looking insect possibly anything up to an inch in length. This is the queen mother of the colony. She is practically an egg-laying machine. The queen is fed by the workers, who also take away and tend the eggs that are laid. The workers are the familiar insects commonly found in damaged timber, and they are responsible for the damage (Plate 7, fig. 2). Also present in the termitarium is found another form of the insect with very large, brown heads and prominent mandibles or jaws, aptly termed the soldier caste. The function of the workers is to build the termitarium, gather food, feed the colony, and tend the eggs and young. The soldier caste protects the colony from attack by other insects. Numbers of the soldiers will often crowd to a broken opening into the termitarium and temporarily close it with their large heads, aggressive jaws turned outwards, until the workers are able to reseal the break.

Both the soldier and the worker caste are sterile, but at certain times in the year—determined by the species, usually in the warmer months—a generation of winged male and female termites is produced in the colony, and on a selected day a dense flight of this caste of the insects is released. The insects are not strong fliers and do not travel far. Their wings are peculiar in that after this short flight they detach at a suture close to the body, and the insects are then able only to crawl. The mating pairs wander in search of suitable colonising sites, but from a swarming flight only a few will actually become established. A surviving female from such a flight becomes the queen mother of a new colony. From a small first generation of workers she gradually builds up the army of workers and soldiers comprising a colony, with occasional swarms of winged males and females which leave the colony in the attempt to found new sites.

(*b*) *Soil-frequenting Termites and Dry-wood Termites.*—As well as the mound-building species of termites there also are species that inhabit the soil, primarily under logs, but which never form a raised mound. Again there are species, known as dry-wood termites, which need no contact with the ground whatever. Under natural conditions the flight caste of the dry-wood termite makes its entry into a dead or broken branch of a tree and there may form a nest high above the ground. In buildings it may similarly attack the rafters. The seemingly inexplicable isolated infestations, high above ground level, can thus be understood.

The workers of all the species of termites make long exploratory galleries in search of food, far from the main termitarium. Whenever it becomes necessary for them to cross an open space a covered runway of soil or chewed wood particles is formed, as termites will not work in the open.

It will be gathered from the foregoing that infestation of structures can occur only in two ways—either by the extension of the galleries of a neighbouring existing colony, or by a new infestation following a flight of winged males and females. A few workers alone are incapable of establishing a permanent nest owing to the absence of a fertile breeding insect.

Peculiarity of Digestive Processes.

The principal ingredient of the food of termites is cellulose tissue, which is really the foundation material on which plant structures are built, and in its lignified form it is the main constituent of timber. In itself cellulose is most indigestible by termites. Inhabiting the alimentary tract of the termite, however, are minute organisms known as protozoa, and when the masticated cellulose tissue is swallowed the minute protozoa feed on it and break it down. The resultant product of their action is a material that is digestible by the termites. Here we have a wonderful example of the inter-dependence of two organisms. The termite would quickly starve to death if the cellulose tissue were not rendered digestible by the protozoa; on the other hand the digestive tract of the termite provides lodging and contains the food for the other organism. The young termite is infested with protozoa in the process of its early feeding, and the breeding of these organisms ensures a continuous population throughout the life of the termite.

Control of Mound-building Termites Infesting Structures.

The control of infestation by mound-building termites in timber structures may be considered from the two aspects of preventive treatment and remedial treatment.

PREVENTIVE TREATMENT.

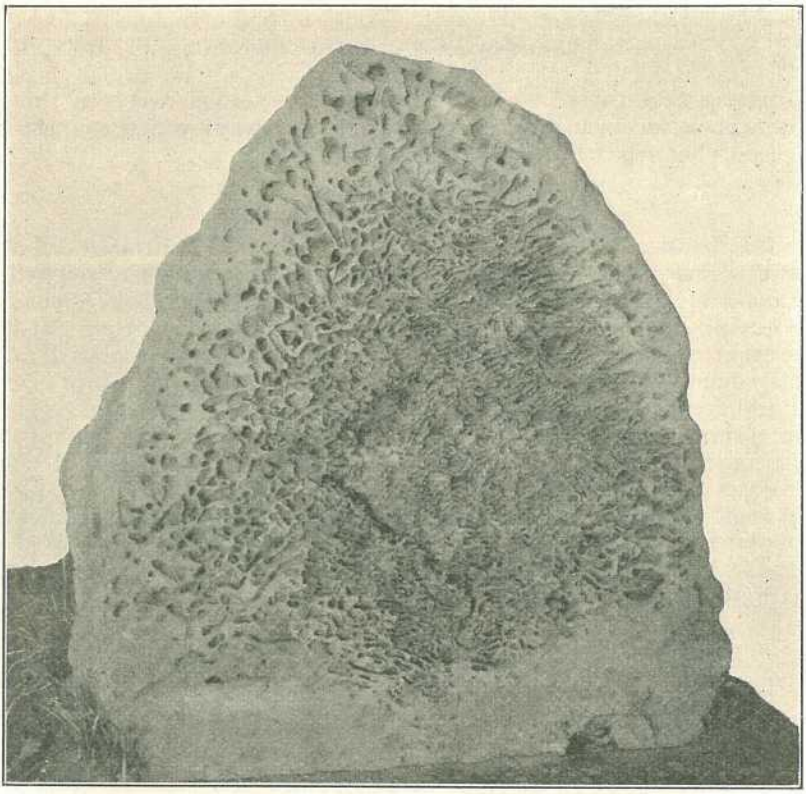
All timber that needs to be placed in the ground should be treated with creosote oil. This material may be painted on to the timber, soaked into it by immersion, preferably with heating, or it may be impregnated under pressure. The success of the treatment and the period for which protection will be realised depends on the degree of penetration of the creosote oil. The success to be attained is thus linked with the cost that the particular building operation will afford. A good practical method of treatment of fencing posts has recently been elaborated by Federal investigators. This consists of standing the fencing posts in empty 40-gallon oil drums, from which one end has been cut. The drum is then almost filled with a mixture consisting of two parts of creosote oil to one part of crude or fuel oil by volume. The whole of the below-ground portion of the posts will thus receive treatment. The posts may then either be left standing in the creosote oil overnight, or the drums may be heated carefully over a fire to a temperature of not more than 210 deg. F. The posts in the latter instance need immersion in the heated oil for not more than four hours. Obviously the degree of penetration obtainable will depend on the dryness of the timber, and for this reason it is advisable to accumulate the timber some time before it is needed and stack it in loose piles, with alternate layers crossing, so that it dries out satisfactorily.

Building sites should be cleared of any stumps or old timber. The supports of buildings should preferably be composed of termite-proof materials such as cement or brick. Wooden house supports are, however, the most commonly used in Queensland on account of initial costs. These house stumps should be heavily treated with creosote oil. The galvanised iron stump cap with its overlapping flange is a most essential precaution for the protection of the main building. The caps should on no account be broken or punctured. Unprotected timber contacts should not be made between the stumps and the main building. Roughly-built rooms beneath wooden houses are often responsible for overhead termite infestation, and dense vines allowed to grow on the side walls would similarly provide the necessary coverage and contact. Such sources of infestation should be removed.

REMEDIAL TREATMENT.

With regard to remedial treatment, it is, first of all, necessary to determine the extent of the infestation and the actual points of entry into the structure. The covered runways on the supports should be searched for and broken. The extent of the damage may be determined by tapping out the weakened timber. Badly damaged and weakened stumps should be replaced, and the new stumps and the surrounding soil drenched with creosote. Lightly infested stumps should be trimmed back to the sound timber and similarly drenched with creosote. The same operations should be carried out in the main building—that is, the removal and replacement of the heavily damaged timber and treatment of the lightly infested. Kerosene may be used as a drench where creosote would be unsatisfactory, as it must be remembered that creosote darkly stains timber to which it is applied.

Arsenical powders may be injected into the channels in lightly infested timbers, as will be explained when dealing with dry-wood termites.



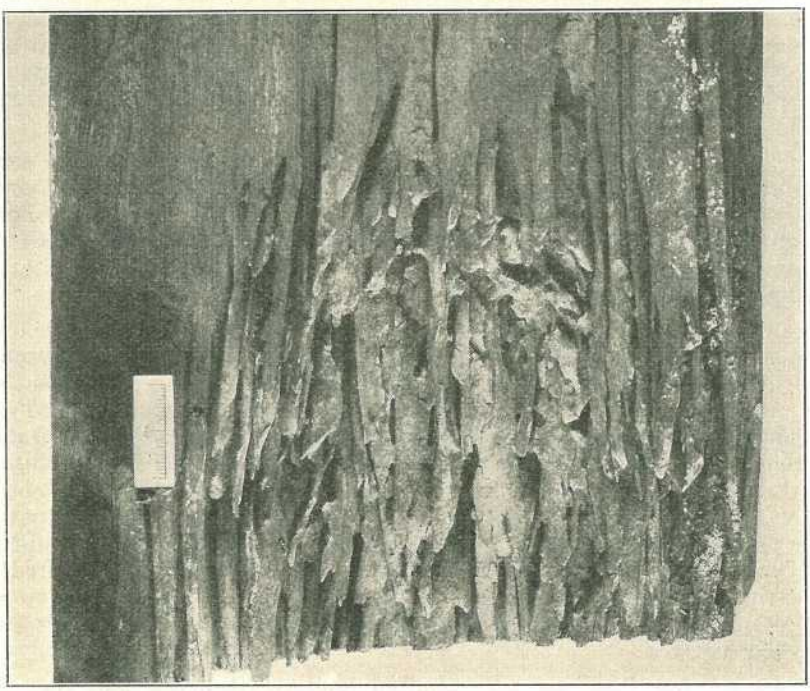


PLATE 7.

Upper Fig. Cross section of a termitarium exhibited at the Queensland Museum.
Lower Fig. Timber damaged by termites.

It may be gathered from the preceding discussion, however, that an important action is to destroy the covered runways which connect the overhead channels with the termitarium.

Control of Dry-wood Termites.

The dry-wood termite infesting timber structures will need different treatment, as there are not necessarily in this instance convenient external runways to serve doubly as a warning and as a means of control. The presence of fine brown pellets beneath rafters is often the first indication of damage. Weakened structures should be replaced. The lightly damaged timbers may be cleansed by injecting dry white arsenic or Paris green, which is another arsenical poison. Holes should be bored at intervals, gauging them to end in the tunnels, and the dry dust should be injected with a bulb blower or a small dust gun. The control depends for its action on the habit of the termites of grooming each other of the very small particles that have caught on the fine hairs which somewhat sparsely cover their bodies. In this way the poison which is picked up from the walls of the tunnels by the passage of the insects is gradually distributed throughout the colony.

Control of Termites Affecting Trees and other Plants.

Termites in the soil affecting trees, vegetables, and other plants may be treated either by poisoning or by fumigation.

Poison baits may be laid at intervals in the soil consisting of soft pine boards thickly smeared with a poison mixture. The formula is as follows:—Add 4½ lb. molasses or treacle and 1¼ lb. sugar to a solution of ¼ lb. sodium arsenite in half a pint of boiling water. Boards thickly smeared should be tied together in pairs with the poison between and buried in the infested soil, care being taken that the treated boards are not placed in close proximity to living roots. Naturally, results will be a little slow from this method.

Trees infested with termites should be treated in much the same manner as was described for the dry-wood termites—that is, a small hole should be bored to reach the tunnels and a small quantity of Paris green should be blown in. This method was suggested by a Federal entomologist. White arsenic is unsuitable for the treatment of trees owing to its greater solubility.

Alternatively a material known as paradichlorobenzene may be used as a soil fumigant. Paradichlorobenzene is a white crystalline substance which volatilises after the manner of naphthalene, giving off fumes that are noxious to insects. A circular trench should be dug around the trunk of an infested tree 3 to 4 inches deep and not closer than 6 inches to the trunk. Small crystals of paradichlorobenzene should be sprinkled in the trench and the soil then filled in. Care should be taken not to place the chemical in contact with any roots that may become exposed. For young trees in a very weakened condition the safe dose would be half an ounce of the crystals, and the treatment should be repeated at intervals of about six weeks. Stronger trees may receive one ounce, while up to two ounces may be applied to well-established trees that may be infested.

In garden beds already planted shallow trenches may be dug 4 inches deep and not closer than 6 inches to the row of growing plants. Paradichlorobenzene at the rate of half an ounce to each 18 inches of trench should be spread, and the earth then filled in and firmed.

Codling Moth Control Experiments, 1930-33.

By HUBERT JARVIS, Entomological Branch.

DURING recent years a number of experiments have been conducted in the Stanthorpe district for the control of codling moth.

The experiments were as follows:—

A.—Control by non-arsenical sprays.

B.—Control by chemically-treated bandages.

C.—Control by trapping with molasses bait.

D.—Control by dusting or spraying.

Interesting results have been obtained in these four experiments, and it has been thought desirable to place them on record for the benefit of growers.

A.—CONTROL BY NON-ARSENICAL SPRAYS.

Because of its efficiency arsenate of lead is more widely advocated than any other insecticide for the control of codling moth, but during the last few years objection has been taken to this chemical owing to its poisonous nature, for it has been proved that apples sprayed with arsenate of lead during their growth may retain traces of the poison when the fruit is sold in the markets, thus giving rise to criticism by the health authorities. This criticism can to a large extent be obviated if the apples are carefully cleaned before packing, but this is a laborious process involving much loss of time.

The justification or otherwise of this criticism is a much discussed point, but the fact remains that the use of arsenic in any form for the control of pests affecting a crop that is used for human consumption is becoming increasingly unpopular. Thus the finding of a satisfactory substitute for arsenate of lead has been engaging the attention of entomologists and others interested for some considerable time, and several chemical combinations have been formulated which have given more or less promising results.

The experiment detailed in this report was carried out during the season 1932-33, and is a further contribution towards the efforts already made to discover a really efficient spray of a more or less non-poisonous nature for the control of codling moth.

The Experimental Plot.

The plot comprised five rows of apple trees, there being four trees in each row; four of the rows were Jonathan apples, the fifth being Vanderpool Red.

The trees were all young, being from five to six years old, and the crop was therefore small, especially on the five-year-old trees.

Materials Used and Mode of Application.

The five rows were treated with five separate sprays, in the following order:—

Row No. 1, barium fluosilicate;
Row No. 2, arsenate of lead;
Row No. 3, nicotine sulphate-white oil;
Row No. 4, katakilla-white oil;
Row No. 5, white oil alone.

Four treatments were given in each case, and the spray was applied with a knapsack spray outfit of 4 gallons capacity. Approximately three-quarters to a gallon of spray fluid was used for each tree at each application. For a small tree this was a generous allowance, and permitted of a very thorough covering of all parts of the tree.

Barium fluosilicate was used at a strength of 1 lb. to 40 gallons, arsenate of lead at 2 lb. to 40 gallons for the calyx spray, and 1 lb. to 40 gallons for the three following sprays. The nicotine sulphate-white oil mixture was used with nicotine sulphate at a strength of 1-640, and the white oil at a strength of 1-80. In the case of the katakilla-white oil mixture, katakilla was used at a strength of 2 lb. to 32 gallons, and the white oil at a strength of 1-80. White oil alone was used at a 1-64 strength.

The cost figures of katakilla, nicotine sulphate, and white oil are based on the local prices charged for these materials. In the case of the barium fluosilicate the price is not available, because only small experimental samples have been imported.

Seasonal Incidence of Codling Moth in the Stanthorpe District.

The codling moth infestation from the first brood was not heavy in any orchard, but there was a notable increase towards the latter end of the season, more especially in neglected orchards, and as the fruit crop throughout the district was exceptionally heavy and spraying was sometimes omitted, losses from codling moth damage in the later maturing apples were more than usually severe.

Weather Conditions.

The season was ideal for the setting and development of fruit, and the rainfall, as will be seen from Table I., was not excessive. Fairly hot weather was experienced during December and January, and a small quantity of fruit exposed directly to the sun's rays was slightly scorched.

TABLE I.

Stanthorpe Rainfall, 1932-33.

October, 1932	248 points
November, 1932	310 points
December, 1932	310 points
January, 1933	752 points
February, 1933	133 points*

*The February rainfall occurred after the fruit was removed.

All the sprays were applied during sunny weather.

Results Obtained.

The results obtained and tabulated in Tables II. and III. would appear to justify further experimental work with the sprays used, especially the white oil alone which, as well as being equally as efficient as arsenate of lead, was also reasonably cheap.

Nicotine sulphate-white oil and katakilla-white oil gave equally good results, and both were slightly more efficient than arsenate of lead but were very much more expensive. However, it is possible that the strength of these two sprays might be reduced, and three applications given instead of four.

Barium fluosilicate, although giving the least satisfactory control, nevertheless proved 92·8 per cent. efficient.

Both fruit and leaves on the trees treated with the sprays containing white oil were particularly clean, the leaves being a good healthy green and the fruit a bright attractive colour.

On the data secured there is a definite indication that the use of arsenate of lead may not be essential in controlling codling moth.

TABLE II.

DATE AND COST OF APPLICATION OF CODLING MOTH SPRAYS.

Date of Application.	No. of Trees Treated.	Materials Used and Strength.	Quantity Insecticide Used in ounces.	Quantity Spray Fluid in Gallons.	Cost per Application.	Total Cost.
1932.					*s. d.*	*s. d.*
4 Nov.	4	Barium Fluosilicate, 1 lb. to 40 galls.	1½	4		
21 Nov.			1½	4		
9 Dec.			1½	4	Not available	
1933.			1½	4		
9 Jan.						
1932.						
4 Nov.	4	Arsenate of lead ; calyx spray 2 lb. to 40 galls. cover sprays 1 lb. to 40 galls.	3	4	0 4	0 10
21 Nov.			1½	4	0 2	
9 Dec.			1½	4	0 2	
1933.			1½	4	0 2	
9 Jan.						
1932.						
4 Nov.						
21 Nov.	4	Nicotine sulphate-white oil ; nicotine sulphate 1·640, white oil 1·80	Nicotine sulphate 1 oz., white oil 8 oz. each application.	4	0 10	3 4
9 Dec.				4		
1933.				4		
9 Jan.				4		
1932.						
4 Nov.						
21 Nov.	4	Katakilla-white oil ; katakilla 2 lb. to 32 galls., white oil, 1·80	Katakilla 4 oz., white oil, 8 oz. each application.	4	0 11½	3 10
9 Dec.				4		
1933.				4		
9 Jan.				4		
1932.						
4 Nov.						
21 Nov.	4	White oil 1·64 ..	10	4	0 5	1 8
9 Dec.			10	4		
1933.			10	4		
9 Jan.			10	4		

TABLE III.

CODLING MOTH INFESTATION AT TIME OF PICKING.

Treatment.	Total, Number Apples.	Sound.	Per Cent.	Unsound.	Per Cent.	Codling Moth Infested Apples.	Other Causes.
Barium Fluosilicate	1,400	1,299	92·8	101	7·2	101	0
Arsenate of Lead..	1,300	1,265	97·3	35	2·7	35	0
Nicotine sulphate-White Oil	950	933	98·2	17	1·8	17	0
Katakilla-White Oil	700	687	98·1	13	1·9	13	0
White Oil	800	782	97·8	18	2·2	18	0

Acknowledgment.

Thanks are due to Mr. Pfrunder, of Applethorpe, who made available the plot for the work and kept it in good condition.

B.—CONTROL BY CHEMICALLY-TREATED BANDAGES.

Bandaging the trees in order to trap the grub of the codling moth was one of the earliest control measures practised, and it is still advocated in all countries where a control of this pest is desired. This practice involves a considerable call on the time of the orchardist, as the bandages have to be examined and all grubs found in them destroyed at least every ten days, and to find time to do this during the fruit season is no easy matter. Thus this method of control has latterly fallen into disfavour, as it is recognised that unless the bandages are regularly examined they only encourage the increase of the pest. Hence the necessity of treating the bandages with some substance which would prove fatal to the grubs without repelling them and would yet be harmless to the trees was realised, and during the last few years a good deal of experimental work has been done along these lines.

In 1927 Dr. Seigler and his associates perfected a bandage meeting all the necessary requirements, and it was decided to test this chemically-treated bandage under Stanthorpe conditions. This experiment was carried out during the 1932-33 season.

Preparation of Chemically-treated Bandages.

The bandages used in this experiment were prepared by dipping strips of corrugated paper in a solution of beta-naphthol and kerosene in the proportion of 1 lb. of beta-naphthol to 1 quart of kerosene. Corrugated paper was used, as it has proved to be far more attractive to the grubs than any other type of bandage. The paper was cut into strips about 5 feet long and 4 inches wide, this being found a convenient length to handle. The kerosene was first heated in a kerosene tin, and the beta-naphthol then added and stirred with a stick until dissolved. When the mixture was smoking hot the strips of corrugated paper were immersed in the liquid and drawn quickly through it, and an even coating of the chemical was thus obtained. When treated the strips were

hung over a line to dry, this process taking about fifteen to twenty minutes. In preparing the bandages it is important to carry out the operation well away from the house, as the hot mixture is very inflammable, and it is advisable to have only just sufficient fire under the tin to keep the mixture reasonably hot.

Orchard Experiment.

The bandages described in the preceding paragraphs were used in Mr. P. Pfrunder's orchard at Applethorpe, and were placed on the trees on 5th and 6th December. The results obtained are shown in Table IV.

TABLE IV.

RESULTS OBTAINED WITH TREATED AND UNTREATED BANDAGES.

Plot No.	Date Bandages placed in Position.	No. of Trees Bandaged.	No. of Bandages Used.	Date Bandages Examined.	No. of Codling Moth Grubs Found.	No. Dead.	Per Cent. Dead.	No. Alive.	Per Cent. Alive.	No. of Moths Emerged.
1	5–12–32	*10	10	1–5–33	42	33	78·6	9	21·4	3
1	5–12–32	†10	10	1–5–33	15	2	13·3	13	86·7	12
2	6–12–32	*3	12	2–5–33	175	165	94·2	10	5·8	7
2	6–12–32	†2	5	2–5–33	30	4	13·3	26	86·7	14

* With treated bandages † With untreated bandages.

Plot No. 1 comprised twenty young apple trees, and on these alternate treated and untreated bandages were used, one to each tree, thus making ten treated bandages and ten untreated bandages. Plot No. 2 comprised five old apple trees, three of which received treated bandages and two untreated bandages. Owing to the size of these trees it was found necessary to use from two to four bandages per tree, one being placed around the trunk and one on each main leader. All bandages had an overlap of from 1½ to 2 inches, and were kept in position by string tied firmly around the top and bottom of the bandage.

Excellent results were obtained in both plots with the treated bandages, which gave respectively a 78·6 and a 94·2 per cent. mortality, as against 13·3 and 13·3 per cent. mortality in the case of the untreated bandages.

The bandages were removed from the orchard on the 7th February, 1933, by which time all the fruit had been harvested. The bandages were then placed in breeding cages in order to check the possible emergence of codling moth until 1st May, when they were examined and a count made of the living and dead grubs and moths. It was found necessary to take the bandages entirely to pieces, as the grubs had in most instances penetrated under the corrugations.

The great majority of grubs in the treated bandages had perished before reaching pupation, and were black and shrivelled in appearance, probably dying a few weeks after entering the bandage.

C.—CONTROL BY TRAPPING WITH MOLASSES BAIT.

During recent years considerable interest has been taken in the trapping of codling moth by means of attractive baits or lures as a supplementary measure for the control of this pest, and experiments carried out in America and in Australia have given very encouraging results in many instances.

In 1924 preliminary trials were carried out in the Stanthorpe district with fermented apple juice and vinegar solutions, but the weather conditions then experienced operated against the experiment, which was only on a very small scale. Few codling moths were trapped, but large numbers of army worm moths were caught, the commonest species being *Cirphis unipuncta* Haw. During the 1930-31 season further work was done in this direction, using molasses baits for this experiment.

Nature of the Experiment.

A bait composed of one part of crude molasses to sixteen parts of water was used for this experiment. Altogether twenty traps were used, twelve being in one orchard and eight in another in the Applethorpe and Summit districts respectively. The traps used were the ordinary two-quart enamel pudding basins, and they were hung in the trees by wire supports fastened around the lip of the basin. In one orchard the traps were hung on light poles about 14 feet long, which enabled the traps to be placed about on a level with the top of the trees. This was done, as it had been claimed that traps so placed caught more codling moth than those placed lower down in the trees, and this proved to be the case. Evaporation, however, was much more rapid in the traps on poles, and occasionally some of the traps so placed dried out when more than a week elapsed between setting. Usually the traps were examined and reset weekly. About one pint of fluid was used to each trap. A count was kept of all codling moths, the sexes being separated, and also of some of the more important miscellaneous insects caught in the traps. The weather throughout the period of the experiment was dry and hot, with occasional heavy wind and rain storms.

Insects Caught in the Bait.

Full details of the insects caught in the bait will be found in Tables V. and VI. These details show that in orchard No. 1, 212 codling moths were trapped, while in orchard No. 2 the tally was 180. Table VI. gives the details of the insects other than codling moths that were obtained in the traps.

The moths referred to in Table VI. belonged to the following species:—The army worm (*Cirphis unipuncta* Haw.), the corn ear worm (*Heliothis obsoleta* F.), the brown cutworm (*Euxoa radians* Guen.), and two other Noctuids—namely, *Prodenia litura* F. and *Agrotis spina* Guen., the first two being the most abundant. They reached their maximum abundance during November in both orchards.

The bugs trapped were all a fruit-spotting species of the genus *Dysdercus*, and they were very abundant in the orchards during mid and late season, causing some damage to apples. The Melolonthid beetles were all of the genus *Heteronyx*, common foliage feeders, and sometimes were very abundant in the orchards at night. Many flies (*Syrphidæ*, *Phoridæ*, *Muscidæ*, &c., wasps, lace wings, butterflies, and a host of small moths comprising many species were also trapped.

TABLE V.

CODLING MOTHS TRAPPED IN MOLASSES BAIT.

Orchard No. 1.

Date of Examination.	Number Moths Trapped.	Number Males.	Number Females.	Number Traps.
1930.				
15 October	8	4	4	12
17 October	9	2	7	12
23 October	32	10	22	12
30 October	12	4	8	12
10 November	5	1	4	12
18 November	20	8	12	12
28 November	8	2	6	12
9 December	9	0	9	12
23 December	50	13	37	12
30 December	12	1	11	12
7 January	17	8	9	12
13 January	16	2	14	12
1931.				
20 January	12	0	12	12
28 January	1	0	1	12
16 February	1	1	0	12
Totals	212	56	156	12

Total period of trapping, 124 days. Per cent. males, 26·4 ; Per cent. females, 73·6.

Orchard No. 2.

Date of Examination.	Number Moths Trapped.	Number Males.	Number Females.	Number Traps.
1930.				
15 October	7	3	4	8
20 October	10	0	10	8
27 October	26	11	15	8
3 November	15	8	7	8
10 November	16	5	11	8
17 November	12	0	12	8
24 November	13	0	13	8
12 December	Traps all	dried out		
16 December	18	2	16	8
22 December	12	4	8	8
30 December	6	2	4	8
1931.				
8 January	19	2	17	8
17 January	12	5	7	8
27 January	8	5	3	8
16 February	6	3	3	8
Totals	180	50	130	8

Total period of trapping, 124 days. Per cent. males, 27·8 ; per cent. females, 72·2.

TABLE VI.

MISCELLANEOUS INSECTS CAUGHT IN MOLASSES BAITS FROM 15 OCTOBER, 1932, TO 16 FEBRUARY, 1933, IN 20 TRAPS.

Hemiptera. (Bugs.)	*Coleoptera.* (Beetles.)	*Hymenoptera.* (Wasps.)	*Lepidoptera.* (Cutworm moths, armyworm moths, etc.)
387	382	137	1,106

Effect on Codling Moth.

The spraying programme and the cleaning up of all codling-moth-infested fruit would probably account in some measure for the comparatively few codling moths trapped. Little control can be claimed from trapping in either of the orchards, the infestation being only slightly less than during the previous season.

Acknowledgments.

Thanks are due to Messrs. Pfrunder and Letters, who made available facilities for this experiment.

D.—CONTROL BY DUSTING OR SPRAYING.

The results obtained by experimental work carried out during the 1927-28 and 1928-29 seasons for the control of codling moth in the Stanthorpe district indicated that almost equally good control could be obtained by the application of arsenate of lead in dust form as is practicable with a wet spray. However, as the percentage of codling moth infestation in the check row was inconsiderable during both seasons, results were considered inconclusive, and it was decided to repeat the experiment in an orchard where codling moth infestation had been very severe during the last few years.

The area chosen for experimental work was again in the Summit district, and it was separated from surrounding orchards by fairly large areas of scrub land, being thus more or less isolated. The codling moth infestation during the last few years was exceptionally heavy in this orchard, and in the 1928-29 season quite 60 per cent. of the fruit was destroyed by this pest. It was thus very suitable for the work in view, and it was hoped that some definite results would be obtained regarding the respective merits of dusting and wet spraying.

Experimental Plots.

The plots used for the experiment covered an area of approximately 2 acres, and consisted of six rows of trees containing fifteen trees to the row, and five rows of trees containing fourteen trees to the row. The former were wet sprayed and the latter dusted, one control row of five trees being left untreated.

The wet-sprayed plot was situated nearer to the packing shed than the dusted trees and the check row, and it was concluded that the infestation would be somewhat heavier in the wet-sprayed plot if no control measures were adopted.

The trees were 20 feet apart and were from eight to ten years old, and very unequal in regard to size and quality. The following varieties of apples were represented:—Granny Smith, Jonathan, Munro Favourite, American Summer Permain, Nicojack, Ben Davis, and Mackintosh Red. The variation in the trees would account for the comparative poorness of the crop, which was a very light one.

Materials Used and Method of Application.

The spray mixture was applied with a power spray outfit at a pressure of 200 to 225 lb. One man and one horse were used to operate the sprayer. The dust mixture was applied with a hand Niagara dusting gun, having a capacity of about 9 lb. Six treatments were made with the dust, the first coinciding with the calyx spray and the others thirteen, twenty-eight, fifty-seven, seventy-five, and eighty-six days later respectively. Four treatments were given with the wet spray—namely, the calyx spray and three others, fourteen, forty-nine, and seventy-five days later respectively. A fine nozzle was used for spraying, and the spray applied in a mist-like cloud. Trees were thoroughly sprayed from both sides, the aim being to direct the spray downwards into the tree. The dust used was the Cloudform A.P. No. 1, containing 15 per cent. arsenate of lead and 85 per cent. reducer. Dustings were made when possible in a still atmosphere and the trees well covered. The dust could be seen on the trees throughout the season.

The dates of application of the dust and spray, strength at which materials were used, and cost figures are given in Table VII. Cost figures are calculated on skilled labour at 2s. 6d. per hour, A.P. No. 1 dust at the local price of 29s. 6d. per 56 lb., and arsenate of lead at the rate of 1s. 9d. per lb. Apples are calculated at 200 to the case, this being a general average.

Codling Moth Infestation.

The codling moth infestation throughout the district was exceptionally heavy, and this was also the case in the experimental orchard, as will be seen from the 100 per cent. infestation of the check row. It was found possible to make nearly all dustings and sprayings at critical times, owing to the favourable weather conditions experienced throughout the season.

Losses from causes other than codling moth were remarkably small and were virtually negligible. These losses included apples unsound or cracked, individual fruits infected with *Penicillium*, "dead stings," and one or two fruits attacked by fruit fly.

Summary.

The results as set out in the tables demonstrate the superiority of wet spraying over dusting as a control of codling moth, and the infestation of the entire crop of apples in the control row is an eloquent illustration of the loss that must follow the failure to adopt control measures. It also shows that efficient spraying, even in an orchard where codling moth has been long established and is very prevalent, will give a reasonable control of this pest.

The dusted trees, although situated well away from the packing shed, which is an acknowledged source of infestation, and given six

applications of the dust, showed a 40 per cent. loss from codling moth. The sprayed plot, on the other hand, although situated nearer to the packing shed and receiving only four treatments, showed only a 15 per cent. loss from codling moth.

Dusting has many advocates owing to the ease and quickness with which it may be applied, and it certainly may prove of value to supplement spraying at critical times, but the results now obtained do not justify the recommendation of dusting as a substitute for wet spraying for codling moth control.

TABLE VII.

TIME AND COST OF APPLICATIONS IN DUSTING AND SPRAYING EXPERIMENTS.

Date of Application.	Number Trees Treated.	Materials Used and Strength.	Quantity Used.	Time Required.	Cost.		
					Labour.	Material.	Total.
			Lb.	h. m.	s. d.	s. d.	s. d.
9–10–29	70	A.P. No. 1 Cloud-form Dust containing 15% Arsenate of Lead, 85% Reducer.	6	0 30	1 3	3 0	4 3
22–10–29	70		11	0 40	1 8	5 6	7 2
6–11–29	70		4½	0 30	1 3	2 3	3 6
5–12–29	70		5¼	0 30	1 3	2 7½	3 10½
23–12–29	70		6	0 30	1 3	3 0	4 3
3–1–30	70		6	0 30	1 3	3 0	4 3
		Totals ..	38¾	3 10	7 11	19 4½	27 3½
			Galls.				
9–10–29	90	Arsenate of Lead 2¼ lb. to 60 galls.	40	2 30	6 3	2 7½	8 10½
23–10–29	90		38	2 45	6 10½	2 6½	9 5
27–11–29	90		40	2 30	6 3	2 7½	8 10½
23–12–29	90		41	2 45	6 10½	2 8	9 6½
		Totals ..	159	10 30	26 3	10 5½	36 8½

TABLE VIII.

RESULTS OF DUSTING AND SPRAYING EXPERIMENTS.

Treatment.	Number Trees.	Total. Quantity of Fruit in cases.	Sound.		Unsound.	
			Number Cases.	Per Cent.	Number Cases.	Per Cent.
Dusted	70	74	44	59·5	30	40·5
Wet sprayed	90	104	88	84·6	16	15·4
Untreated	5	8	0	0	8	100

Acknowledgment.

In conclusion, I would like to express appreciation to the Chief Entomologist, Mr. Robert Veitch, for his valuable co-operation and advice.

AGRICULTURAL NOTES.

By H. S. HUNTER, Agricultural Branch.

Lucerne the King of Fodders.

LUCERNE has been aptly termed the "king of fodders," an application which fits it admirably in Queensland, where periodical dry spells are of regular occurrence. Not only is the crop unsurpassed in feeding value, but it is drought resistant, lends itself to conservation for lengthy periods, once established the crop persists from year to year, and calls for comparatively little attention. In addition it acts as a soil renovator rather than as a soil exhauster. Although the cultivation of lucerne is extending in Queensland each year, its distribution is not nearly so extensive as its value would seem to warrant. The plant demands certain conditions and types of soils, but recent experience has shown that these are not so limited as was at one time believed. For example, since the fall in wheat values and the consequential extension of the dairying industry to the inland sandy loam wheat areas of New South Wales and Victoria lucerne has been grown successfully on those soils. Its value to the Maranoa has been demonstrated by Mr. R. S. McGeoch, of Roma Downs Station. The establishment of lucerne in such areas has been facilitated by light sowing, even as light as 2 lb. of seed per acre.

The range of the crop has been extended also by innoculating the soil with the particular nitrogen fixing bacteria necessary for its successful growth, as, in some cases, the absence in the soil of this organism has been the only obstacle to the establishment of a lucerne crop.

Lucerne also forms a valuable constituent of pasture, and should give good results when sown in conjunction with Rhodes grass, using not more than 2 lb. of lucerne seed per acre. A more extensive use of lucerne as a pasture plant has been advocated by Mr. W. Davies, the Empire grassland expert, who has suggested that efforts be directed towards the evolution of a strain with a habit of growth more suited for grazing than the ordinary cultivated type.

Crop Prospects.

Some relief was given by the late June rains. Falls in Southern Queensland, exceeding 1 in., were more general in the coastal areas, but it is pleasing to note that the new settlers on the former prickly-pear infested county of the Dulacca-Chinchilla area received up to 2 inches. In most of the dairying districts young fodder crops will receive a much-needed impetus, and now will be enabled to become sufficiently well established to permit of their being grazed by stock.

The danger of drought conditions, however, is not yet passed, and additional good rains of a soaking nature are needed at an early date before the late winter and early spring months can be approached with confidence.

Wheat may be sown under seasonably good conditions in the Milmerran, Leyburn, and Inglewood districts, where the precipitations recorded ranged from 1 inch to 140 points, but elsewhere throughout the wheat belt, including the Maranoa, the average falls were in the vicinity of half an inch. Although this is somewhat short of immediate requirements, it will be helpful to the young crops sown on dry land and which germinated after the light rainfall received early in June, also for plantings made immediately after those rains. As the season is well advanced, the balance of the sowings most probably will be made now, and provided July is a little more generous than usual in the matter of rain, all these latter sowings also should come through their preliminary stages of growth successfully.

Production Problems.

Important questions affecting the interests of primary producers still are awaiting solution. Amongst the most important of these is the question of restricting wheat acreages in the principal wheat exporting countries. Although Queensland is not at present concerned in the wheat export trade, the object which the proposal aims at—a raising of prices—is of immediate and vital concern to this State, particularly as commodity prices generally are influenced to a great extent by the price of wheat. Additionally, local proposals for an Australian domestic price for wheat are being held in abeyance. New Zealand has stabilised its own domestic price by the appointment of a Wheat Purchase Board, which is to control all transactions in wheat in the Dominion.

The reasons for Australia's objection to a curtailment of wheat acreages are well understood within our borders, and, as was to have been expected, the Commonwealth has adopted the attitude that development should not be retarded by this means, and wheat farmers in single-crop areas heavily penalised, unless it were felt definitely that advantages would accrue. One obstacle in the form of unrestricted production in Europe of wheat protected by high tariffs and import embargoes, was shown to be most formidable in a recent bulletin issued by the International Institute of Agriculture, which stressed the danger to Europe, with its large population, of the extension of wheat growing during the war period to sparsely populated countries.

The question of most immediate concern to Queensland is that of a domestic price for butter and cheese. As the States are in agreement on the proposal, it only remains for the Federal Government to announce its intentions in this regard.

Primary producers' organisations have been invited to tender evidence before the Royal Commission on petrol, relative to the effect upon primary production of the prices of power kerosene, and in Queensland inquiry is to be made by the Commissioner of Prices into the prices of dairy farm machinery as recommended by the Royal Commission on dairying.

Improved Prices.

The present time is not without encouraging signs from the producer's point of view. A trend appears to have developed towards an improvement in prices of staple commodities. Values of wool are appreciating, and wheat prices have advanced sharply in North America, following on the effects of unfavourable weather conditions in the wheat belts of Canada and the United States. Other grains and cotton also have responded to the upward movement in values.

Locally, an encouraging improvement has occurred in pig prices, with a seasonal rise in the values of farm fodders and potatoes. The prevailing cold weather is not assisting the demand for fruit.

Breeders of good quality draught horses have been reaping the benefits of their industry and foresight for some considerable time. Evidences of the return to the horse for farm work are shown in the high values and the improvement, both in quality and quantity, in the horse sections of country and metropolitan shows.

Farm Fodders.

With the continued dry weather and the advance of the winter months farm fodders are appreciating in value, particularly lucerne chaff, which at the time of writing has realised up to £8 per ton. This is really a very high price when it is considered that the fodder is purchased principally for the ultimate production of other commodities which have slumped to exceedingly low market values.

Lucerne hay also is in better demand, and maize values are steadily improving, with every indication of a considerable advance in the near future. Apart from commercial lots, there is a good demand from New South Wales for lines suitable for seed purposes. The crop on the Darling Downs generally was poor, although success has been reported with early maturing varieties in the Allora district. Much of the Downs maize normally finds a market across the border, and as the crops in the Northern portion of New South Wales produced light yields there is a possibility of a stronger Southern inquiry on the Brisbane market.

The maize crop on the Atherton Tableland, which is now nearing maturity, has experienced a favourable season, and it has been estimated to yield approximately 18,000 tons.

Fruit and Vegetables.

Better quality bananas have been in steady demand, but most other lines of fruit are dull of sale. The market has been well supplied with local citrus, pineapples, strawberries, and papaws, also apples and pears from Tasmania. Good prices are being obtained for locally grown potatoes, and the demand for pumpkins has improved. Potatoes from the South for seed purposes are not sought after owing to the dry weather. There have been heavy condemnations of faulty lots, both from local growers and from across the border. Green vegetables are in better supply. Consignments of crisp, fine-flavoured celery are arriving from South Australia, which State has built up a valuable trade with this vegetable on Melbourne, Sydney, and Brisbane markets. Exports to the Eastern States have increased from 200 crates in 1928 to 60,000 crates in 1932.

THE USE OF DELINTED COTTON SEED FOR PLANTING PURPOSES

By LLOYD HODGE, Manager, Cotton Research Station, Biloela.

IT would appear from the experience gained during the past two or three seasons, and from investigations conducted at the Cotton Research Station at Biloela, that the use of delinted cotton seed for planting purposes ensures quicker germinations, more even distribution of seed, and better ultimate stands than are obtained from planting undelinted seed.

This is illustrated in a striking way by the following experiment:—One side of a two-row drill was arranged to plant delinted seed while the other side sowed undelinted, both sowing at the rate of 20 lb. per acre. The test covered 1 acre sixteen rows wide. From the sixth to the twelfth day inclusive, after sowing, population counts of the resulting stand were made. The subjoined table shows the comparative rate of germination between the two treatments, expressed as the percentage of the *possible* germination daily and the final stand per foot obtained in each—

Seed.	6th Day.	7th Day.	8th Day.	9th Day.	10th Day.	11th Day.	12th Day.	Plants per Ft.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	
Delinted	49·1	65·2	69·4	72·4	73·8	75·2	76·3	4·5
Undelinted	7·9	25·7	33·9	40·9	44·9	49·6	52·3	2·0

The principal gain appears to be due to the fact that the delinted seed, without the coating of fuzz, is brought into more intimate contact with the soil moisture. It must be borne in mind in this connection that sufficient germinating moisture is more often than not difficult to obtain for early planted cotton. Scrub soils, with their more or less waterproof coating of ashes, newly-broken land, hurriedly prepared cotton or maize stubble, the lightness of the early spring rains, the limits as to the depth at which cotton may be planted, are all factors which contribute to the especial difficulty of obtaining sufficient moisture to ensure complete germination.

The removal of the fuzz from the seed, in allowing the seed coat to come into closer contact with the damp soil, undoubtedly enables the grower to obtain satisfactory stands under conditions which would render the achievement of the same stands doubtful or even impossible if undelinted seed had been planted.

In addition to this, the removal of the fuzz renders the seed more fluid, and consequently permits of more even sowing and a more consistent depth being maintained.

Rate of Sowing.

Various rates of sowing delinted seed have been advocated, from as low as seven to as high as 20 lb. to the acre.

In order to obtain information on the subject, carefully conducted field experiments and laboratory examinations were carried out at the Cotton Research Station during the 1932-33 planting season. The results indicated that after allowing for mutilated and unsound seed there are around 3,000 to 3,500 sound seed per pound of delinted Durango cotton seed. The number varies naturally with the percentage of good seed in the sample, but for general practical purposes the figures given may be taken as a representative average. As there are 9,680 ft. of rows in an acre in which the rows are spaced 4½ ft. apart, an increase of approximately .3 of a plant per foot is obtained for every pound of seed sown. The following would represent the vital seeds sown per foot at the indicated rates of planting:—

9 lb.	per acre	= 2.8	vital seeds	per foot.
10 lb.	„	= 3.1	„	„
11 lb.	„	= 3.4	„	„
12 lb.	„	= 3.7	„	„
13 lb.	„	= 4.0	„	„
14 lb.	„	= 4.3	„	„
15 lb.	„	= 4.6	„	„

In order to test the reliability of this table, sowings of delinted seed were made in the field over an acre, the rates being very carefully regulated to 9 lb., 12 lb., and 15 lb. respectively. Germinating conditions were good, and when the germination was complete, a count of the entire populations gave the following figures, expressed as plants per foot:—

At rate	9 lb.	per acre	= 2.05	plants	per foot.
„	12 lb.	„	= 3.46	„	„
„	15 lb.	„	= 4.18	„	„

It will be seen by comparison with the laboratory table given above that the field results approximated very closely, being only 13 per cent. lower over all treatments. This is, of course, to be expected, as the laboratory germinations are conducted under ideal conditions. It must be borne in mind that conditions for germination during the course of this experiment were very favourable, and a germination above the average that would be obtained on a large commercial planting resulted.

It is emphasised that the percentage of vital seeds sown which do not survive to the thinning stage is a very variable quantity, and is much higher than is generally supposed. Drying out of the seed-bed, insect attacks, fungoid diseases, to mention only a few, are examples of the reducing influences which may, and do, whittle down the number of young seedlings. Close tests carried out at the Research Station, where the sowing rates of the drills are known exactly, and the germination tests have given the vital seeds per lb. factor, have revealed the surprising fact from population counts subsequently made, that what appears to be a satisfactory commercial stand may have failed to germinate from 13 per cent. to 45 per cent. of the vital seeds sown. Add to this percentage losses of seedlings which occur between germination and thinning, and one begins to realise that a margin must be allowed in the planting rate to cover these contingencies.

On this account it is strongly recommended that not less than 10 lb. per acre of delinted seed be planted, when sown through a seed drill, and preferably at least 12 lb. of varieties like Durango and Lightning Express. When planting the varieties with larger seed, such as Acala, Mebane, and Lone Star, it is possible that over a series of seasons more seed than this will be found to be of advantage. Numerous cases, doubtless, could be quoted where good stands have been obtained from lighter sowings, but with the low price of seed a grower is well advised to plant enough to insure against a probably gappy stand. Ten lb. per acre gives a possible three plants per foot, when the rows are 4 ft. 6 in. apart, assuming that every vital seed sown germinates, and that every germinated seed lives; so that when growers remember from their own experience how many things can and do happen to the young seedlings before thinning time, it will be understood that the safety margin at three plants per foot is none too large.

Rate in Unstumped Scrub, when Planted by Hand.

When the planting of unstumped scrub soils is undertaken, either with a walking-stick planter or with the hoe, the following table will give the grower the necessary information as to how many vital seeds he is planting to the hill at pounds per acre, when he spaces his hills either at 18 in. or 24 in. apart and his rows 4 ft. 6 in. apart. The vitality of the seed, and the number of seeds in a pound are assumed to be the same as in the table already given for drill planting:—

Rate.	Hills 18 Inches Apart.	Hills 24 Inches Apart.
4 lb. per acre	1·85 vital seeds per hill	2·44 vital seeds per hill
5 lb. per acre	2·31 vital seeds per hill	3·05 vital seeds per hill
6 lb. per acre	2·77 vital seeds per hill	3·66 vital seeds per hill
7 lb. per acre	3·23 vital seeds per hill	4·27 vital seeds per hill

How to Sow Delinted Seed through the Undelinted Cotton Seed Hopper.

Although the cotton drills on the market at present are designed to sow undelinted seed, they may be adapted for delinted seed with a slight alteration of the slide opening through which the seed falls on to the feed wheel. With the ordinary square-ended slide a point must inevitably be reached, when closing the seed opening, where the opening is less than the diameter of the seeds, and no seeds are dropped. Before this point a stage is reached when the largest seeds are held back, which means that either the largest and best seeds are graded out or the drill is being clogged up. It has been ascertained that a quarter-inch opening gives a somewhat irregular sowing rate of approximately 12 lb. per acre. A quarter-inch opening is very small, and it is not unlikely that with this minimum opening choking of the feed may occur through bits of foreign matter gradually bridging the opening. It is recommended, therefore, that growers cut a pair of seed regulator slides for the seed hoppers out of 24 gauge iron, and then cut a small rectangular notch in the middle of the end which is used to regulate the flow of seed, as shown in Fig. 1.

This opening if cut ¾ in. long by ½ in. deep will give about a 10 lb. to the acre rate when the slide is pushed right home. Growers should, however, experiment themselves with a gradually increased opening until the required rate is arrived at, and this can be done quite easily in the following way:—

There are 9,680 ft. of row in an acre, when the rows are spaced 4 ft. 6 in. apart, and since in a two-row planter each hopper plants only half an acre to every acre the whole machine plants, it follows that each wheel travels only half of 9,680 ft., or 4,840 ft. to the acre planted.

In the P. and O. planter the wheels are 94 in. in circumference, so that by dividing 94 into 58,080 (inches in 4,840 ft.) one ascertains that each wheel revolves 618 times (in round numbers) for every acre planted by the machine. If the machine is therefore jacked up, with both wheels clear of the ground and both hoppers filled, it can be readily determined what the planting rate is and if both hoppers are distributing at the same rate. On the abovementioned machine, 206 turns round would sow one-sixth of an acre from each hopper, so that multiplying by 6 the weight of seed distributed through a hopper the acre rate can be determined.

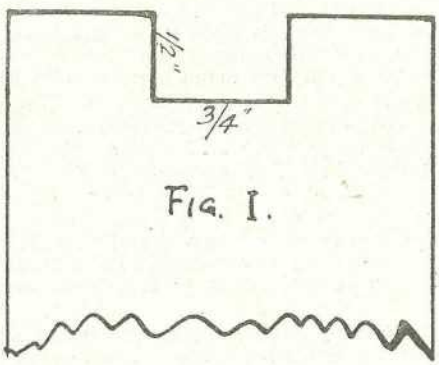


FIG. I.

When the circumference of the planter wheel is other than 94 in., the same principle may be applied, divide the circumference in inches into 58,080 to find the number of turns per acre, and multiply the seed discharged by each hopper by the fraction of an acre represented by the number of turns given to the wheel.

It is a help to tie a rag to one of the spokes as a marker when turning.

To Sow Delinted Seed Through Maize Plates.

Should the grower only have a drill designed for planting maize, the six-hole plate, when the holes are ⅜ in. diameter, will sow delinted seed satisfactorily if the cut-off plate is removed and a spring steel strap of ⅛ in. steel and 1 in. wide is inserted in its place. This strap must be centre bored for the insertion of the winged holding-down screw, and the ends filed with a notch to correspond with the notch on the rim of the cut-off plate, which prevents it turning with the holed seed plate. This strap serves the purpose of holding the ring cog (which carries and revolves the holed seed plate) down on to the bevelled driving cog, and also allows the delinted seed to flow freely. In principle, it is necessary to remove as much non-moving metal as possible from over the seed plate, otherwise the delinted seed has a tendency to bridge over the holes. It is a help also to insert in the side of the hopper a short rod (a 3-in. by ¼-in. bolt with the head cut off will do) which has the last inch bent down at right angles, so that it just clears the six-hole plate. This moves the seeds about between the holes and assists in more even feeding.

If a heavier rate of sowing is desired, it will be necessary to enlarge the holes with a round file. Six holes bored out to ⅜ in. has been found to give a rate of 21½ lb. per acre with the P. and O. machine in low gear.

In conclusion, it is repeated that where germination moisture is low, the use of delinted seed is a distinct improvement over undelinted, and that as germination moisture early in the season in Queensland is generally low, the using of delinted seed, both in cultivated land and newly burned scrub, is strongly recommended. It is pointed out, however, that planting delinted seed in dry soil to await the germinating rains may necessitate replanting in a spring in which light storms are experienced. Undelinted seed may, therefore, be more suitable for planting in the dry in all classes of soils on account of less possibility of germination being started with light showers.

MANURES AND MANURING.

By E. H. GURNEY, Senior Analyst.*

THE term manure is usually used in reference to farmyard manure and bulky organic material which improve the physical and biological condition of the soil, as well as supplying plant food.

Fertilizers, often spoken of as artificial fertilizers, are the names given to what may be termed manufactured materials used by cultivators of soil to supply plant food to their crops.

The earth, including the vegetable and animal life upon it, is composed of material built up by the combination of some eighty-odd elements. Of these, though it may be necessary for the soil to supply a number for successful plant growth, the majority are usually present in sufficient quantities in soils in available form for plant needs, and the elements nitrogen, phosphorous, potassium, and calcium are the only ones that may be necessary to be applied in manures or fertilizers.

Under certain soil conditions and crop requirements it has been found that the application of small quantities of such elements as manganese, boron, copper, &c., has resulted in healthy and increased crop growth, though it must be remembered that these elements when present in more than minute quantity become toxic to plants.

Mention may be made of the elements sulphur and magensium. It has been reported that in some countries sulphur, or compounds containing sulphur, applied to some soils has caused the production of larger crops with increased protein content. The sulphur content of pastures and the effect of the application of ammonium sulphate on the sulphur content of pasture has been investigated by Askew and Bishop in New Zealand.

In the 1914 Annual Report of the Agricultural Chemist, Mr. J. C. Brünnich, it is stated that a large number of Queensland soils had been tested for their sulphur content and that there was in most of the soils sufficient supplies of sulphur for crop requirement.

In connection with supplying sulphur to soils, it must be remembered that when application of such fertilizers as superphosphate, sulphate of potash, and ammonium sulphate is made to the soil a certain amount of sulphur is supplied.

Regarding magnesium, it has been found in many cases that the application of fertilizers containing some compound of this element has caused improvement in the quality of some kinds of tobacco leaf.

In nature plant life decays and is deposited where it has grown, returning to the soil organic matter containing mineral plant food in readily available form for future plant life, and thus the soil in this case is not depleted in any way and retains its fertility.

In the case of cultivated or pasture soils, the crops grown are removed with the plant food material they have absorbed from the soil during growth and unless means are taken to return to the soil such food material, the continued removal of crops will ultimately cause infertility in the richest soil.

In this country, owing to the fact that in the past there has been available a relatively large amount of good virgin country, it has been a somewhat common practice to crop the land until more or less depleted, then when this occurs to remove from this worn-out soil and cultivate fresh virgin soil. Now that there is not available the quantity of rich virgin soil the abovementioned practice will necessarily be restricted. It should be stated here that it is easier to maintain a soil in a fertile condition than it is to bring a thoroughly depleted infertile soil back to fertility.

One of the means available for maintaining soil fertility is by the application of manures and fertilizers to the soil, but it must be understood that if the soil is not in good tilth, or is badly drained, successful results will not be obtained from the application of fertilizers.

It has been mentioned that the four elements—nitrogen, phosphorous, potassium, and calcium—are the main ingredients considered necessary to be supplied in fertilizers. The last three mentioned when considered in fertilizers, are estimated as phosphoric acid—potash—and lime, and for our purpose these substances may be considered as mineral plant food ingredients.

Manures, such as farmyard manures, green manure crops, composted vegetable matter, &c., are used essentially for supplying humus to the soil and thus improving

* In a radio lecture from station 4QG.

the physical and biological conditions of the soil, but such manures, depending upon particular soil condition and crop requirement, may or may not be able to supply the particular amount of any mineral plant food required.

The great value will therefore be seen of using farmyard manure, together with artificial fertilizers. For not only is any deficiency of mineral plant food that is not supplied in the farmyard manure made good by supplementing with a fertilizer, but the efficiency of the fertilizer is improved by the increased soil's solvent and bacterial action upon the fertilizer, due to humus of the farmyard manure.

One ton of mixed farmyard manure contains from 450 to 700 lb. of organic matter, 10 to 15 lb. of nitrogen, 3 to 6 lb. of phosphoric acid, and from 8 to 16 lb. of potash.

The composition of green manure crops varies very much according to the kind of crop used, the nature of the soil upon which it is grown, and the cultural treatment of the crop. The average amount of material returned to the soil by ploughing in crops from an acre of some different varieties of cowpea is as follows:—

Organic matter	14,976 lb.
Nitrogen	364 lb.
Phosphoric acid	97 lb.
Potash	400 lb.

The artificial fertilizers may be grouped according to the fertilizing ingredient they supply, some containing a single ingredient, others, namely, mixed fertilizers, supplying more than one ingredient. Again the fertilizers may be grouped as "quick acting" or "slow acting" according to the speed in which the active fertilizing ingredient becomes, when in the soil, available to plants.

The time required for a fertilizer to become available to plants depends upon its degree of solubility in the soil water, and also upon the state of fineness of the fertilizer.

Thus the fineness of such materials as bonedust, lime, and pulverised limestone is of particular importance, as the more finely these materials are ground the sooner do they become available to crops.

A few of the more commonly used fertilizers will be briefly mentioned.

Fertilizers containing Nitrogen.

Nitrate of soda—15 to 16 per cent. nitrogen; very quick acting.

Sulphate of ammonia—20 to 21 per cent. nitrogen; quick acting.

Dried blood—11 to 12 per cent. nitrogen; fairly quick.

Fertilizers containing Phosphoric Acid.

Superphosphate—20 to 21 per cent. phosphoric acid; quick acting.

Nauru phosphate—37 per cent. phosphoric acid; slow acting.

Fertilizers containing Potash.

Sulphate of potash—48 per cent. potash; very quick acting.

Muriate of potash—50 per cent. potash; very quick acting.

Fertilizers containing Nitrogen and Phosphoric Acid.

Bone dust—3 to 4 per cent. nitrogen and 20 to 25 per cent. phosphoric acid; slow acting.

Meatworks fertilizers—3 to 7 per cent. nitrogen and 14 to 20 per cent. phosphoric acid; slow acting.

Mixed Fertilisers containing Nitrogen, Phosphoric Acid, and Potash.

Mixtures composed of quick acting materials or of mixtures of quick and slow acting materials.

Materials supplying Lime.

Quick lime or burnt lime.

Agricultural lime—pulverised limestone, pulverised shells, &c.

Gypsum—Calcium sulphate.

The above list does not include all fertilizing material on the market. There are now a number of nitrogenous fertilizers synthetically manufactured from the nitrogen of the air.

In manuring, consideration has to be given to the nutrient requirement of any particular crop, and also to the soil's capacity of supplying such nutrient. If the soil has an ample supply of any one plant food it is certainly not necessary to give more of such plant food by means of manure.

Again, though it is admitted that a number of our soils are deficient in phosphoric acid, it must not be assumed that superphosphate is the only fertilizer required.

Valuable information can be gained as to the fertilizer requirement of a soil by a few duplicated small experimental trials, provided, of course, that favourable physical condition (tilth, &c.) of the soil exists. Different crops have different manurial requirement, and have also different root development, and varying power of assimilating their food from the soil.

Thus, as a general rule, cereals and grasses have very good power of assimilating nutriment from the soil—leguminous crops somewhat less power—and root crops a poor assimilative power.

The nutrient requirements of a few crops stated in a brief and general manner, are as follow:—

Leguminous crops, such as lucerne, peas, &c., respond well to the application of lime and require ample supplies of potash and phosphoric acid.

Though these crops contain large amounts of protein (nitrogenous body), they do not require fertilizers containing nitrogen as they obtain their nitrogen from the air through the agency of bacteria existing on their roots.

Maize grows best on soils well supplied with humus, and if grown for grain on such soils, requires a fertilizer containing only phosphoric acid and potash, but if grown for green fodder the addition of some nitrogen with the above fertilizers will stimulate growth and give increased croppage.

For the best results with vegetables the soil must be well supplied with humus; on such soil carrots and turnips require fertilizer containing high phosphoric acid, with fair potash content; potatoes, a fertilizer with high potash and fair phosphoric acid content; tomatoes, a fertilizer with high phosphoric acid and high potash content.

Grown on soils deficient in humus the fertilizers mentioned for these vegetables would require to be supplemented with a small amount of nitrogenous fertilizer.

For vegetables the best source of humus is well rotted farmyard manure.

The general effect upon plant life of the different ingredients in fertilizers may now be stated:—

Nitrogen stimulates the growth of the stems and foliage of plants, and if an excessive amount of available nitrogen exists, particularly in the presence of a deficiency of phosphoric acid and potash, very vigorous plant growth occurs, but with poor development of flowers and fruit.

Nitrogen increases grass growth, which is valuable if the young grass is utilised, but if present in an excess is liable to cause rankness in the matured grass.

Phosphoric acid encourages root growth of plants, increases crop yields, and accelerates the ripening and maturity of crops.

Potash seems to be connected with the formation of starch and sugar in plants, and in some cases with increased crop yield.

Potash deficiency causes plant growth to be less resistant to disease.

Lime improves soil tilth, causes conditions favourable for bacterial growth, and neutralises soil acidity.

Thus it will be seen that for successful crop growth not only is it necessary for all these fertilizing ingredients to be present, but that all must be present in correct proportion for any particular crop. It must be understood that without good physical and biological soil conditions, the application of fertilizers can not yield successful results.

In connection with the selling and buying of fertilizers, in many countries there are Fertilizer Acts, which Acts were brought into force for the purpose of protecting both seller and buyer of fertilizers. The Queensland Acts of 1914 to 1916 require every seller of fertilizers to obtain a license to sell, and that such licensed dealer must give to the buyer upon sale of any fertilizer an invoice certificate.

This certificate must have upon it the name of the seller and the name of the buyer, the name and weight of fertilizer sold, together with the percentage of nitrogen, phosphoric acid, and potash existing in the fertilizer, and the forms in which these fertilizing ingredients occur. Also the fineness of such materials as bone dust, meatworks fertilizer, Nauru phosphate, and lime has to be stated.

A buyer should always retain such invoice, as reference to it may at times be required.

The bag containing the fertilizer sold is required by the Act to have a label attached stating the name and weight of the fertilizer, and with composition and fineness as mentioned in the invoice.

By this means the buyer can see what he is purchasing and is informed as to the nature of the fertilizing ingredients—whether quick or slow acting.

SOILS AND SOIL FERTILITY.

By E. H. GURNEY, Senior Analyst.*

SOIL is the friable material formed from the weathering of rocks and the decay of plants and animal life. The soil must be considered not only as serving as a foothold for plant life, but also as a factory in which material is transformed into a form suitable for plant food.

Some weathering agencies by which rocks are broken and decomposed into soils may be briefly mentioned:—

Changes of Temperature.—The different constituents of rocks expand and contract to a different extent when subjected to different degrees of temperature and the alternate expansion and contraction ultimately cracks the rock, causing pieces to fall off.

Water.—Rain falling upon rocks wears away the surface and running streams of water have similar wearing down action upon rocks, and such action is still further increased by the presence of small particles of rock material contained in streams.

Water, also containing carbonic acid, has an increased solvent action upon some rock material, and in this way the rock structure is weakened and ultimate disruption of the rock occurs.

Wind.—Wind carrying small particles of loose material beats upon the rock surface and wears this surface down.

Plant Life.—The roots of plants force their way into crevices of rocks and push the rock particles still further apart, thus helping in breaking down the rock. Plant life in decaying forms organic acids which are capable of dissolving some of the rock material and thus weakening the rock.

All the above agencies have been mentioned as causing the breaking down of rocks, but it must be fully recognised that these same agencies are acting in a similar way in breaking up particles of soil and, therefore, cultural operations such as ploughing, bare and crop fallow, soil drainage, efficiently conducted, are all aids towards procuring soil material suitable for crop growth.

The consideration of soil material suitable for crop growth—namely, the fertility of soil—will require taking into account various soil properties. And a most important fact is that these soil properties must be considered in conjunction one with another and not singly. Only brief mention will be made of the many factors upon which the fertility of the soil depends, and for convenience the soil properties are included under the following three divisions:—

Physical condition,
Chemical condition, and
Biological condition.

Physical Condition.—Under this heading consideration must be given to the following properties:—Tilth, water-holding capacity, capillary capacity.

Tilth.—This is the condition into which the surface soil may be brought by cultivation. A soil with good tilth is one which upon working forms a good seed-bed—that is a soil whose constituents break down into fairly small granules which remain in a friable condition—the term "crumb-like structure" has been applied to this condition.

Improvement of tilth may be obtained by cultivation, fallowing, drainage, liming, and the addition of humus.

Water Holding Capacity.

By this is meant the power a soil has of holding water falling upon it. This property depends partly upon the porous nature of the soil, but more particularly upon the nature of the soil ingredients. Of these ingredients humus has greatest water-holding capacity, followed in order by clays, loams, and sands.

It is considered that the most successful plant growth is obtained when the water content of the soil ranges from 40 to 50 per cent. of the total water-holding capacity of the soil.

The soil capacity for retaining water may be improved in some cases by cultivation, but the greatest improvement is obtained by increasing the humus content of the soil.

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* In a radio lecture from station 4QG.

Capillary Capacity.

The water in a soil exists as a film coating the surface of the soil particles. The power a soil has of circulating water within itself is termed its "capillary capacity," and this depends largely upon fineness of soil texture.

Cultivation breaks up the soil and causes larger granular surfaces to be exposed, and this surface becomes covered with water films.

The soil is deprived of its water by evaporation, transpiration of plants, and drainage.

The movement of water by capillarity tends to keep the soil moist at the surface, and thus aids the loss by evaporation. Such loss is lessened by repeated surface cultivation, as this breaks the continuity of the film of soil water; the top inch or so of soil becomes very dry and acts as a mulch preserving the water of the soil beneath.

Rolling the soil causes increased capillarity and, therefore, loss by evaporation, but the percentage of water in seed-bed is increased.

Chemical Condition.

By this is meant the amount of plant food in the soil, and in what condition that plant food is, viz.: available or unavailable to plants. The following are means of improving or maintaining the amount of available plant food in the soil:—

Cultivation.—By this means exposure of soil to the weathering action of the air converts some unavailable into available plant food.

Fallowing (crop).—Permits of an accumulation of available plant food.

Rotation of Crops.—By such system the soil is not depleted of any particular plant food, and plant food, owing to different root systems of different crops, is drawn from different portions of the soil.

Addition of Humus.—This will supply a certain amount of plant food, but more important is the fact that in decaying the organic matter (from which humus is derived) yields acids, which convert some unavailable soil material into available plant food.

Addition of Manures and Fertilizers.—By this means both slowly and quickly available plant foods may be applied to the soil.

Liming changes some of the insoluble plant food of the soil into an available condition.

Drainage.—This enables an increased depth of soil to be exposed to weathering agencies.

Soil Acidity.—The question of soil acidity may be mentioned under chemical condition.

Briefly stated there are different forms of soil acidity and, therefore, there is not a simple definition for this condition. Of late years soil acidity has been considered from the degree of hydrogen ion concentration in the soil. This is expressed by the number of litres of water that contain 1 gram potential hydrogen, such numbers being very large; for convenience logarithms are used, and these logarithms, ranging from 0 to 10, are known as the pH scale.

In the case of water which is neutral the pH value is 7. This means that 10^7 (= 10,000,000) litres contain 1 gram of potential hydrogen in the form of ions. Smaller numbers indicate acidity. For example, pH 5.0 means that 1 gram of potential hydrogen in the form of ions in 100,000 litres—such solution is acid.

It has been stated that the extreme limits within which cultivated crops can grow are from pH 4.0 to pH 8.5; and that acidity of pH 3.0 and an alkalinity of pH 9.5 would kill crops.

Soil acidity may be rectified by the application of lime. In some cases the necessity of applying both lime and phosphate have been reported.

Some crops are more affected than others by soil acidity and respond differently to application of lime. Thus lucerne, peas, cabbage, and cherries are benefited by liming, whilst maize can grow in somewhat acid soil and is practically not affected by liming.

Biological Condition.

By this is understood the condition of the soil bacteria (useful and otherwise).

Organic matter applied to the soil is decomposed by means of bacteria, and most of the products of this decomposition are utilised by plants.

Those bacteria which cause unavailable nitrogen or nitrogenous compounds to become available to plants, and *vice versa*, have, perhaps, been most studied, and are termed respectively "nitrifying" and "denitrifying" organisms.

The following conditions are necessary for soil bacteria to obtain their greatest activity:—

(1) Fair proportion of humus in soil; (2) a warm climate; (3) good drainage; (4) a certain proportion in the soil of basic substances, such as lime.

That the humus content of the soil is a matter of very great importance has been emphasised in so far that the addition of humus has been mentioned as a means of maintaining or improving all three soil conditions—physical, chemical, and biological.

As the maintenance of soil humus is of particular value in our climate of somewhat irregular rainfall, a brief summary of the functions of this soil ingredient is given.

All organic vegetable and animal matter upon decomposition in soil yield complex residues such as humus.

In the improvement of tilth humus cements together the granules of a sandy soil and causes the fine particles of clay to flocculate. This lessens the shrinkage of clay in dry seasons and creates a more "crumb like" texture.

Its capacity of absorbing and also retaining water enables crops on soil well supplied with humus to better withstand the ill effects of dry spells.

In decomposing organic matter, besides providing plant food itself, yields carbonic acid to the soil water, which thus has the greater power of converting unavailable into available plant food.

The soil bacteria derive the growth energy required by them from the organic matter of the soil, and if this is lacking, the bacterial life—upon which soil fertility so largely depends—is decreased.

The increased effects obtained by applying farmyard manure, together with artificial fertilizers, depends upon the carbon dioxide evolved in decomposition of the organic matter of the manure increasing the solvent power of the soil water and also upon the action of bacteria in the manure.

Humus can be added to the soil by the addition of farmyard manure—ploughing in of all vegetable residues, and ploughing in green manure crops. Sufficient care is not given to the collection and the proper conservation of farmyard manure. Owing to present conditions a large number of men have turned their attention to market garden crops, and such crops for the most successful returns require intensive cultivation. As a foundation for such cultivation for these crops there is need for the application to the soil of good amounts of well-rotted farmyard manure and decayed vegetable matter to supply the humus so necessary for the successful growth of most garden crops. And the great value of collecting all waste plant material, preferably mixed with some farmyard manure, and keeping the mixture just moist in compost pit or heap, is a matter the value of which many cultivators have not sufficiently appreciated.

In connection with green manuring, leguminous crops are particularly valuable for ploughing under owing to the fact that these plants can assimilate the free nitrogen of the air by the aid of bacteria living in the root nodules of the legume.

The intention in briefly summarising the many factors that influence a soil's fertility was to again emphasise that in soil management it would be a mistake to unduly consider only one of these factors. For instance no amount of manuring will rectify the ill effects of bad drainage.

Finally the question of suitability of the soil to any particular crop is of importance, as it is impossible to obtain successful results from crops planted in soils of unsuitable texture with unsuitable climatic conditions, though such soils with other crops may prove entirely satisfactory.

NOTES ON MAIZE CULTURE.

By C. J. McKEON, Instructor in Agriculture.

AS the maize crop for the past season throughout the Southern portion of the State generally was light, and, incidentally, much of the grain harvested, particularly from the late crops, was not of the best quality, growers who have not saved their own seed for next season's planting would be well advised to secure their supplies early.

Supplies of good quality, true-to-type seed will be very limited and the demand, by reason of the fact that a large number of growers who usually save their own seed were unable to do so (owing to failure or partial failure of their crops) will be much greater than usual.

As a result of this anticipated shortage, much of the grain offered for seed purposes will be inferior to that which would be available following on a normal season; and apart from the fact that it will be of poor quality, much of it will also be of doubtful origin. Growers who intend purchasing seed would be well advised to pay attention to the following:—

1. Secure supplies of seed early and from some known reliable source. It would be much better to plant seed of some proved variety which is known to have been grown under conditions ensuring its varietal purity, even if slightly inferior in appearance as a result of adverse weather conditions under which it was raised, in preference to a more attractive looking sample of unknown origin, but which may have been grown under much more favourable seasonal circumstances.

2. Be sure that the seed has been tested for germination. Numerous complaints have been received by this Department, particularly following on a season such as last, regarding the failure of the seed to germinate. This has frequently been found on investigation to have been due to the fact that persons taking advantage of the shortage of seed have disposed of maize which has been tanked for lengthy periods for seed purposes.

Preparation of the Land for Planting.

The time is now at hand when a start should be made on the preparation of the land for the early crop. It is one of the easiest crops to grow, and, unfortunately, advantage is frequently taken of this fact, and many crops are grown under conditions which would be fatal to many other crops.

To get the best results maize requires a good soil, in which a plentiful supply of plant food is available, a condition which can only be brought about by an early and thorough preparation of the land before planting, attention to the cultivation of the crop itself, and to the eradication of young weeds during its early growth.

The land should be ploughed to a depth of at least 9 inches during the winter, and allowed to lie in the rough until the early spring. The action of the frost and rain will have a sweetening effect on the soil, and will leave it in a mellow condition. In the early spring the land should receive a second ploughing, which, if possible, should be a cross ploughing. This should not be so deep as the first ploughing, and should be immediately followed by a harrowing and cross harrowing to work the surface soil into a nice fine condition.

If a crop of weeds is turned under during the second ploughing planting should not be carried out for a few weeks at least to allow decomposition to take place. On land which is not too heavy and moist this will be greatly assisted by rolling, as the rolling will consolidate the soil and cause the decomposition to take place much more quickly. It will also at the same time make a good firm seed bed. Rolling should always be followed by a light harrowing.

The preparation of the seed bed is one of the most important points in the production of maize, and no amount of after cultivation will undo the damage that has been caused by planting in a badly prepared piece of land.

One has only to see the difference, not only in growth but in the colour of the foliage also, between crops grown side by side, and where one has been sown on thoroughly prepared and the other on hastily prepared land, to realise how great the effect is.

Give the young crop a chance to become well established in a good seed bed—and by a good seed bed is meant not only a well-prepared one but one in which the young plants will not have to battle with a host of weeds—and the increased return will more than compensate for the extra time and labour spent.

Time to Plant.

The best times to plant will naturally vary according to the different districts. In districts which have a long growing season and a comparatively regular rainfall, this can be carried out whenever weather conditions are suitable, from August to late December.

Two very important points are—firstly, to choose a variety which is suitable for the district in which it is to be grown; and secondly, to try and have the crops tasselling during periods in which there is usually a good chance of getting rain. Maize must have moist conditions during tasselling, and if hot dry winds occur during this period the pollen is destroyed and fertilization cannot take place.

Seed should be sown in drills spaced from 3 feet 6 inches to 4 feet apart—nothing less than 4 feet for the tall-growing, late-maturing varieties. As a general rule, single spacing gives the best results, the grains being dropped singly along the rows, with a distance of approximately 12 inches between the grains for the quick-maturing varieties and from 15 to 18 inches for the late-maturing varieties.

From 9 lb. to 10 lb. of seed is sufficient to plant an acre when sown in this manner.

The most satisfactory method of sowing is with a seed drill, as in this way it is possible to get a good even spacing, and no loss of moisture occurs during planting, as is often the case where furrows have to be opened up for hand planting.

Field Practice.

The land can be lightly harrowed even until the plants are a few inches high. This will not only destroy young weed growth but will also greatly improve germination in the event of heavy rain falling shortly after planting and causing the surface soil to become caked. Many growers are afraid of injuring the young crop, but if harrowing is done on a bright warm day, when the young plants are not brittle, and care is taken to prevent dragging of rubbish which may collect under the harrows, the crop not only will not be injured but will be greatly benefited.

In districts where the rainfall is heavy, and difficulty is experienced in keeping weed growth in check, many growers before planting run out shallow drills a few inches deep with a light plough or other suitable implement, and then sow along the bottom of the drills with the planter. When the young plants are high enough the cultivator is worked through the rows, and is set in such a way that the soil is drawn in around the plants, filling up the depression made when drilling, and thereby smothering the young weeds which have sprung up in the rows. This, of course, to be effective must be done while the weeds are very young.

During the early stages of growth the crop should receive at least two good inter-row cultivations to keep weed growth in check and to keep the surface soil in a nice friable condition, and on no account should the surface soil be allowed to remain in a caked condition while it is possible to work a horse cultivator in the rows.

Harvesting.

The picking of the crop still remains a hand operation, and although machines have been tried, one of which was invented and built in Queensland and which performed well at the trials, none of these have so far reached a stage where they can be successfully worked in the majority of crops.

The ears should be allowed to dry out thoroughly before being shelled, for, apart from the fact that the grain if shelled too early is likely to heat in the bags, a large amount of grain is broken and damaged during the shelling process and the appearance of the sample is spoiled. A considerable wastage also occurs through the cores being too soft to withstand the pressure of the drums, and these break up into small pieces and pass out through the machine with the grain still attached.

Cost of Production.

To make maize-growing profitable the cost of production has to be reduced to a minimum, and this can only be done by increasing the yields by the use of pure strains of seed which have proved suitable for the locality, and also by practising the best cultural methods. Good quality seed not only gives an increase yield per acre, but also an increased return per bushel, as a better price will always obtain for grain which is of good even type and colour.

The use of modern machinery also plays a very large part in lessening the cost of production, and hand work must be eliminated wherever possible, and the combined husker and sheller has done a great deal towards this.

Storage.

Maize can be stored for very long periods at no very great cost other than the initial cost of the tanks, yet growers frequently dispose of their entire crops for very low prices during flush seasons; whereas if they had the storage accommodation, and, of course, were in a financial position to store their grain for a time, they would receive very much better prices. One thousand gallon tanks are very suitable for this purpose, and hold approximately 3½ tons of grain. The lids of the manhole and shoot should be so constructed that they can be made quite airtight by puttying or by the use of puddly clay. First and foremost the grain should be thoroughly dry, and should not contain more than 14 per cent. of moisture at the time it is placed in the tank.

If the grain is showing signs of weevil it can be fumigated by placing a couple of saucers on the top of the grain and pouring into these 1½ to 2 lb. of carbon bisulphide. Place the lid on as quickly as possible and puddle up the edges of the manhole cover to make it perfectly airtight. The tank should be kept sealed for twenty-four hours, or longer if desired, and then remove the lids from the manhole and discharge shoot and cover the discharge shoot with strong gauze to prevent the grain from running out. After forty-eight hours the covers can be put back. Grain for seed purposes should not be left for such a long period, and should immediately after fumigation be exposed to the air, otherwise the germination may be seriously affected.

Carbon bisulphide is highly inflammable, and care should be taken to see that no lighted pipe or other light is near the tank when the fumes are released.

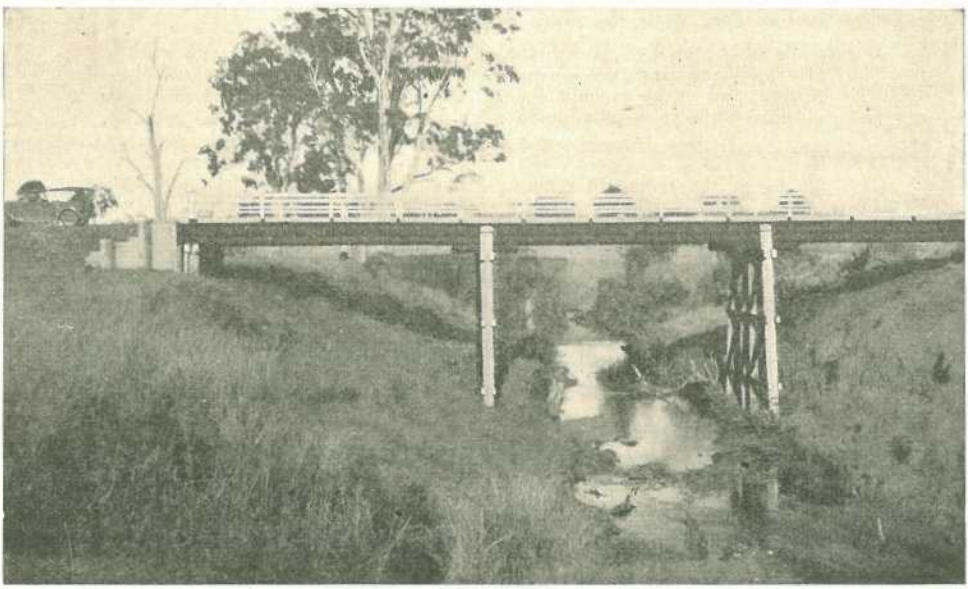


PLATE 8.—TIMBER BRIDGE AT MCLEAN'S CROSSING, BRISBANE-WARWICK ROAD.

Blocks by Courtesy Main Roads Commission.]

SHEEP BREEDING IN QUEENSLAND.

By J. CAREW, Senior Instructor in Sheep and Wool.*

THE breeding of sheep in Queensland is confined almost entirely to the Merino for wool production.

The enormous area of country in which the breeding and pasturing of sheep is the chief industry, embraces such a variety, conditions of soil, rainfall, edible weeds, herbage, shrubs, and grasses that it can be fully appreciated that all our sheep country is not adapted for purely breeding purposes.

An average in the vicinity of 5,000,000 lambs are reared in Queensland each year. In many areas, and over a great variety of country, these grow into a well-developed wool-growing type. Flock rams are introduced chiefly from New South Wales, and much of the improvement showing in the general run of our flocks is due to their influence. This improvement is increasing the confidence of Queensland graziers, who realise that the country and pastures are capable of producing the type in keeping with their own ideas. Many breeders scattered over an area extending from the border of New South Wales to the North-Western Queensland are now breeding their own rams, both for their own use and for sale, while others are coming into prominence through their establishment of special studs of high quality. This is as it should be, but there is plenty of room for flock improvement and the maintenance of a high standard of quality.

The introduction of high quality stock is always an advantage if they are of the proper type, provided that they carry the pure blood of that type, though in this particular phase of sheep breeding many disappointments are met with. It is not the introduction of fresh blood that counts for improvement, but the right strain which possess the power of prepotency—that is the power possessed by some animals of stamping their characteristics upon their progeny. Most of the cases of prepotency are merely the operation of Mendel's law of dominance.

Mendel's Work.

Gregor Mendel, in 1866, published the results of eight years' experimental work, which received little attention at the time and was soon forgotten, but was again discovered simultaneously in 1900 by three different scientists, Correns, von Tscharmak, and de Vries, working independently in three different countries. Mendel discovered that inheritance is governed by certain laws—namely, those of unit character, independent assortment, segregation, and dominance. When a sire of high quality of the desired type is discovered to possess this power of dominance or prepotency, his value should be fully appreciated. It is only the keen and attentive sheep-breeder that takes particular notice of all the points in the young sheep, who will be able to trace this special feature to the sire, therefore, close observation is essential.

Flock Improvement.

When commencing on a method of flock improvement, it is necessary first to choose the most desirable type likely to prove suitable to the existing local conditions where they are to develop; second, to watch carefully for the sires that are dominant, and produce true to type; third, to keep flock books in order that the history and pedigree of prominent strains may be watched; fourth, when pure lines are established, see that they are maintained by breeding on right principles; fifth, if fresh blood is introduced, be careful to have it pure, and not extreme in type, as pure breeds transmit their characters with greater uniformity. Each year the system of selection should be carefully observed, selecting the best and rejecting the rest. The ideal should be pictured in the mind's eye, which, when once secured, should be maintained as far as possible.

As man's ideas of improvement in sheep may not always be in keeping with nature's ideas, some disappointment may therefore be expected.

The occurrence of black sheep in purebred flocks is an instance of reversion, even when it is definitely known that no black sheep have been in the flock for generations. This phenomenon is known as atavism, and can be completely eliminated by culling out the recessive characters.

Each individual inherits from its parents independent and separable characteristices, each of which is a distinct unit, so that it may occur in any combination with other characteristics. Much attention during recent years has

* In a radio lecture from Station 4QG.

been given to that form of cell structure known as the chromosomes. Every chromosome according to this theory contains actual material substance, and represents specific characteristics. Among the many names given to these material substances are factors and determinants which influence heredity, and may effect many characters. For each character the individual inherits two determinants, one from each parent. One of the determinants is stronger than the other, and is known as a dominant, while the weaker of the pair is known as a recessive, and may not be evident in the individual.

In the degree of dominance, sex has an effect as illustrated by the presence of horns. It is rare that Merino rams are without horns, but the great majority of Merino ewes are hornless. Both sex of the Dorset Horn breed are horned, while both sexes of the Southdown and Shropshire are hornless. When the Dorset Horn and the Southdown are mated all the rams produced are horned, and all the ewes are polled. This indicates that the horned characteristic is dominant in the male, and recessive in the female.

When the progeny of this first cross are mated, both horned and polled sheep will result. In the ram section, approximately three will be horned to the one polled, while there will be about three ewes polled to the one horned.

Various degrees of dominance as regards colour is also in strong evidence, as instance the white and dark faced English breeds. The Cheviot, which has white hair on the face and legs, when mated with the Southdown, which has brown hair on both face and legs, the progeny will have grey hair on those parts. This intermediate colour between the two will take two crosses to the pure breed of either side to regain the original colour. These two factors of horns and colour are easily detected and are useful for comparative purposes. Where the wool covering is the chief aim for improvement, as in the Merino, the variation is difficult to detect in length, character, quality, and denseness of fleece. All these factors, as well as the frame form constitution and development, are closely associated with success in breeding.

Methods of Breeding.

Many terms are applied as to the methods of breeding, such as in and inbreeding where all relations are mated. Close breeding is a term used when the system is similar to the above, but adhering to close relationship. Both these methods are likely to cause a development of good or evil, for if both possess good characters these are intensified just as bad characters show further defects.

Up to Bakewell's time, any form of in or close breeding was regarded with suspicion, and likely to cause defects and deformities. Bakewell's success and Mendel's principles applied in sheep breeding, altered the methods previously adopted of out breeding—that is, introduction of fresh blood, principally sires, each year. Line breeding is regarded by many as similar to inbreeding, but in practice it should be followed on the principle of sire to daughter, and the pick of the young rams to the parent flock, until the fourth generation.

The best ram from one flock is then selected and mated with the pick of the ewes of the other flock, and the breeding continued on these lines. In the progeny there are always fixed types if it is possible to pick them out, and it is in this respect that the gifted breeder can detect that quality. Local conditions and environment also have an important influence on successful sheep breeding.

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 IDEAL PIG.

By Officers of the Department of Agriculture and Stock, Brisbane, Q.

PIG-RAISERS are frequently confused in the matter of selecting the correct types and breeds of pigs to produce their baconers and porkers, and the object of these notes is to place before Queensland farmers something definite about the pig trade requirements and how they may be met by careful attention to the breeding of pigs.

The information herein is given after careful consideration of all the available evidence of breed tests and performances both here and abroad. It must be noted from the outset that, although the matter of "breed" is important, it is not nearly so important to the pig-raiser as the matter of individuality within the breed; also feeding and management of the pigs have a vast effect on their inherent characteristics. The best bred pigs can be spoilt by incorrect feeding and by bad management, and farmers are sometimes inclined to pay too much attention to the breeding of their pigs in comparison to the attention they give to improving their methods of feeding and general management.

Wherever one goes, he hears the question: "What is the best breed or cross of pigs?" The answer at present is that, "There is no best breed or cross of pigs, but several breeds and crosses of pigs give satisfaction in that they meet the requirements of the farmer as well as the bacon curer, pork butcher, and the consumer." Firstly, one must consider the trade for which he intends to cater. The pork trade, the Queensland bacon trade, and (if it should come our way) the English bacon trade, all require the same conformation and proportion of fat and lean in the pig's carcass, but each of these trades requires the "finished" pig at a different weight. A description of the ideal carcass for any of these trades is as follows:—

A fleshy pig, with a comparatively light covering of fat; the flesh and fat being of fine texture and firm, and should harden under ordinary chilling treatment; in conformation, the pig should be comparatively light in the shoulders, neck and jowl, and head; the middle should be comparatively long and fairly deep with ribs well sprung, but not bulging into a rounded barrel; the back should be slightly arched, and the belly line straight but full. The hams should be fleshy, well rounded, deep and broad. The skin and the legs should denote fine quality.

The most desirable weights are—(*a*) For porkers, 60-80 lb. dressed; (*b*) for Queensland baconers, 95-120 lb. dressed; and (*c*) for the English bacon trade, heavier carcasses are required, pigs dressing 130-160 lb. usually realising highest price per pound.

The ideal pigs can be pointed out when alive with a reasonable amount of accuracy, and for the breeder's purpose it is necessary that the ideal pigs should be discernable while alive.

For the farmer's purpose, the ideal breed or cross, type or strain of pig, is the one that will give him the most pounds of meat of good quality in the shortest time with the least cost.

Now, to consider the various pure breeds of pigs with which we have to work, and to attempt to lay down some more or less definite plan to which breeders may direct their operations. Although there are variations in all breeds of pigs, we can in a general way, class our breeds of pigs into two fairly distinct types, viz.:—(*a*) The smaller, quicker-maturing porker type, and (*b*) the larger, later-maturing bacon type.

Early maturity (with which is associated early fattening) must not be confused with fast growth which may be found in either late or early maturing animals. Maturity means that the animal has finished its development, at which stage it usually fattens rapidly. Fast growth means that the animal grows rapidly, although

it may not be fattening. To have an abundance of lean meat it is necessary to have the animal growing rapidly, but not fattening; therefore, to produce the ideal pig which is in a "finished" condition, but not too fat, when it reaches the most desirable trade weights, and which has grown rapidly, it is necessary to use the correct class of breeding stock. For the production of light-weight porkers, the early-maturing breeds are quite satisfactory, but if this class of pig is grown on rapidly to either local or export bacon weights, it will give a thick and overfat carcass; this is a common mistake made by pig-raisers. DON'T TRY TO MAKE A BACON PIG FROM A PORKER, AND DON'T TRY TO MAKE A PORKER FROM A BACON PIG.

To produce the export baconer, the larger, late-maturing class of pig suits admirably, but if this class of pig is marketed at porker weights or at Queensland baconer weights, it is "unfinished," and does not give a meaty and attractive carcass.

A problem is presented by the Queensland bacon curers who require their "finished" pig at an inconvenient weight. The smaller class of pig, if used to produce bacon, must either be grown very slowly to baconer weights or give an overfat carcass, while the larger class of pig, if marketed at 95-120 lb., gives a very rangy carcass which is usually lacking "finish." So it is a medium class of pig which is required, and this class must be produced either by (i.) selective breeding of either the more lengthy pigs of the smaller class or the more compact pigs of the larger class; or (ii.) by crossing the pigs of the smaller type with pigs of the larger type, which is the general practice with Queensland pig-raisers.

Of the breeds in common use in Queensland at present, the Berkshire and the Middle White are typical early maturing pork breeds, while the Tamworth and Large White are typical late maturing bacon breeds.

Individual animals and families vary, but the more typical representatives of these breeds fit into these classes. It might be repeated here that selection of the most desirable individuals within each breed is even more important at times than the selection of a breed, as individuals vary to a great extent.

Where cross-bred sows of medium type are in use on the farm, they should be mated with boars of the larger class for the production of baconers, and with boars of the smaller class for the production of porkers. When we speak of the smaller class of pig it is not meant to imply that a very small class of pig is desirable. From the pig-breeder's point of view, size of the individual within the breed is a most important characteristic. A good-quality big pig is better than a good little pig.

Fineness of bone must be sought in the selection of stock, and in this respect the Berkshire, Middle White, Tamworth, and Large White breeds are particularly good. The English pork and bacon markets and the local pork market have a distinct preference for white pigs, and when these markets are being specially catered for the Middle White and Large White breeds—either as purebreds or for crossing—must receive consideration. The progeny of white pigs are white even if the one white parent is mated with a black or red animal. It might be mentioned with regard to white pigs that while they are reasonably hardy, their skin will soon become unhealthy if they are exposed to insanitary conditions or to parasites, such as lice and mange.

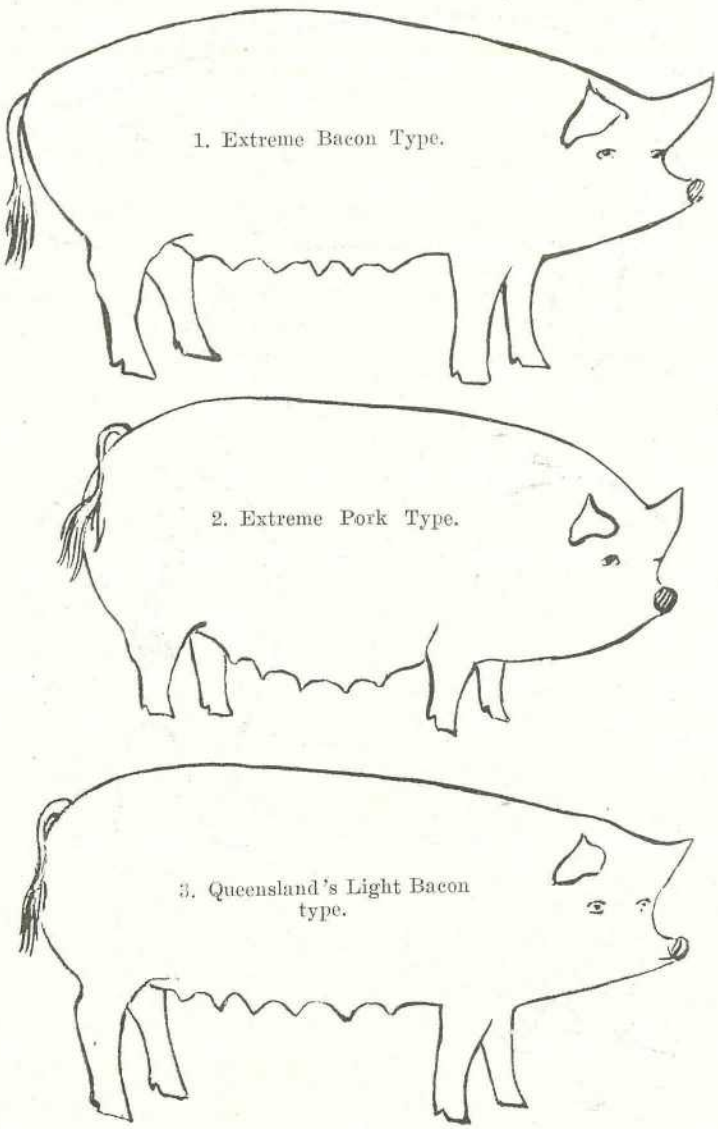


PLATE 9.

The above diagrams illustrate adult pigs of the larger and smaller types, as well as the medium type which suits the Queensland bacon trade.

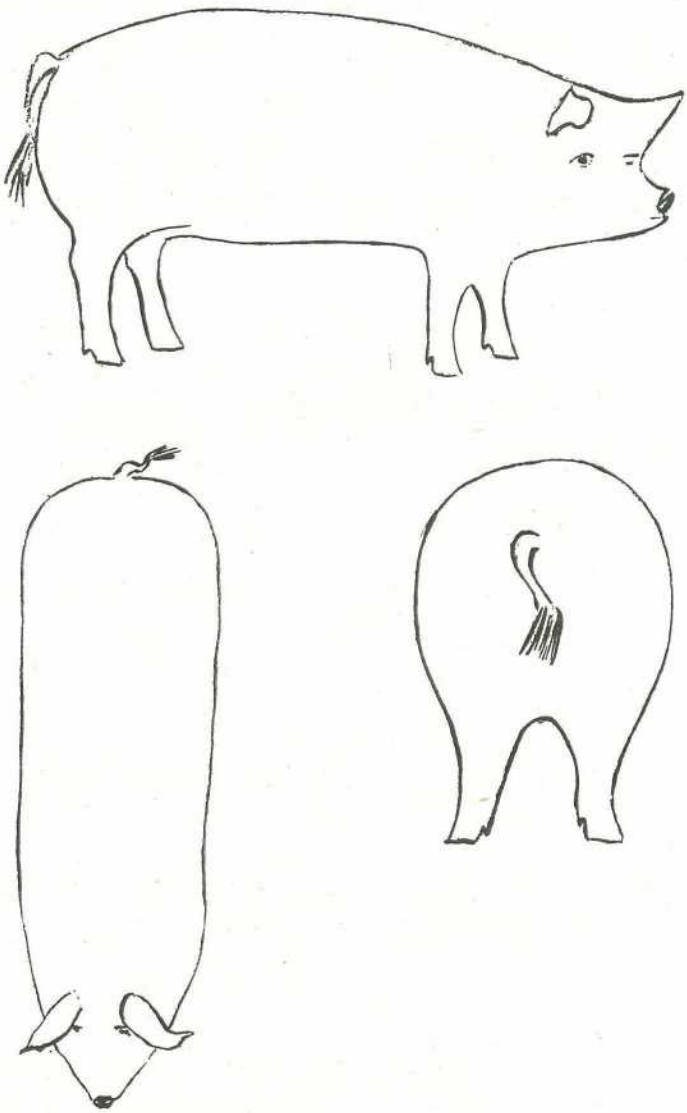


PLATE 10.

Diagrams showing side, top, and rear views of a good type of pig carrying the required proportion of the most valuable parts of a carcass. The ideal conformation to be aimed at by the breeder of porkers and baconers.

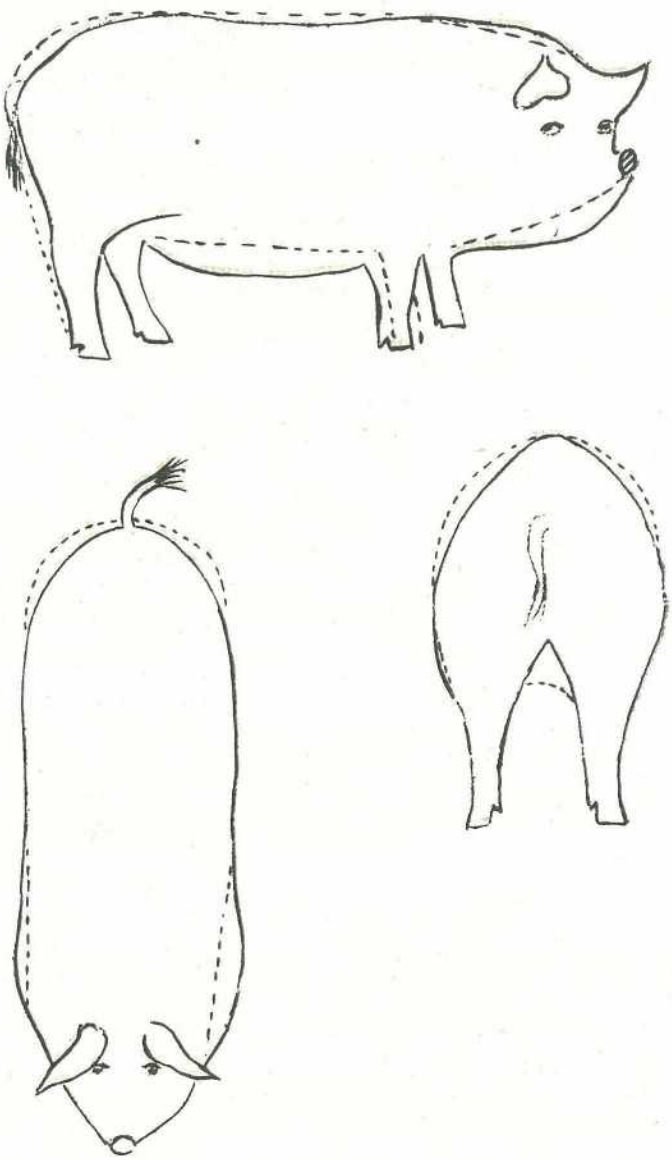


PLATE 11.

Diagrams showing side, top, and rear views of an undesirable type of pig. Comparison of heavy lines with dotted lines shows where this type departs from the ideal.

FRUITGROWING IN NORTH QUEENSLAND.

QUARTERLY REPORT.

Fruit Crops, Citrus.

Of the country between Cooktown and Townsville the Cairns district will produce the heaviest crops of both oranges and mandarins this year.

Locally grown oranges of excellent size and flavour were being sold on the Cairns market as early as the first week in March. Sales were quite satisfactory.

Local mandarins did not come on to the market until the third week in March and, although not carrying the quantity of sugar that the oranges contained, realised a fairly satisfactory price.

A very interesting fact is the tremendous crop of Emperor mandarins being carried by two-year old trees growing on Mr. Polentz's farm at Edge Hill, Cairns, proving that, with the conditions that exist in these Northern centres, citrus-growing could be advanced to a much greater degree of productivity than it is at present. It also proves that the Emperor mandarin is the most suitable variety for this district.

The bulk of the Northern citrus crop, both mandarins and oranges, could be completely marketed during the months of March and April if properly coloured.

Means of transport have improved beyond imagination, when compared with the conditions existing in the days when the old citrus orchards throughout these districts were first planted, in the hope that they would be a commercial success. Unfortunately, the locally adopted methods of cultivation, orchard control, and marketing have not grown apace with the improved methods of transport that are so much in evidence to-day.

Local lemons of excellent quality are being marketed at present and are realising very satisfactory prices. The season prevailing throughout the term appears to have suited the lemon crop admirably, and it would be quite a difficult task to find lemons of better quality.

Pineapples.

Very few pines were marketed during the quarter; consequently it was necessary for local fruiterers to import their pines from the Nambour-Woombye areas as well as a few consignments of Northern Tableland pines.

Granadillas.

Granadillas are still scarce, only odd consignments coming on to the market each week.

Passion Fruit.

Practically no passion fruit has been marketed from off the coastal areas. Fruiterers have secured their supplies either from the Brisbane markets or from the Tableland areas where, during any season other than the winter period, passion fruit thrives.

Papaws.

The usual quota of papaws have been marketed, realising a standard price of approximately 4s. per dozen wholesale for good fruit. It is interesting to note that during the early part of this year numerous areas were planted out with seedlings produced from excellent fruiting varieties.

Mangoes.

January saw the final harvesting of our mango crop. The prices then were quite sound.

Bananas.

During the first quarter of the year practically no bananas were sent South. The Northern demand was capable of absorbing all locally grown bananas, and fruit of decent size and quality met with a profitable and ready sale in any of our local centres. A few new areas have been planted, and fully considering the rapidity with which the present bearing plantations are nearing their commercial end, the prospects ahead for the owners of new plantations, look very favourable at present.

Grapes.

In February the main Tableland grape season closed. A satisfactory crop was harvested.

Temperate Fruits.

During the month of January and the early portion of February an excellent crop of plums was harvested from some of the small orchards in the Tableland area. Apart from fruit-fly, no losses were accounted for, and practically every sound fruit harvested was readily sold. The appearance of the trees at present give every indication of them undergoing a long dormant period. Should a few beneficial showers fall in the early spring, there is no doubt that a good crop will naturally follow. It is reputed that one individual grower with quite a small orchard, in this district, made £500 off his plum trees last season.

Melons.

Melons of excellent quality and flavour were marketed up till as late as the end of February, and it was then only owing to the excessive wet that the vines ceased production.

Custard Apples.

Custard apples had a particularly good run this year, and locally grown fruit was noticeable in fruiterers' windows at late as the end of March.

General Progress.

A considerable progress has made itself manifest, particularly in regard to pineapples, papaws, and bananas, the plantings of these fruits being the outcome of a desire to supply the local market only.

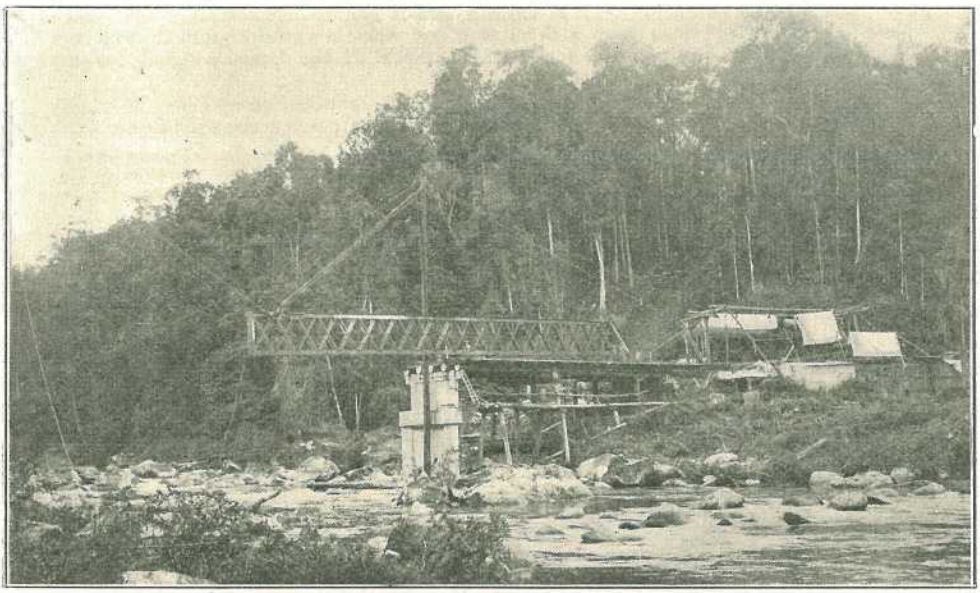


PLATE 12.—LAUNCHING THE FIRST GIRDER.
Beatrice River Bridge in course of construction, on the Eacham-Millaa Millaa-Innisfail Road, North Queensland.

BANANA PLANTING.

AFTER giving the matter full consideration, the Banana Industry Protection Board unanimously decided to recommend the same planting policy as that which gave general satisfaction during the past planting season.

The suggested policy has now been approved by the Minister (Mr. Frank W. Bulcock), and is as follows:—

Outside the Quarantine Area.

With regard to that portion of the State outside of the quarantine area—

No permit shall be issued to the occupier or owner of a neglected or abandoned plantation nor for planting in close proximity to a plantation badly affected with bunchy top.

Within the Quarantine Area.

(*a*) No permit shall be granted to an applicant whose plantation at the date of application, either wholly or in part, is in a neglected condition, or has at any time during the preceding six months been known to be so and/or where such neglected condition has not been rectified without pressure from an inspector.

(*b*) No permit shall be issued in respect of any plantation in which bunchy top has appeared during the preceding four months. Exemptions from this clause may be granted by the Board under special circumstances.

(*c*) In general, permits shall not be issued for any area or areas which will bring the total acreage under bananas for any one owner or occupier in excess of 8 acres, unless by special permission of the Board.

(*d*) Planting of new areas by persons not at present established in the district is undesirable, and permits for such planting will only be granted by the Board under very special circumstances.

(*e*) Any plantation in which bunchy top is found discernible in the third leaf from the top of the plant shall be classed as a neglected plantation, and dealt with as such.

With regard to the securing of suckers, the recommendation is as follows:—

A.—In any clean districts suckers must be free from bunchy top, beetle borer, and thrips.

B.—In any case the removal of suckers from plantations where thrips are prevalent will be permitted only in cases where it can be demonstrated that clean plants cannot be obtained from a clean area and where the suckers are dipped in a solution of nicotine sulphate under the supervision of the Board's agent for the district.

B1.—The Board may, at its discretion, waive the application of clause B wholly or in part, insofar as any particular agent's district or portion thereof is concerned.

C.—In a district affected with beetle borer but no bunchy top, suckers can be moved within the district, provided the agent considers the plantation the suckers are being taken from is reasonably clean.

D.—In the area from the Maroochy River northwards, which is free from bunchy top, suckers may be obtained from reasonably clean plantations in the district, but the source of supply must be first inspected and approved by the agent of the Board.

E.—The condition of the plantation and locality to which the suckers are to go should largely determine the origin of the suckers.

F.—As far as possible the suckers for planting any new areas should be obtained from clean districts.

G.—*Quarantine Area.*—Suckers for planting in the quarantine area may be obtained from clean plantations in the area which have never been infected with bunchy top, or from clean plantations outside of the area.

H.—*South of the Quarantine Area.*—Growers may plant suckers from their own plantations where disease has been satisfactorily controlled or from—

(*a*) Plantations where the grower has made a continued and successful effort to control bunchy top;

(*b*) From within his own immediate locality, from approved plantations on which disease has been satisfactorily controlled;

(*c*) For a new plantation, suckers may be obtained from an area free or reasonably free from bunchy top and beetle borer approved by the agent concerned;

(*d*) In isolated localities free, or only very lightly infected, suckers shall be secured from within that area or from an area free from both bunchy top and beetle borer.

SUDAN GRASS.

The Minister for Agriculture and Stock, Mr. Frank W. Bulcock, has received the subjoined memorandum from the Officer in Charge of the Pure Seeds Branch (Mr. F. F. Coleman):—

FROM the 1st July, 1932, up to and including the 31st May, 1933, no fewer than 182 samples of *Sorghum sudanese* seed were examined. Out of this large number 97 samples contained the poisonous seeds of Datura spp. which are totally prohibited under the Seeds Acts.

Several samples were under the low standard of germination prescribed, which is 70 per cent. Many samples contained a greater proportion or quantity of inert matter and weeds seeds than is allowed. Later in May several complaints were made regarding samples of Sudan grass that were submitted by farmers to merchants. One merchant alleged that such a sample probably contained Johnson grass. This complaint necessitated an examination of the farmer's paddocks, also the taking of an official sample from seed held by him. The paddocks in question were infested with *Sorghum halepense* (Johnson grass) and one of the samples contained a trace of the poisonous seeds of Datura sp. as well as the dreaded seeds of *Sorghum halepense* (Johnson grass).

It is frequently overlooked that all forms of sorghum contain more than a trace of hydrocyanic acid during the young stages of growth—in particular, forms of *Sorghum vulgare*, or the common sorghums of commerce. Johnson grass (*Sorghum halepense*) is a stoloniferous rooted form of fine-stemmed sorghum. The leaves of Johnson grass are particularly high in hydrocyanic acid. Unfortunately, Johnson cannot be readily distinguished from the fibrous rooted sorghum, *Sorghum sudanese*. Owing to the roots which develop with Johnson grass it is possible for this plant to produce young leaves in practically any part of the year, if sufficient moisture is present. Such leaves have a high hydrocyanic acid content and probably on many occasions have caused loss of stock.

Unfortunately, samples from some districts frequently contain the poisonous seeds of Datura which is an evil-smelling, large, coarse-growing plant that could easily be eradicated if the paddocks were carefully gone over to prevent the plant seeding. Such seeds may not always germinate the first year. It is therefore possible that weeds of the year before last may produce Datura plants next year. The leaves of Datura are poisonous and the seeds are highly poisonous, and when such material is chaffed up animals do not have an opportunity to reject this plant, as they would do when grazing in the open.

It has been necessary to issue a warning in the press against the presence of *Sorghum halepense* in Sudan grass samples, and repeated attention has been directed to the poisonous properties of Datura.

Many large quantities of *Sorghum sudanese* seeds have been rejected by the other States on account of their weed seed content. Although some merchants, both at Warwick and Toowoomba, are equipped with efficient seed-cleaning machinery, such machinery cannot entirely remove Datura from millets, Canary, or *Sorghum sudanese*. Further, it would be impossible to entirely remove the seeds of Johnson grass.

It has frequently been said that better seeds mean better crops. Although this is true, the farmers should realise that better cultivation will lead to better seeds and ensure crops of such a character that they will produce seed that, after machine cleaning, would comply with the low standards prescribed by the Regulations under the Seeds Acts.

CARE OF CREAM.

The care given to cream on the farm and during transit is of considerable importance in relation to its grading, and any of the following practices may be responsible for it being classed as of second quality:—Failing to stir cream with a metal stirrer. Failing to blend each separating as soon as cool. Keeping cream in untinned or rusty receptacles and unsuitable containers, such as benzine tins—the can in which the cream is to go to the factory is the best container to store cream in. Failing to send in the morning's separating on cream-delivery day. Keeping small quantities of cream back and sending in next cream-delivery day. Failing to protect cream in the dairy from flies and vermin. Mixing warm cream with cold. Failing to keep cream cool whilst in the dairy. Exposure of cans to the direct rays of the sun, either on carts, at the roadside, or on vans and launches en route to the factory.

ARTIFICAL MANURE SUBSIDY.

PART VII. of the *Commonwealth Relief Act*, No. 64 of 1932, provides for the payment *to primary producers* throughout Australia of a subsidy of 15s. per complete ton of artificial manure used by such primary producers in the production of primary produce other than wheat during the year ending 30th November, 1933.

This means that, providing a primary producer has applied to the soil during the period 1st December, 1932, to 30th November, 1933, one ton of artificial manure in connection with the production of any primary product, *except wheat*, he will be eligible to claim 15s. subsidy. If he has used two tons during that period he will be eligible to receive 30s., and so on; but if he has used less than one ton no subsidy is payable, as the Act prescribes that, in calculating amounts of subsidy, fractions of a ton shall be excluded.

The financial assistance in regard to the use of artificial manure applies to primary producers in respect of every product except wheat. Special provision has, of course, been made for wheatgrowers under Commonwealth grants distributed by the States. Producers of oats, barley, hops, beans, apples, pears, citrus fruit, tobacco, &c., will therefore be eligible to claim the subsidy, which will also apply to artificial manure used in top-dressing of pastures.

Artificial manure for the purposes of the Act is any substance which contains nitrogen, phosphoric acid, or potash, and which has been manufactured, produced, or prepared in any manner for the purpose of fertilizing the soil or supplying nutriment to plants; but does not include any animal or vegetable matter which has not been subjected to process or manufacture.

All the fertilizers registered at the Department of Agriculture and Stock, Brisbane, under "*The Fertilizers Acts, 1914 to 1916*," are artificial manures for the purposes of the Commonwealth Financial Relief Act, with the exception of lime on which the Commonwealth subsidy is not payable.

Applications for the subsidy must be made *in ink* by primary producers on a special form, and these applications will require to be completed by the primary producer and sent by him to the supplier of the artificial manure for his certificate as provided on the form. The supplier will then send the application to the Fertilizer Subsidy Section of the Department of Commerce in the State in which the fertilizer has been used. Queensland claims will be sent to the Department of Commerce, Desmond Chambers, 303 Adelaide street, Brisbane. Forms of application have been distributed to country post offices. Any primary producer who may experience difficulty in securing a form should communicate with the Department of Commerce, Brisbane, where a reserve supply of forms is held.

It will be noted that primary producers are not eligible to submit applications for the subsidy until they have actually used the artificial manure in regard to which they desire to claim financial assistance. They should use the full quantity of artificial manure which they intend to apply in regard to any particular product before submitting an application. They should not submit a claim in regard to a portion of the quantity used and then submit one or more claims in regard to the remainder. The Department of Commerce hopes that in most cases it will be necessary for only one claim to be made by primary producers, but it is recognised that in special circumstances two claims may be necessary.

The declaration to be completed by applicants for the subsidy as shown on the form of application must be made in the presence of either a commissioner for declarations, a justice of the peace, bank manager, postmaster, station-master, or constable or officer of police. No other official is authorised to take this declaration.

Primary producers are requested to exercise every care in completing their claims so as to ensure that they claim the subsidy only in respect of artificial manure *used* during the period 1st December, 1932, to 30th November, 1933. If the artificial manure was applied to the soil prior to 1st December, 1932, no subsidy is payable. It must also be used prior to 30th November, 1933, to be eligible for the subsidy. All the particulars asked for on the form of application must be filled in by the applicant; otherwise delay will be caused in finalising the claim owing to the necessity of returning claims to primary producers for completion or correction.

FARM PRODUCE AGENTS ACTS—IMPORTANT PROVISIONS.

IN the last session of Parliament several important features were incorporated in the Farm Produce Agents Acts.

The Acts as they now stand afford ample protection to the growers in their dealings with agents and, at the same time, they raise the status of the agetn, as the "man of straw" who came and went, leaving a trail of dishonoured cheques in his wake, will not be able to obtain a license.

Perhaps the chief of the amendments is that which requires the agent to provide a fidelity bond prior to his obtaining a license to trade as a farm produce agent. In the event of an agent's default his bond may be estreated and the proceeds utilised to meet the claims of unpaid growers.

Agents are required to forward account sales within fourteen days, and to pay the consignor within thirty days of the date of sale of the produce. This latter obligation still stands, although the agent has not been paid by the purchaser.

It will be seen that the grower is in an advantageous position in this regard, and runs no risk of bad debts, the responsibility for collection of payments for produce sold being transferred to the agent.

In addition to the recognised agent, there was another class of trader carrying on ostensibly as a merchant.

Now a merchant buys his produce outright, the price being mutually agreed upon between himself and the producer, his profit arising from the better price at which he expects to sell.

The trader now referred to was not trading along those lines. His practice was to receive goods and fix the price himself without reference to the grower. Such a price might be fixed after the receipt of the day's quotations, or even after the sale of the produce. This class of trader accepted neither the risks of the merchant, nor the responsibility of the agent; clause 5A of the Acts was designed to stop this practice. The price of farm produce must now be arranged with the producer at the time of purchase, or before delivery is accepted, whichever date is the earlier.

When produce is sent to an agent for sale on behalf of the producer, this provision does not apply.

Several cases have recently come under the notice of the Department where farmers, in response to, perhaps, a circular letter or an advertisement, have consigned produce under the impression that they were dealing with an agent to find the consignee, later, denying that he had acted as agent.

Growers should protect themselves to the extent of seeing that the person to whom they intend forwarding their produce is either a bona fide buyer or an agent who holds a license under the Farm Produce Agents Acts.

List of Licensed Farm Produce Agents, Brisbane.—Addis Bros., Allen, Joseph, Anderson, Edward Arthur, Archer and Goss, Arkell, W., and Sons, Australian Fruit and Produce Co., Ltd., Barnes and Co., Ltd., Barr, Alexander S., Barron, Orr, and Co., Ltd., Barter, G. and W., Bowden, T. S., and Co., Brabant and Co., Burrell, Fenton, and Co., Pty., Ltd., Carseldine, Arthur W., Carter, Alfred J., Chave, Alfred E., Clark and Jesser, Collard and Mackay, Comino Bros. Ltd., Committee of Direction of Fruit Marketing, Cooksley, John F., Cooksley and Co., Cooper Bros., Copp, Ralph E., Cranley, J. P., Ltd., Cripps, William, Dairy Products Co-operative Co., Ltd., Dalgety and Co., Ltd., Davies, W. C., and Co., Dean, Henry, and Sons, Ltd., Edward, George, Eriksen, Hans P., Evans, Arthur L., Evans, Norman, Foggitt, Jones, Pty., Ltd., Fong Pie and Co., Francis, Frederick W., Gall, George, Granite Belt and Coastal Fruit Agency, Geeves, Hedley, Ltd., Gesler, Frederick C., Good, D. E., Pty., Ltd., Hall and Pascoe, Harris, H. N., and Co., Hodges and Pratt, Hutton, J. C., Pty., Ltd., Izatt and Johnson, Jacklyn and Justins, Jackson, J., and Co. (Produce and Seeds), Ltd., Johnson, and Markwell, W., Johntson, Adam, Johnston, Reginald W., Johnston and McDowall, Jordan, Ernest Arthur, Laidlaw and Co., Lambert, G. and W., Leavy, James H., Livingstone, J. R., Mackay, William M., Mant, Charles O., Martin, Duncan G., Martin and Co., Matthews, John, Mendoza and Wright, Murray, John, Murray Bros., McCausland, Louis J., McCowan and Hammond, New Zealand Loan and Mercantile Agency Co., Ltd., Nicholson, Alphonso, Pettigrew and Wilson, Queensland Fruit Distributors, Robinson and Laidlaw, Robsons Ltd., Rollinson, John Edward Linsey, Russell, M. M., and Co., Ltd., Sellars, R. B., Sellars, Derek P., Shay,

Percy, Sibley, P. C., Siemon, W., and Sons, Ltd., Skinner, P. J., Stanton Bros., State Produce Agency Ltd., Stewart and Walker, Sutton Bros., Tacey and Eyre, Thorpe, H. W., Wanless, Thomas H., Watson, W. P., and Co., Whatling, E. H. R., Wiltshire, F. C. G., Winters, Edward, Wool, A. E., Wool, H. L., Yow Sang and Co.

Other Agents.—Backhouse, J. J. C., Killarney; Baker, G. H., Stanthorpe; Black, H. L., Mackay; Bramble, J. G., Rockhampton; Brand, Thomas, Mackay; Curtis, W E,, and Co., Bundaberg; Dawson, Joseph, Rockhampton; Dick, Charlie, Rockhampton; Ellwood, E. A., Killarney; Featherstonhaugh, Albany, Roma; Fowles, Herbert, Roma; Gore, A. C., Cambooya; Goltz, F. W., Mackay; Good, D. E., Rockhampton; Gore, Edward, and Co., Oakey; Gower, H. R., Rockhampton; Haigh, E. V., Ipswich; Harding and Walker, Ipswich; Healy, M. F., Rockhampton; Heers, J. W., Coominya; Joyner, R. G., Gladstone; Lee Sang and Co., Cairns; Leonard, T. J., Mackay; Limpus, Bert, Bundaberg; Limpus, C. M., and Co., Bundaberg; Lindemann, C. H. D., Lowood; Lymburner, E. A., Cairns; Mackay District Co-operative Fruit, Vegetable, Poultry, and Bacon Association, Ltd., Mackay; Manz, Walter, Lowood; Mar Kong, Townsville; Marles, W., and Sons, Bundaberg; Maxwell, Samuel, Warwick; Moynehan, W. H., Imbil; MacDiarmid, A. M., Crow's Nest; Olsen, A. E., Killarney; Poll and Co., Wynnum South; Profke, Albert, Lowood; Ransome, V. W., Warwick; Redmonds Pty., Ltd., Bundaberg; Reeds Ltd., Maryborough; Rex, J. W., Maryborough; Reye, C. A. H., Townsville; Stay, W. H., Toowoomba; Sun Wo Tey, Cairns; Tatnell, W. R., Gympie; Thomas, D. B., Gympie; Thomas, George, Gympie; Thomas, L. J., Gympie; Thompson, Sydney, Warwick; Thorpe, T. E., Cairns and Townsville; Tong Sing, Cairns; Townsville Fruit Exchange, Townsville; Tung Yep, Cairns; Viles, K. L., Kandanga; Wakeford, W. J., Townsville; Walker, E. E., Gympie; Walker, Shaw, Townsville; Walters, W. J., Lowood; Warneke, A. E., Gladstone; Warrys, Ltd., Maryborough; Waters and Punzell, Mackay; Wilkinson, J. J., Nambour; Williams Ltd., Rockhampton; Wilson, John, Kingaroy; Willie Young, Rockhampton.

QUEENSLAND SHOW DATES, 1933.

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.
Townsville: 11th and 12th July.
Caboolture: 13th and 14th July.
Rosewood: 14th and 15th July.
Nambour: 19th and 20th July.
Charters Towers: 19th and 20th July.
Esk: 21st and 22nd July.
Ingham: 21st and 22nd July.
Atherton: 25th and 26th July.
Cairns, 18th to 20th July.
Maleny: 26th and 27th July.
Pine River: 29th July.
Royal National: 7th to 12th August.
Crow's Nest: 23rd and 24th August.
Home Hill: 1st and 2nd September.
Imbil: 1st and 2nd September.
Enoggera: 2nd September.
Malanda, 6th and 7th September.
Innisfail: 8th and 9th September.
Mary Valley: 1st and 2nd September.
Kenilworth: 30th September.
Southport: 6th October.
Nerang: 13th October.

NOTE.—The Esk Show set down for 21st and 22nd July has been abandoned.

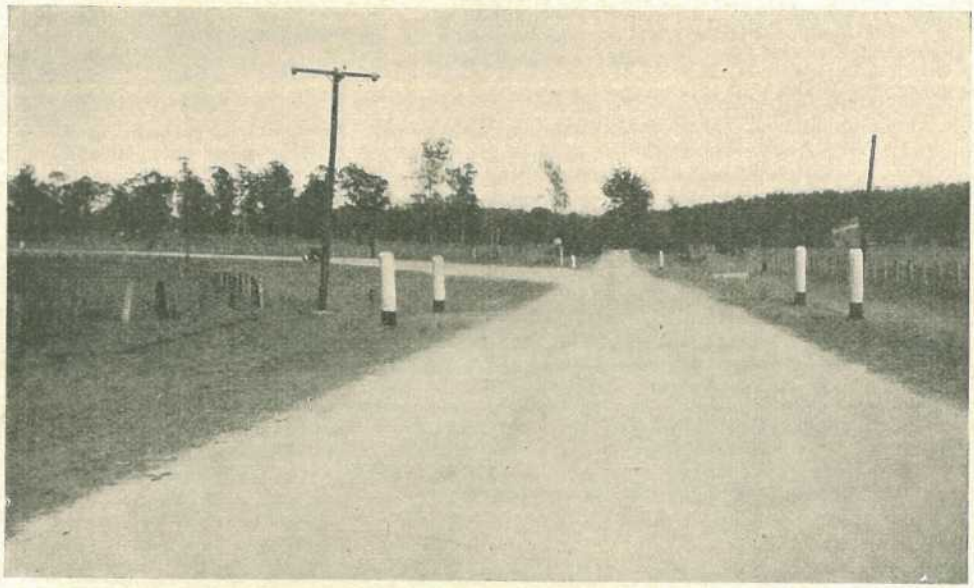


PLATE 13.—ON THE BRASSALL–HAIGSLEA ROAD, WEST MORETON DISTRICT.

PLATE 14.—JETTING CONCRETE PILES.
Pump used by Main Roads Commission on the Main South Coast Highway.

Answers to Correspondents.

BOTANY.

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

Khaki Weed.

C.K.R. (Wynnum)—

The specimen is the Khaki Weed or Khaki Burr, *Alternanthera achyrantha*, a native of tropical America, now a naturalised weed in many parts of the world. It is one of the worst weed pests we have in Queensland, and should be eradicated as soon as possible whenever it makes its appearance in a new locality.

Groundsel Bush.

N.S. (Cooroy)—

The specimen is *Baccharis halimifolia*, the Groundsel Bush, a native of South America, now a very common naturalised weed in Queensland. It has been suspected of poisoning stock, and as members of the genus were known to be definitely poisonous, feeding experiments were carried out some years ago at the Animal Health Research Station, Yeerongpilly. These gave negative results. At the end of the feeding period, however—about a fortnight—the animals were very emaciated and in poor condition, but they recovered when put on to better feed. From this it is inferred that the plant has no value as a fodder, and unless better feed was available stock would certainly die from starvation.

Cattle Bush, Homalocalyx Polyandrus.

G.S. (Dalby)—

The tree with the yellow fruit is *Pittosporum phyllyræoides*, commonly known as Cattle Bush, a small tree widely spread through Western Queensland, New South Wales, and parts of South Australia. It is generally regarded as excellent fodder for stock. The little health-like shrub from the rocky country proved to be *Homalocalyx polyandrus*, a most interesting find. It is a small Myrtle, only previously known from very scrappy material collected by the explorer Leichhardt, somewhere in Queensland or in the Northern Territory. So, later on, if you could let us have a good bundle of flowering material, the favour would be greatly appreciated.

Weir Vine.

INQUIRER (Glenearn)—

The specimen forwarded is *Ipomae calobra*, the Weir Vine, a native of Western Queensland, generally regarded as poisonous to stock. When sheep eat the vine they develop symptoms similar to those of animals affected by Indigo or Darling Pea. Cattle and horses are also affected. A poisonous principle, however, has not been isolated from the plant. The plant forms a large underground tuber, which, unlike the green part, is quite edible and was an important article of diet with the aborigines in the early days.

Licorice.

INQUIRER (Toowoomba)—

So far as we know the Licorice plant is not now grown in Queensland. Some years ago it was grown to a very limited extent on the Darling Downs and in the Granite Belt. It is, we understand, still grown to a limited extent in the Southern States.

Mangroves.

F.W.S. (Maryborough)—

1. *Aegiceras majus* (River Mangrove).—Not known to be poisonous or harmful in any way, though I do not know that it is eaten by stock.
2. *Excœcaria agallocha* (Milky Mangrove).—Poisonous, but I do not think it is eaten by stock. No antidote is known, but if you have had any trouble with this plant write to the Director, Animal Health Station, Yeerongpilly.
3. *Avicennia officinalis* (White Mangrove).—Freely eaten by stock and generally regarded as an excellent fodder. It is not known to possess any poisonous properties, but stock sometimes get sick through searching for the fallen beans in the mud and swallowing a certain amount of mud along with the beans, of which they are very fond.
4. *Rhizophora mucronata* (Red Mangrove).—Not known to be poisonous, but rarely eaten by stock.

Starr Burr.

J.B.C. (Oakey)—

The specimen is the Starr Burr, *Acanthospermum hispidum*, a native of tropical America, now a naturalised weed in most tropical countries. It has been established in Queensland for a number of years, and about Townsville and in parts of the Gulf country it is one of the worst weed pests. Of recent years it has spread south, and is now moderately common about Brisbane. This, however, is the first record we have had of the plant's occurrence on the Downs.

Rattle-Pod or Rattle-Box.

T.A.P. (Toowoomba)—

The specimen is *Crotalaria incana*, a species of Rattle-Pod or Rattle-Box, a common weed in some parts of Queensland. It has been accused of poisoning stock on various occasions, though we have no very definite information on this point. In view of the fact, however, that several species of the genus *Crotalaria*, both in Australia and abroad, have been definitely proved by feeding tests to be poisonous to stock, the plant must be regarded with suspicion and its eradication advised. The plant is sometimes known as wild lucerne owing to its resemblance to ordinary lucerne, but this vernacular is not to be encouraged, as several other plants are known in Queensland as wild lucerne which are quite good fodders.

Northern Grasses and Other Specimens Identified.

J.Mc. (Hughenden)—

No. 44, *Chionachne barbata*.—A native grass, closely allied botanically to maize and Tiosinte. On account of the amount of grain it carries it should be a highly nutritious and valuable fodder grass. We do not know that it is common in any particular locality, and have heard no local name for it.

No. 45, *Commelina cyanea*.—This plant is sometimes called "Wandering Jew," a name, however, applied to a number of plants of the same family. It is sometimes called Scurvy Grass, and is reputed to be used as "greens." It is not known to possess any poisonous or harmful properties.

No. 46, *Corchorus hygrophilus*.—A native plant moderately common in the Northern Territory and the north-west of Queensland. We have not heard any local name for it, but it belongs to the wholesome family of plants, the Tiliaceæ, and is not known to possess any harmful or poisonous properties.

Nos. 46A, 47, and 48 all represent different growth stages of the common *Salsola Kali*, Roly Poly, or Russian Thistle. We should think the plant would be quite useful as roughage for sheep. It is probably at its best when in young seed, as the stock are very fond of the seed-bearing tops which are naturally fairly nutritious. On the whole, the plant is an inferior fodder.

No. 49, *Amarantus Mitchellii*, Boggabri.—In its slightly younger stages this plant is quite a good fodder and, even in the old, dried stage forwarded may have some value on account of the quantity of seed produced.

No. 50, *Flaveiria australasica*.—A very common weed in Central and Northern Queensland. The only local name we have heard applied to it is Yellow Weed, a name, however, given to other plants in Queensland. It has been reputed poisonous to stock, but we have no definite information. We rather doubt its fodder value.

Nos. 51 and 52, *Triodia* sp.—Unfortunately all the seeds had fallen out of the specimen forwarded. We think the only value of the Spinifex Grass as fodder lies in the seeds. These are readily eaten by all classes of stock, especially horses.

No. 50A, *Sorghum* sp.—Is this a native grass? If so, we would much appreciate complete material, especially a piece of the lower part of the stem showing the root system. It seems to us more like one of the cultivated sorghums, but which one, from the small specimens, it is impossible to say.

The specimen submitted by T. Field, Hughenden, is *Justicia procumbens*, a small plant of the family Acanthaceæ. It is very common in parts of Queensland, but we have never heard a local name given to it. We have had no personal experience with it but, judging from some of its allies, we should say the plant would make quite a good fodder.

A Valuable Fodder (*Echinochloa Turneriana*)

J.H.McC. (Hughenden)—

The specimen is a native of Central and Western Queensland and, we should say, an extremely valuable fodder. The genus *Echinochloa* is a small one, and contains such well-known cultivated fodders as Japanese Millet and White Panicum.

Tape Vine or Ivy Weed.

R.J.C.J. (Mudgeeraba)—

The specimen is *Stephania hernandiæfolia*, commonly known as Tape Vine or Ivy Weed. This plant is definitely poisonous and, we think, is the probable cause of your trouble. Wild passion vine is poisonous, but generally stock have to eat large quantities of it to show any ill effects. We have never heard of any plants of the Currajong family being poisonous or harmful to stock in any way.

Guinea Grass, Giant Couch.

T.B. (Howard)—

The tall-growing grass is Guinea Grass, *Panicum maximum*, a grass with a varying reputation as a fodder. It is suitable for either hay or grazing. The grass with a creeping habit is *Brachiaria mutica*, better known in Queensland as Giant Couch or *Panicum muticum*. It is very palatable grass to stock, and is one of the best grasses in coastal Queensland. It prefers rather damp situations. In some parts of North Queensland, such as the Daintree River and the wetter parts of the Atherton Tableland, it is the most important dairying grass.

Suitable Trees for Chinchilla District.

H.C. (Chinchilla)—

The following trees should do well in your district:—

Insignis Pine (*Pinus radiata*).—This pine is much cultivated in the Southern States and on the Darling Downs. If seed is not available in Toowoomba it should be obtainable from any recognised Southern nurseryman. It is not grown to any extent in Brisbane.

Torulosa Pine (*Cupressus torulosa*).—This is a large cypress, much grown as a breakwind and shade tree. As regards a supply of seed, the same remarks apply as to the Insignis Pine.

Pepperina Tree or Pepper Tree (*Schinus molle*).—Much grown in Western New South Wales and Western Queensland. Seeds or plants should be obtainable from any recognised nurserymen.

Bottle Tree (*Sterculia rupestris*).—This tree might be obtainable in your own district, and if so, you should find seedlings or young trees transplant quite readily. The Forestry Department has on hand at the present time a large quantity of seed, and if you ask some may be sent to you for trial purposes.

Currajong.—Like the Bottle Tree, you might be able to get young plants of this locally. If not, most nurserymen stock plants; or if you preferred seeds you could get them from A. Murphy, Seedsman, Woy Woy, New South Wales.

Sugar Gum.—This is not grown to any great extent in Queensland, but the plants are stocked by most Southern nurserymen, or if you want seeds you could obtain them from Mr. Murphy, of Woy Woy.

Honey Locust and Carob Bean are two leguminous trees with edible pods. Planted to some extent on the Downs, and plants or seeds should be obtainable from Toowoomba or Southern nurserymen. Mr. Leadbetter, Curator of the Botanic Gardens, Toowoomba, may be able to supply you with seeds from some of the trees in the gardens there.

We do not understand your lack of success with Camphor Laurels, as we find here that these seeds germinate readily, the usual practice being to sow them in flats or boxes, prick them out into pots when a few inches high, and then transplant them into their permanent situations.

We think the planting of shade trees in Western Queensland an exceedingly important matter, and the desirability of propagating a number of the trees mentioned and some others for distribution to farmers and pastoralists at a nominal rate is being considered.

Suitable Shade Trees for the North-West.

G.W. (Maxwelton)—

A number of trees that should do well if planted in your district. Following is a selection:—

Bottle Tree, both narrow-leafed and broad-leafed varieties. The Forestry Department happens to have at the present time a large quantity of seed of the narrow-leafed Bottle tree, and no doubt you could obtain some for trial purposes.

Albizzia Lebbek.—This is the tree much planted in Western Queensland and commonly known as Acacia. You could easily get seeds in your own district or from Hughenden, and raise plants for planting out.

Pepper Tree or Pepperina (*Schinus molle*), much planted in parts of Western Queensland and Western New South Wales. Plants should be available through most nurserymen.

Celtis sinensis.—Though a native of China this tree is commonly called Portugese Elm in Queensland. It should do well with you and the leaves are valuable stock food. Seed will be available from the Botanic Gardens, Brisbane, next February or March.

Citron Gum (*Eucalyptus citriodora*), a very quick growing Eucalypt. It does well in a variety of situations and is well worth planting. It should be obtainable from any recognised nurseryman.

Phytolacca dioica, Phytolacca or *Bella sombra* tree.—This tree is worthy of extensive planting. It is exceedingly quick growing, but is subject to frost. The leaves make excellent fodder for stock. Seed is obtainable from Mr. R. Dick, Purga, via Ipswich, at the price of 2s. per large packet.

Parkinsonia Tree (*Parkinsonia aculeata*), very widely planted in Western Queensland, and you should be able to obtain seeds locally. There is a chance that it might run out and become a pest, but we think probably its virtues would outweigh any doubtful qualities.

Algaroba Bean (*Prosopis juliflora*).—This is being planted now to some extent in parts of Western Queensland, and if not obtainable locally you might get seeds from Longreach or Winton. Failing that, write to the Curator of the Botanic Gardens, Brisbane. Like the Parkinsonia Tree it has been suggested that this tree might run out and become more or less of a pest, but we think here again its virtues far outweigh any bad qualities the tree might possess. It certainly is a valuable forage.

The planting of shade trees in North-Western Queensland is an exceedingly important matter, and one having an important bearing not only on lamb-raising but on stock breeding generally.

Suitable Grasses for the Blackall Range.

J.H. (Mapleton)—

An excellent grass for the conditions you mention would be Kikuyu. This is obtainable from most nurserymen and agricultural seedsmen. It is propagated from cuttings, as seed is quite rare. The grass, however, is a rapid grower and easily propagated by vegetative means. Another grass you might try is *Panicum muticum*, or Giant Couch. This is similar in growth to Kikuyu, but of more robust habit. If you have difficulty in obtaining supplies locally you could obtain a bag of cuttings from the Botanic Gardens, Rockhampton, but we do not know what charge is made. Like Kikuyu, propagation is by cuttings, not by seed.

Regarding leguminous plants, we should say that the ordinary White Clover would be best. Red Clover is also worthy of trial; we have had one or two reports of its doing quite well on the North Coast Line, but have not personally seen it. Of Cocksfoot and New Zealand Rye we have not had personal experience, but the latter should be worthy of trial. *Phalaris tuberosa* would probably do well during the winter months, but it may die out in the summer. We think it is more suited to the Darling Downs and New England districts than to the Blackall Range. The common Guinea Grass which is everywhere a weed in orchards on the Blackall Range is a uesful fodder if kept cut or eaten down, but soon becomes rather rank and unpalatable.

General Notes.

Staff Changes and Appointments.

Mr. George Burton, Cambooya, has been appointed Chairman of the newly elected Canary Seed Board until the 31st May, 1934.

The resignation of Mr. T. Toms, Maryvale, as Acting Inspector of Stock has been accepted as from 30th April.

Constable P. H. Gimpel, Eromanga, and Constables N. E. Bahr and P. J. Rynne, both of Ingham, have been appointed Inspectors of Slaughter-houses.

Constable A. V. Tanner, Mount Molloy, has been appointed an Inspector of Brands.

Mr. F. C. Hunter, Court House, Maryborough, has been appointed an Honorary Ranger under and for the purposes of the Animals and Birds Acts.

Mr. D. O. Atherton, Assistant to Entomologist, at present stationed at Atherton, has been appointed Assistant Entomologist as from the 1st April, 1933.

Messrs. E. H. Crease and J. Murnane, of Upper Tallebudgera, via West Burleigh, have been appointed Honorary Inspectors under the Diseases in Plants Acts.

Constable E. D. Bauer, Maryborough, has been appointed also an Inspector of Brands.

Messrs. R. B. Corbett (Woombye), A. A. Cousner (The Gap, Ashgrove), Tom Hallick (Mount Gravatt), A. McLauchlan (Boonah), W. T. Hughes (Toowoomba), and E. Graham (Director of Marketing, Brisbane), have been appointed members of the Egg Board for the period from the 1st May, 1933, to the 31st December, 1933.

Mr. W. J. Sheahan, Inspector of Stock, Clermont, has been appointed also an Inspector under and for the purposes of the Slaughtering and the Brands Acts.

Mr. N. C. Copeman, Inspector of Stock, Wandoan, has been appointed also an Inspector under the Slaughtering Act.

Constables H. E. Benson, Jundah, and J. W. Elstob, Bollon, have been appointed also Inspectors under the Brands Acts.

Mr. T. E. Dwyer, Acting Police Magistrate, Mackay, has been appointed Chairman of the Farleigh, Plane Creek, Pleystowe, and Marian Loal Sugar Cane Prices Boards, in the place of Mr. M. Gallagher, who has resigned the Chairmanship of these Boards.

Mr. A. C. McLaughlin, Buckleton, Springsure, has been appointed an Honorary Ranger under the Animals and Birds Acts.

Mr. B. Flewell-Smith (Committee of Direction of Fruit Marketing), K. L. Viles and J. R. Stocks (C.O.D., Kandanga and Nikenbah, respectively), and Mr. Thomas Shiels (Upper Tallebudgera) have been appointed Honorary Inspectors under the Diseases in Plants Acts.

Mr. A. E. Watt, Coolangatta, has been appointed an Honorary Ranger under the Animals and Birds Acts and the Native Plants Protection Act.

The resignation of Mr. H. W. Harvey as Acting Stock Inspector at Banana has been accepted, as tendered, and Mr. John King, of Banana, has been appointed Acting Stock Inspector in place of Mr. Harvey.

Mr. T. F. Corbett has been appointed Cane Tester for the forthcoming sugar season at the Inkerman Mill.

Banana Industry.

Two new Regulations have been issued under the Banana Industry Protection Act. These provide that any authorised officer of the Banana Industry Protection Board may enter the premises and inspect the books and accounts of any grower, authorised agent, carrier, or other person for the purpose of obtaining information as to the quantity of bananas produced in Queensland and marketed by any grower, and may make copies or take extracts therefrom. Any person who obstructs or impedes an officer in the execution of any of these powers will be guilty of an offence and liable to a penalty of £5 for a first offence and not exceeding £20 nor less than £5 for a second or subsequent offence.

Dairy Produce Act Examinations—A Reminder.

The date for the holding of the annual examinations in the theory of milk and cream testing, milk grading, cream grading, butter making, and cheese making is 29th July next. Applications must be lodged with the Department before the 12th July.

Honey Board.

The result of the recent election of four growers' representatives on the Honey Board was:—Charles William Edwards (Greenbank, via Kingston), 248; Owen Norman Tanner (Samford), 156; Henry Edgar Fagg (South Killarney), 156; John Schutt (Perthton), 144; Alex. Roy Brown (Park Ridge), 142; Roy John Bestmann (Caboolture), 132; and George Herbert Whiting (Coowonga, via Rockhampton), 122. The successful candidates will be appointed for a term of one year as from the 16th April, 1933.

Queensland Apples in London.

The Minister for Agriculture and Stock (Mr. F. W. Bulcock) is in receipt of information from the Acting Agent-General for Queensland in London (Mr. L. H. Pike), to the effect that he had personally examined or obtained reports on various shipments of Queensland apples recently despatched overseas. In every case the quality, condition, and grading were satisfactory, but it was noted that a proportion of the fruit was affected by bitter pit. It was suggested that certain improvements in packing would be an advantage, and in this connection the practice of lining cases with corrugated paper, as adopted by New Zealand, was advocated.

Atherton Tableland Maize Board.

In July, 1932, an Order in Council was issued extending the operations of the Atherton Tableland Maize Board for a period of ten years from 1st July, 1933, to 30th June, 1943.

Executive approval has been given to the issue of a further Order in Council under the Primary Producers' Organisation and Marketing Acts extending, for the abovementioned period of ten years, the powers of the Board in respect to borrowing money on mortgage.

Trans-Boarder Stock Restrictions at Killarney.

An Order in Council was issued recently restricting the introduction of stock through the crossing place at Killarney on account of an outbreak of cattle tick in the portion of New South Wales adjacent to this crossing. Approval has now been given to a further Order in Council which prohibits the introduction into this State of any stock from New South Wales through the crossing place at Lower Acacia Creek. This crossing is in close proximity to the Killarney Crossing.

Animals and Birds Sanctuary at Springsure.

Grazing Homestead 2481, which comprises part of Nalcoombie Holding, in the Springsure District, has been declared a sanctuary under the Animals and Birds Acts by an Order in Council. It will now be unlawful for any person to take or kill any animal or bird on this property.

Dairy Science Schools.

The Minister for Agriculture and Stock (Mr. Frank W. Bulcock) in discussing the activities of his Department in its educational extension work, has announced that short schools of dairy science, each of one week's duration, will be conducted at Malanda and Kingaroy for the benefit of factory managers, employees, and interested dairymen. A similar school has just closed at Toowoomba.

The success of last year's schools led to the more ambitious programme this year. A range of subjects even more comprehensive than that of last year's programme has been arranged for the present series by Departmental officers. The more the fundamentals of dairy science are promulgated throughout the dairying centres and brought particularly before those men who handle our butter and cheese, said Mr. Bulcock, the better will they be able to grapple with the problems of manufacture that confront them in their every day work.

The dates for the schools are—Malanda, 10th to 14th July; Kingaroy, 21st to 25th August.

In addition to these schools, arrangements are also being made for refresher courses at an early date for Departmental field officers in veterinary and dairying science at the Animal Health Station, Yeerongpilly.

A start will also be made in the first week in August in short courses of instruction to leaders of dairying committees which have been formed throughout the State in furtherance of the policy of bringing the dairy farmer into closer co-operation with the activities of the Department of Agriculture and Stock.

Sugar Cane Levies.

The Minister for Agriculture (Mr. F. W. Bulcock) has approved of the levying of an assessment at the rate of one halfpenny (½d.) per ton on all sugar-cane produced during the season 1933-1934 for the purposes of the Sugar Experiment Stations Acts. This assessment is at the same rate as that for the past season 1932-1933.

An Order in Council has been issued fixing the assessment for the purposes of the Sugar Cane Prices Acts for the coming season 1933-1934 at one penny farthing (1¼d.) per ton on all sugar-cane produced in Queensland. This assessment also is at the same rate as that levied under the Regulation of Sugar Cane Prices Acts during the season 1932-1933.

Tick Precautions at Killarney Border Crossing.

An outbreak of cattle tick has been reported from that portion of New South Wales adjacent to the Queensland border at Killarney, and precautions are being taken by the Department of Agriculture and Stock to ensure that the outbreak does not spread into Queensland by means of stock movements through the crossing-place at Killarney.

An Order in Council has therefore been issued further restricting the introduction of cattle at that place. From now on all cattle and horses entering Queensland at Killarney must be provided with a certificate of health and freedom from ticks, and also a certificate that the cattle have been dipped and the horses either dipped or hand-dressed within the seven days immediately preceding their introduction. They must be found clean from ticks upon inspection at the crossing-place, and must be again dipped or hand-dressed at Killarney before they are finally allowed to proceed.

Mill Suppliers' Committees.

A regulation has been issued amending certain regulations under the Primary Producers' Organisation and Marketing Acts with reference to mill suppliers' committees. When a vacancy occurs in the personnel of a district canegrowers' executive it could hitherto be filled either by the mill suppliers' committee concerned or the remainder of the district executive. In accordance with the amendment, any vacancy will now be filled by the mill suppliers' committee concerned only. Regulation 354 has also been amended to provide that the representative of any mill on the district executive who is *ex officio* a member of the mill suppliers' committee shall be eligible for election to the position of chairman of the committee.

Plain Turkey Protected—Its importance in Farm Economy.

An Order in Council has been issued under the Animals and Birds Acts totally protecting the bustard or plain turkey in the Shires of Woothakata and Tinaroo, North Queensland. A previous Order in Council was issued affording total protection in the Shire of Eacham. This action has been taken as a result of representations made by sugar-farmers and others that the plain turkey is an important factor in keeping down inspect pests in the fields. Enquiries made by the Department of Agriculture have confirmed this, and the shire councils concerned have also supported the action taken. Prior to the issue of these Orders in Council, only partial protection was afforded the plain turkey.

Pig School at Gatton.

Arrangements have now been completed for holding the Annual School of Instruction for those interested in the breeding, feeding, and marketing of pigs. The school is to be held at Gatton College commencing on **Monday, 14th August, and concluding on Saturday, 26th August.** Applications are now being received and those who are able to arrange attendance should lose no time in lodging their applications with the Principal, Queensland Agricultural High School and College, College Siding, Queensland.

Concession fares by rail are available throughout Queensland, and the school fees (approximately £3 10s.) include all charges for board, residence, instruction, and excursion to bacon factory.

The Principal (Professor J. K. Murray) is anxious to have all applications as early as convenient in order to arrange accommodation, hence those interested will materially assist by prompt action in order to save disappointment.

Further particulars may be obtained from the Principal at the College, or from the Department of Agriculture and Stock, Brisbane, Queensland.

Buffalo Fly Infested Area.

An Order in Council has been issued under the Diseases in Stock Acts altering the boundaries of the Infested Area declared in North-west Queensland in March, 1929, for the purpose of the control of the buffalo fly. The area has been extended to include all know infested and adjoining holdings incorporated in the areas defined during the last cattle season.

Cheese Board.

An Order in Council has been issued under the Primary Producers' Organization and Marketing Acts, giving notice of the intention of the Governor in Council to extend the operations of the Cheese Board for the period from the 1st August, 1933, to the 31st July, 1934. It is also declared that the Governor in Council will receive, on or before the 3rd July, 1933, a petition signed by not less than 10 per cent. of the growers of cheese, requesting that a vote of such growers be taken on the question as to whether the functions of the Cheese Board shall cease on the 31st July, 1933, or continue until the 31st July, 1934. Growers eligible to vote will be cheese manufacturers and persons who, at any time within the six months immediately prior to the election supplied or supply milk to cheese factories in Queensland.

Nominations are also being called for the election of five growers' representatives on the Cheese Board for a term of one year from 1st August, 1933.

The International Year Book of Agricultural Statistics.

The International Institute of Agriculture at Rome has recently published the 1931-32 edition of the "International Year Book of Agricultural Statistics."

This volume—of about 800 pages—is the result of the most extensive and detailed inquiry made in the domain of international agricultural statistics, and constitutes a work of the greatest importance to all those who are interested in questions having a direct or indirect relation to production and commerce of agricultural products.

In the first part of the year book are classified the figures for area and population in the years nearest to 1927 and 1931 for 208 countries; the presentation of these figures throws light upon the world situation from the geographical, political, and demographical points of view during the post-war period. The second part is composed of a series of tables comprising for nearly fifty countries the available data concerning the uses for which the total area is employed, the apportionment of cultivated areas between the different crops, agricultural production, numbers of the different kinds of live stock and the products derived from them. In the tables constituting the third part of the volume, have been indicated for nearly forty agricultural products, the area, production, and yield per acre in each country during the five years 1923-1927, and during each of the years from 1928 to 1931.

For each kind of live stock all available figures in the different countries have been grouped for the years 1927 to 1931. A large part of the volume is devoted to statistics of the commercial movement of forty-three vegetable products and thirteen products of animal origin. The figures published relate to the imports and exports during the calendar years and for the cereals also during the commercial seasons.

It may be added that the tables of production and commerce not only specify details for each country but also the totals for the different continents and hemispheres and for the whole world, allowing the formation of a general idea of the changes taking place during the periods under consideration in the area under each crop, quantities harvested, and the commercial movement in each product.

The part devoted to prices contains the weekly quotations of twenty-five agricultural products on the principal world markets for the period January, 1927, to July, 1932. In the freights section will be found the quotations for the transport of wheat, maize, and rice on the most important shipping routes, and in the section reserved for fertilizers and chemical products useful in agriculture are published statistics of production, trade, consumption, and prices for fifteen products. In the Appendix have been brought together special chapters on the distribution of agricultural holdings according to their size and mode of tenure. The forestry statistics have been extended and developed, and will be published in a separate volume under the title of "International Year Book of Forestry Statistics."

Sanctuary at Willowburn.

An Order in Council has been issued under the Animals and Birds Acts declaring the grounds of the Willowburn Mental Hospital, Toowoomba, to be a sanctuary under the abovementioned Acts. It will now be unlawful for any person to take or kill any animal or bird on this property.

Rural Topics.

Feeding a Famous Jersey.

There is a well-founded saying to the effect that it is not possible to get from a cow more than you are prepared to put into her in the form of feed. Thus, whenever a new record is established, the dairy farmer immediately becomes interested in how the record producer was fed.

Many have asked that question since 1st February, on which date the thirteen-year-old Jersey cow, "Wagga Gladys," completed her 273 days' lactation period with a world's record butter-fat production for her breed of 935.23 lb. (from 17,202 lb. milk), states the New South Wales "Agricultural Gazette." "Wagga Gladys" is a member of the Hawkesbury Agricultural College Jersey herd, and this is the second occasion on which she has established a world's record. Chief interest now centres in whether she can better the 365 days' record of 1,220 lb. butter-fat held by the New Zealand Jersey cow, "Woodlands Felicie."

Although varying slightly from month to month during the lactation period, throughout the greater part of the time she was fed on the following ration:—Silage 20 lb., lucerne chaff 10 lb., and 3 lb. of a mixture of bran 100 lb., linseed meal 50 lb., and bone-meal 3 lb. In addition, for every gallon of milk produced, her daily ration was augmented by 2 lb. of a mixture comprising bran 100 lb., maize-meal 80 lb., crushed oats 30 lb,. and linseed 20 lb. The grazing varied considerably. During the winter months there was a fair picking of green barley and green wheat, and at other times she was given an occasional day's grazing on short lucerne.

No very special treatment was meted out to "Wagga Gladys." She remained with the college herd except during the days when they had to travel more than half a mile to the grazing paddock. She was milked twice a day throughout the test.

The Future of Rural Industry.

The Secretary for Agriculture in the United States of America, in addressing a large body of pig producers recently, had this to say in regard to future prospects in rural industry:—

"In times like the present the pig producer, like all of us, is apt to forget normal relationships. He may feel that he is caught in a web of economic difficulties. He may forget temporarily his own production skill, mastery over disease, the normal value of swine as profit-makers.

"There is no reason for losing faith in the future of the pig industry, for in the long run, when the general fear is broken and credit once more flows normally through all the channels of trade, the efficient producer is bound to reap the bounty of his labour. Realising that the pig did not gain its reputation as a mortgage-lifter on the farm of the inefficient farmer, producers should apply more strictly than ever before scientific and economic production methods. Above all, they should produce only that number of pigs that they can grow and sell on a profit-making basis.

"America will come back. America will be stronger than ever before. Every sound industry will rise to new heights, and the people of those industries will secure even greater rewards. I have no doubt of this." The Australian producer may accept the foregoing as applying somewhat to our own particular problems of the day.

Tapping for Bloat.

Tapping for bloat is done, when necessary, by inserting a sterilised trocar (dagger) and canula (tube or sheath) in the distended paunch (rumen) high up in the left flank, close to the last rib and transverse spines of the backbone. Hair should first be clipped or shaved from a small patch of skin where the instruments are to be inserted; then the skin should be cleansed and disinfected, unless it is absolutely necessary at once to do the tapping to save the life of a gasping cow. The instruments should be directed inward, forward and downward, as if aiming for the right elbow of the cow. When inserted full length, draw out trocar, leaving the canula in place. When the gas has escaped, return the trocar to the canula and very slowly pull out both instruments; pinch the opening in the skin shut and then apply tincture of iodine, if available; otherwise apply pine tar. The instruments may be bought from a veterinary supply house.—"New Zealand Farmer."

The Importance of Minerals.

It is imperative to realise that a stock lick is primarily intended to supply those minerals essential for growth and production which are lacking in the soil and, consequently, in the grasses, &c., growing thereon, from which the animals obtain their food supply. It is absolutely impossible for any animal on a diet poor in essential minerals to make normal growth or to be capable of normal production, whether it be flesh, wool, or milk.

The minerals commonly found to be deficient in pastures are phosphorus (in the form of phosphoric acid) and calcium (in the form of lime). These two minerals enter very largely in the composition of bones; hence young animals developing their skeletons require greater amounts of these minerals than adults. Similarly the pregnant female requires large amounts of these minerals in order to supply the needs of her own body, and also to build the skeleton of the growing fœtus. Calcium plays an important part in controlling the clotting of blood, in regulating the heart's action, determining the firmness of muscle, in assisting the digestion of fat, and controlling the action of other minerals on the body. Phosphorus is essential for the building up of all tissues of the body, and without it the supply of wool, milk, and flesh would be impossible. Deficiency of calcium and phosphorus results in stunted growth, poor carcasses, low production, and weak constitution.

Supply Bone Meal and Salt Separately.

Owners are advised by the Department of Agriculture to adopt the practice of supplying pure bone meal to their stock. Salt, which is also essential, should also be supplied, but in a separate container to the bone meal. The animals themselves will then be able to choose the amount of either they will consume—and the animal is a better judge as to what it requires than is man. Stock which have been accustomed to being fed a lick containing salt may, for a few days, require to be enticed to partake of the pure bone meal, and this can be accomplished by mixing a small amount of salt with a small amount of bone meal.

There is special need for stockowners to make a careful and impartial survey of this lick question. No owner can afford to pay high prices for licks with a low phosphate content. There can be no doubt that the provision of bone meal and salt is the most economical and most satisfactory method of rectifying any mineral deficiency which might exist in the feed of the animals.—A. and P. Notes, N.S.W. Dept. Agric.

Dodder—The Greatest Enemy of Lucerne.

Dodder is a parasitic plant, with long leafless stems, orange yellow in colour. The dodder seed germinates in the ground, and the young plants attach themselves to the lucerne seedlings. As soon as the thread-like vine is firmly attached to the lucerne plant, the stem connecting it with the ground withers away, and the dodder draws its sustenance from the lucerne by means of tiny suckers, which enter the tissues of the host plant. The dodder flowers are a beautiful golden colour. As the parasite develops, the tangled masses of crop in which it occurs have the appearance of ringworms, working from the centre outwards.

On no account should dodder be sown with the lucerne seed. Fortunately the removal of seeds of dodder is a simple process, as they are much smaller in size than lucerne seeds, and can be removed by screening through a mesh sufficiently close to retain healthy lucerne seed, whilst allowing the dodder to pass through.

If dodder appears in a lucerne paddock it should never be allowed to seed, but the affected growth should be removed as soon as possible. The plants should be cut with a scythe or chipped to the crowns. The patches should be treated before the general crop is cut, as otherwise the parasite may be distributed throughout the field by the machinery. The infested material should be removed from the field, taking care not to drop any of the dodder during the process, and destroyed by burning.

A Prolific Sow.

A Berkshire sow that produced fifty-four pigs and reared them in four litters, not losing one, ought surely be regarded as a champion. In one litter of twelve every pig was a female. There were fourteen in the next, but a few boars found their way into this family to break the spell. The sow is owned by Mr. P. O'Brien of Highfields, Queensland, and is a first-class specimen of the breed. She is still breeding freely and is like an old milking cow.

Phosphorus and Calcium contained in Bone Meal.

Probably the best method of supplying this deficiency in phosphorus and calcium is by top-dressing the pastures with fertilizer, but next in importance to top-dressing is the supply of an adequate mineral lick; that is to say, a lick containing large amounts of these two minerals. The best form in which to supply phosphorus and calcium is as sterilised bone meal, which is a form of calcium phosphate. This is the product of ground-up sterilised bones obtained from animals slaughtered for human consumption, and it naturally contains all the minerals present in the animal's skeleton. Nauru or Ocean Island phosphate is another substance supplying these minerals, but the phosphorus is in a more insoluble form than is the case in bone meal, and is, therefore, not as readily available to the stock.

The addition of iodine to a lick is in the majority of cases unnecessary, and, furthermore, increases the cost of the lick enormously. Unfortunately, stockowners have indiscriminately used iodised licks in many cases where they were not indicated.

Preparation of Land for Spring-sown Crops.

Where a preliminary ploughing has not been given to land which it is intended to sow in spring the operation should be attended to without delay. Whatever the crop, production will be more successful if it is grown on land which has been adequately prepared.

There are many advantages attached to early and thorough working of the soil; some of them are direct and others are indirect, but all are important in relation to the final result. The first direct advantage is the exposure of the soil for three or four months to the sweetening influences of sun, air, and frost, and the second the increased capacity of the soil for the absorption and retention of any rain that may fall.

The early ploughing should be deep, in order to ensure that when the seed is planted it will have a good depth of worked soil beneath it. Towards the end of the winter the land should be cultivated with the springtooth cultivator, and this should be repeated occasionally to conserve the moisture. If heavy rains have occurred during the period of cultivation it will be necessary to plough the land again, but in this case a shallow working will be sufficient. The effect is to open up and aerate the soil which has been hardened down by the rain, to give it a better physical condition, and to turn under any weeds that have grown. The aim in all operations should be to loosen the soil, as any rain which falls after the crop is planted will soon compact the seed-bed.

The result of this treatment is that the soil is in such good condition and has such a reserve of moisture when sowing time arrives that it is unnecessary to wait for rain to carry out sowing operations. This reserve has also an important influence on any fertilizer used. Soil moisture is essential for the best results from fertilizers.

Besides the above-mentioned benefits attaching to early ploughing and working of the soil, a large amount of plant-food is also released and made available for the needs of the crop. Analysis has shown that the bulk of our soils contain sufficient plant-food to produce crops for hundreds of years, but the trouble is that this plant-food is not in an available form, and on continuously cultivated soils it is only by a proper system of cultivation that a sufficiency of it is secured for the crop.—A. and P. Notes, N.S.W. Dept. Agric.

Constipation in Pigs.

When pigs, particularly breeding sows close to farrowing, are severely constipated, and immediate bowel action is desirable, a powder consisting of 5 grains of calomel and one teaspoonful of sugar should be mixed, and made into a small ball with moistened pollard and given to the affected animals.

Rolling the ball of pollard in table salt before it is given to the pig will very often induce the animal to take it readily. The animal should be compelled to take plenty of exercise a few hours after it has taken the medicine. This treatment should be followed by a dose of 2 oz. Epsom salts in a small quantity of food or fresh milk.

It is essential in cases like this to be sure that the bowels are cleansed of accumulations of fæcal matter otherwise ill-health may continue, and the animal will have little or no desire for food. Feeding the animal on light, nutritious, appetising rations, in which there is a good supply of greens—lucerne, pumpkins, sweet potatoes —skim milk or similar foods is advised. Little grain is required, but plenty of clean drinking water should be allowed. On the third day after treatment add to the food one dessertspoonful of finely powdered Nauru phosphate and 10 grains of boracic acid to "sweeten" the stomach and put the animal in better heart. The drugs in powdered form should be mixed with a small quantity of meal and then be moistened to a paste before being added to the food. Continue this treatment for fourteen days in cases where the animal has been very ill.

Egg Board.

The election of members for the two contested districts of the Egg Board resulted as follows:—

District No. 2 (Brisbane North-Redcliffe).—Arthur A. Cousner, The Gap, Ashgrove, 94 votes; Henry E. Probert, Figtree Pocket, Indooroopilly, 50.

District No. 5 (Darling Downs).—Walter T. Hughes, Toowoomba, 161 votes; Fred. M. Proellocks, Wyreema, 77.

The present members—Messrs. R. B. Corbett (Woombye), Tom Hallick (Mount Gravatt), and Alex. McLauchlan (Boonah), for Districts 1, 3, and 4 respectively—have been re-elected unopposed.

The new Board will hold office until the 31st December, 1933.

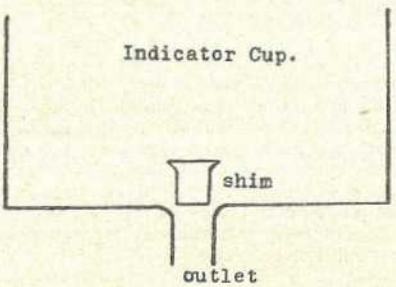
Loss through Faulty Cream Separation.

Of the unledgered losses upon the dairy farm those due to faulty separation frequently receive little more than a passing thought until the matter is brought under notice by a separator salesman, who, as might be expected, is more interested in demonstrating a fault in the farmer's machine than in discovering the cause and rectifying it, observes an officer of the Dairy Branch of the Department of Agriculture in current notes. Not infrequently separators are regarded as worn out, or may even be faulty when first installed, as the result of too large an indicator cup outlet.

This is situated beneath the float, and upon the size or calibre of the outlet depends the speed at which the milk enters the bowl, the function of the float being to restrict the flow of the milk from the tap and thus prevent it overflowing. It will readily be seen that a worn or enlarged outlet will permit a greater quantity of milk to enter the bowl than that part of the machine was designed to deal with, with the result that imperfect separation takes place. Periodic spurting of milk from the cream spout has also been traced to this cause.

Excessive wear of the indicator cup outlet, which usually takes the form of a short tube, is most often the result of vigorous scouring with worn brushes, the wire of which, coming into contact with the metal, rapidly wears it away.

A rough test can easily be made should enlargement of the outlet be suspected to be the cause of butter-fat losses, failure of the cream screw to raise the test, or spurting of milk from the cream spout, by inserting thin flat shims in the neck of the outlet and observing the result. The shims may be made of thin capsule tin



similar to that used to seal certain types of tobacco tins and should be fashioned in the manner indicated in the diagram. One or more may be tried, and should the result justify the opinion that the outlet is too large, steps should be taken to permanently reduce the size.

Construction may be effected by placing a small bell-mouthed punch over the lower end of the tube and striking, or by getting a tinsmith to re-tin heavily the internal surface of the tube, which may then be reamed out to the desired size. Reaming should be done carefully, and a constant check kept upon the result by frequent tests under working conditions.—A. and P. Notes, N.S.W. Dept. Agric.

Care of Stored Honey.

If honey is stored in a damp place, and not thoroughly sealed up, it will absorb moisture, and if excessive moisture is so taken up the honey is liable to ferment and deteriorate in value. Do not leave the lid off the containers, or leave honey exposed for any length of time during the later autumn and winter months. If kept in a dry place in a sound container honey will keep good for years; it may granulate, but that is not a sign of deterioration, and in such cases it may easily be liquefied by immersion of the container in hot water.

The Home and the Garden.

OUR BABIES.

(Issued by the Queensland Baby Clinics.)

Under this heading we issue a monthly series of short articles dealing with the welfare and care of babies, in the hope of increasing their health and happiness, and decreasing the number of unnecessary deaths among them.

WINTER INFECTIONS.

THE glorious weather of our Queensland winter would be an unmixed blessing if this season were not cursed by diseases which attack the nose, throat, and air passages. They attack persons of all ages and do much harm, especially to those of weak health and early years. The most common is the "cold" or "catarrh." Though often a mild disturbance of health, it may have serious consequences—bronchitis, pneumonia, and abscess of the ears—and these are sometimes fatal. Then there are the influenzas allied to the "common cold," but more severe, and sometimes causing a high mortality. To these we must add the well-known diseases—measles and whooping-cough, infectious sore throats, diphtheria, scarlet fever, and some more rare and even more serious—meningitis and infantile paralysis.

All mothers at the approach of winter, if not before, should consider seriously what they can do to protect their children from these infections. No good is done by "coddling" or over-clothing. School children cannot escape the risk of infection, nor can infections be prevented altogether. That is impossible, but much can be done to make them less frequent, to diminish the severity of their attacks, and to prevent them from leaving behind weakness and ill-health. This can be done in two ways—(1) by increasing the child's resistance to infections, (2) by lessening the number of infections.

Protective Foods.

To increase the resistance the child should be in vigorous health, not only apparently healthy, but with all his tissues strengthened against disease. This depends on right feeding with the right foods containing liberal supplies of the vitamins necessary for health. Milk, eggs, and green vegetables are the protective foods, and unless wholemeal bread is always used, each day should have its dessert or tablespoonful of cooking bran at school age. Should the child be weakly he should be given cod liver oil, either plain or in emulsion. If he has a strong dislike to this, he may obtain the same benefit from "Radiomalt" (a pleasant sweetmeat) or some other substitute that his doctor may recommend.

How Infectious Diseases are Spread.

Infectious diseases are spread only occasionally by those who are sick in bed. The infection is most often distributed by mild cases, convalescents, and many persons who are apparently healthy, but are carriers of the disease germs. During an epidemic these last are numerous, and all persons should be suspected of being carriers. By coughing, sneezing, and even loud-speaking an invisible spray is ejected containing the disease germs. These extremely minute particles float like a light mist, especially in closed rooms and halls in cold weather, where there is little ventilation. It is easy to understand how the disease is inhaled by others. Where there is no cough, another method of infection comes into prominence. Most young children are in the habit of putting their fingers into their mouths and smearing their secretions on their clothes and toys, and on the hands, faces, clothes, and toys of their playmates. In this way disease germs are rapidly distributed among any group of young children. This dangerous habit of slobbering and smearing persists because of want of proper training in the home. Mothers have not yet learnt how dangerous it may be. Prevention of infection by coughing is more difficult, but even young children may be taught to cough into handkerchiefs and not into other people's faces.

Give the Baby a Chance.

Nearly everyone contracts measles and whooping-cough some time or other, but the chief mortality results are in the early years of life, so that every year in which the child escapes them, improves the prospects of recovery. Measles is rare in the first year, but whooping-cough is often fatal to young and weakly infants. Diphtheria infection is almost universal in childhood, though only a small proportion develop this dangerous disease; the others become immunised. By artificial immunisation the disease can be prevented more safely, and many lives saved. "Colds" and influenzas give no lasting protection, and there is no limit to the number of the attacks. Every effort should be made to protect the youngest. A baby who is handed round to all visitors to be hugged and kissed has little chance of escape. Crowded halls are sure to be centres of infection when this is about, and therefore babies and young children should not be taken to dances and picture-shows. This may entail some self-sacrifice on the part of the mother; but what is a mother for, if not for that?

BREAD-MAKING.

SOME useful hints on a question of wide interest to country housewives were given in an address by Miss Valeria Holcombe, secretary of Burren Junction Branch of the Country Women's Association, at a conference of the N.S.W. Agricultural Bureau, and which are quoted below:—

A good bread-making flour is essential; some flours make excellent cakes and puddings, but are not good for bread-making. This is because bread requires a flour containing plenty of gluten. Some varieties of wheat make a flour low in gluten content and these are not suitable for bread.

Yeast works best at temperatures of from 77 to 95 deg. Fahr. Keep the dough near the stove in cold weather and during heat waves put in cool place or it will rise too quickly and give a loaf that is too porous. Yeast will not work below 30 deg. Fahr., and is killed at 212 deg. Fahr. Salt retards the action of the yeast slightly; it should not be added till the dough is working well.

A little sugar improves the loaf. It prevents the crust from being too hard. The water or milk used to mix the bread with should be scalded and then allowed to cool down to lukewarm—about 103 deg. Fahr. Milk makes a very nutritious loaf with white crumb and rich crust. If all milk cannot be used try half milk and half water.

Cook for one hour; start with a hot fire (400 deg.) and decrease the temperature after a while. The cooking drives off the carbon dioxide and kills the yeast plant, so that it does not rise any more.

Troubles in Bread-making.

Over-kneaded dough is sticky and will not rise; under-kneaded dough is streaky and the bread will contain lumps of dough that have not been worked out.

Too much flour gives too stiff a dough, rises very slowly, and the flavour will be poor.

Too long a rising will give a porous loaf with poor flavour. If the rising continues too long, the bread will settle over the side of the tin or become sour.

Too cool an oven will make the bread rise too long and it will be too porous.

"Rope" is caused by a bacillus; it often appears in hot, damp weather. When the bread is about a day old the crumb goes stringy or ropey and the flavour is so disagreeable that it is quite unfit for use. This disease is hard to get rid of. The treatment is to sterilise all utensils, and add vinegar equal to 2 per cent. (one tablespoon vinegar to 1½ lb. flour) of the flour used, for all the remaining flour you have.

Recipes for Yeast.

Yeast is a microscopic plant, which, when given food, air, warmth, and moisture multiples very rapidly and produces carbon dioxide; this stretches the gluten and the dough rises. There are three main kinds of yeast. Compressed yeast comes in small damp cakes; it is ready to work immediately it is given the food and moisture, &c., and will keep in good condition two or three days. Dry yeast is a mass of yeast plants dried and mixed with some kind of meal. Although alive,

it is inactive, and even after it has been given the food, warmth, and moisture it takes some hours to start working well. It is sold in tins and will keep some months. Liquid yeast may be made at home as follows:—

Cream of Tartar Yeast.—Put 1 heaped tablespoon of hops in a saucepan with 4 cups water and boil twenty to thirty minutes. Put 1 tablespoon sugar, 1 teaspoon cream of tartar into a basin, strain the boiling hop water on to it and stir; when cold mix with 3 tablespoons flour and add 1 tablespoon old yeast. Put in basin, cover with plate, and keep in a warm place near the stove for twelve to eighteen hours. It is then ready for use. Stand in a cool place, and it will keep for a week or ten days in cool weather. Use three-quarters of a pint of this to make 3 to 5 lb. bread.

Potato Yeast.—Materials: Three potatoes, two pints boiling water, half cup flour, one-quarter teaspoon ginger, one tablespoon sugar, one and a-half tablespoons salt, half cup old yeast. Peel the potatoes, cut small, cook in the boiling water, mash potatoes. Mix next four ingredients and pour over them the potatoes and water in which they have been cooked. When lukewarm add old yeast. Keep lukewarm for twenty-four hours, put into basin, cover, and keep in cool place. Will keep two weeks.

Neither of these yeasts requires bottling or cooking.

LANDSCAPE GARDENING.

The landscape gardener must possess a good deal of artistic taste, as he deals with the landscape and its improvement. Should alterations be necessary, they must be carried out in as natural a manner as possible, and they must be in unison with the surrounding country. Any existing natural features may be made the most of.

If trees shut out a desirable view, they may with care be removed. Tree thinning also becomes necessary when some are spoiling others. It is better to have one good specimen than several poor ones. When tree planting, the gardener must look forward, and consider their size when maturity is reached.

Broad stretches of lawn may be broken up with shrubs or specimen trees, or beds of flowers. The character of the soil and the situation must be taken into consideration when planting. It is of no use to plant trees or shrubs that are not likely to succeed, and if doubtful ones are included, they must be in positions where they can be easily replaced should they fail. The character of the dwelling must also be taken into consideration.

Vista making is an important part of landscape gardening, and to carry it out the various points of vantage have to be ascertained and their values determined. The outline of the landscape from the various vantage points must be undulating, not straight or unbroken, and though special hues in greenery may be made the most of, they must not be repeated until the eye wearies of them.

Paths should be as few as possible, and each should be made for some definite purpose. They should run in bold but graceful curves, especially when made of gravel.

If summer houses are included they should not stand out aggressively, and they should be covered with creepers as quickly as possible.

FLOWERING SHRUBS.

Lagerstræmia indica varieties.—There are many beautiful forms of this shrub on the market, and the finest varieties have been raised in Queensland—*L. Matthewsii* and *L. Earesiana;* the colours of both are lilac, but *Matthewsii* is the darker shade. The heads of bloom of both varieties attained a length of about 24 in., and the individual flowers are a couple of inches across. The plant may be grown in any small garden, and the size may be kept at the will of the gardener. Specimens growing in Brisbane range from a few feet high to 20 ft.

The plant stands severe trimming; in fact, it stands the knife so well that it can be grown almost any height by being cut back in July every year, like a grape vine. One of the finest specimens of *L. Matthewsii* can be seen growing on the river

side of the Customs House garden. Plants are easily raised from cuttings taken from the previous year's wood and planted during July and August. Also plants well established may be purchased at any of the nurserymen's stores.

Gardenias.—In the earlier days of Brisbane there were few gardens without a gardenia; now they are rarely seen. *G. Thumbergii* is one of the varieties that should be grown. The flowers are pure white, exquisitely scented, and the foliage of all the varieties are a glossy green. These plants are not too fond of pruning, and should be allowed to grow in their own way. *Gardenia florida* is mostly grown for florists' use, the flowers being perfect in form and not having the heavy perfume of the other varieties. All the gardenia family are subject to scale diseases, but are easily kept clean by occasional sprayings with boiler water that has plenty of soap in solution. The plants never attain any size, so are very useful in small gardens.

Oleander.—In the northern part of the State these plants flourish, and are much admired by visitors from the Southern States and overseas.

The plants attain a fair size if not kept within bounds. In some of our northern towns it is quite common to see plants 20 to 30 ft. high, and of many colours. The plants are grown in Brisbane, but by a few only; yet they grow just as well here as in the North. The smaller growing varieties should be more extensively grown, and the pink "Carnea," white "Madonna," and carmine "Delphine" are all good old varieties.

When growing the plants in small gardens it is necessary from their earliest stages of growth to keep them well headed back, the young wood of the previous year being the flowering wood.

Lantana.—The small varieties of lantana are not in common with the pest scattered all over Queensland, and are very beautiful when trained as hedges or shrubs. The tangerine-coloured variety and the canary-yellow variety are the two usually grown in Southern Queensland. Splendid specimens of these are growing in the Botanic and Museum gardens. The plants flower for nine months of the year, and will grow in almost any soil and will stand fairly hard conditions.

TRANSPLANTING FRUIT TREES.

The transplanting of partially developed fruit trees is seldom attempted on account of the risk of failure and the trouble entailed in endeavouring to retain sufficient fibrous roots to ensure a reasonable prospect of success. Trees up to five or six years old, where subject to the necessary preliminary treatment, can not only be removed without risk of failure, but transported satisfactorily over long distances. It will be recognised that the sustenance of the plant is absorbed by the small or fibrous roots in the immediate vicinity of their terminals, and by inducing a profusion of these within a short radius of the stem the chances of failure are practically nil. A profusion of small roots may be ensured by cutting through at the desired distance from the stem (15 to 24 inches, according to the size of the tree) all roots to a depth of 18 inches. In so doing a trench is made around the tree, and the ends of roots carefully pared if the cutting has not been "clean." The trench is then refilled with soil containing a good supply of humus, and in about three months' time the original root ends will have developed a good supply of fibres. At the time of removal these are not interfered with more than can be avoided, the necessary excavation for removing the tree from its original position and severance of any lower roots being made beyond the terminals of the young root growth. The head of a large tree should be materially shortened at the time of removal. The cutting of roots in the first instance should be performed when the tree is in a dormant state; in the case of citrus, conditions are generally favourable about March. Tropical varieties handled in this manner can be removed at almost any time after sufficient roots have formed and hardened, and may be first treated at any time of the year at the period known as "between growths."—GEO. WILLIAMS, Director of Fruit Culture.

FLOWER GARDEN.

All the roses should have been pruned some time ago, but do not forget to look over them occasionally, and encourage them in the way they should go by rubbing off any shoots which tend to grow towards the centre. Where there is a fine young shoot growing in the right direction, cut off the old parent branch which it will replace. If this work is done gradually, it will save a great deal of hacking and

sawing, when next pruning season arrives. Trim and repair the lawns. Plant out antirrhinums (snapdragons), pansies, hollyhocks, verbenas, petunias, &c. Sow zinnias, amaranthus, balsam, chrysanthemum, marigolds, cosmos, coxcombs, phloxes, sweet peas, lupins; and plant gladiolus, tuberroses, amaryllis, pancratium ismene, crinums, belladonna, lily, and other bulbs. In the case of dahlias, however, it will be better to place them in some warm, moist spot, where they will start gently and be ready to plant out in a month or two. It must be remembered that this is the driest of our months. During thirty-eight years the average number of rainy days in August was seven, and the mean average rainfall 2.63 in., and for September 2.07, increasing gradually to a rainfall of 7.69 in. in February.

KITCHEN GARDEN.

Nearly all spring and summer crops can now be planted. Here is a list of seeds and roots to be sown which will keep the market gardeners busy for some time: Carrots, parsnips, turnips, beet, lettuce, endive, salsify, radish, rhubarb, asparagus, Jerusalem artichoke, French beans, runner beans of all kinds, peas, parsley, tomato, egg-plant, sea-kale, cucumber, melon, pumpkin, globe artichokes. Set out any cabbage plants and kohl-rabi that are ready. Towards the end of the month plant out tomatoes, melons, cucumbers, &c., which have been raised under cover. Support peas by sticks or wire-netting. Pinch off the tops of broad beans as they come into flower to make the beans set. Plough or dig up old cauliflower and cabbage beds, and let them lie in the rough for a month before replanting, so that the soil may get the benefit of the sun and air. Top-dressing, where vegetables have been planted out with fine stable manure, has a most beneficial effect on their growth, as it furnishes a mulch as well as supplies of plant food.

THE CARE OF THE LAWN.

For a lawn to be a success it must be carefully made in the first place. Good drainage is essential, for stagnant water-logged soil encourages weeds and kills the grass. The soil should be rich in plant food. Give the ground a heavy dressing of good manure, and thoroughly dig it over. Enough time should then be allowed for the soil to settle, as it must be firm when the grass is planted or there will be a series of hills and hollows shortly after. In addition to the manure apply the following mixture at the rate of 3 oz. to the square yard, forking or raking it well into the top spit of the soil:—2 lb. superphosphate of lime, 1 lb. bonemeal, and 1 lb. sulphate of ammonia.

Early in the spring, as the grass begins to grow, a heavy roller should be passed several times over the ground.

Lawns showing bare patches will require a dressing during the autumn, and the mixture previously mentioned will be found very suitable, and will keep the grass well nourished. Wood ashes and soot, combined or not, will also be found beneficial. All dressings should be applied during showery weather. If soil poverty is the cause of a patchy lawn, it is best to rake over in the autumn with a sharp-toothed rake, and dress with a good layer of fine soil and wood ashes.

Farm Notes for August.

LAND which has been lying fallow in readiness for early spring sowing should now be receiving its final cultivation prior to seeding operations. Potato-planting will be in full swing this month, and in connection with this crop the prevention of fungoid diseases calls for special attention. Seed potatoes, if possible, should be selected from localities which are free from diseases; they should be well sprouted, and, if possible, should not exceed 2 oz. in weight. Seed potatoes of this size are more economical to use than those large enough to necessitate cutting. If, however, none but large-sized seed are procurable, the tubers should be cut so that at least two well-developed eyes are left. The cut surfaces require to be well dusted with slacked lime, or wood ashes, as soon as possible after cutting. Where it is necessary to take action to prevent possible infection by fungoid disease, the dipping of potatoes in a solution of 1 pint of 40 per cent. formalin to 15 gallons of water, and immersing for one hour, will be found effective. Bags intended for the subsequent conveyance of tubers to the paddock should also be treated and thoroughly dried. After dipping, spread out the potatoes and thoroughly dry them before rebagging. Where the tubers are cut, the dipping is, of course, carried out prior to cutting.

Arrowroot, yams, ginger, and sugar-cane may be planted this month in localities where all danger from frosts is over.

Maize may be sown as a catch crop, providing, of course, that sufficient soil moisture is available.

Sweet-potato cuttings may also be planted out towards the end of the month.

Weeds will now begin to assert themselves with the advent of warmer weather; consequently cultivators and harrows should be kept going to keep down weed growths in growing crops and on land lying fallow, as well as on that in course of preparation for such crops as sorghums, millets, or panicums, maize, and summer-growing crops generally.

Tobacco seed may be sown on previously burnt and well prepared seed-beds.

Orchard Notes for August.

THE COASTAL DISTRICTS.

THE bulk of citrus fruits, with the exception of late ripening varieties, will now have been marketed, and cultural operations, pruning, spraying, &c., should be receiving attention. Where trees show indication of impaired vigour, pruning should be heavy, both in respect of thinning and shortening branches. Where trees are vigorous and healthy a light thinning only will be necessary, except in the case of the Glen Retreat Mandarin, which in coastal lands is invariably disposed to produce a profusion of branches, with consequent over-production and weakening of the constitution of the tree in addition to the fruit being small and not of the best quality. Where white louse is present on the main stem (where it almost invariably makes its first appearance) or branches, spraying with lime sulphur solution in the proportion of one part of the concentrate to ten parts of water after the centre of the tree has been opened up by pruning will be found most beneficial.

In dealing with trees which show signs of failing, investigation should be made near the ground level for indications of collar rot, and in the North Coast district particularly, for the presence of the weevil root-borer which may attack the roots in the vicinity of the thin bases or at some feet distant. A very light application of paradichlor, buried a few inches under the soil in circles around the tree and the surface stamped firm, is considered efficacious in destroying the pest. The distance between the circles (shallow openings connected throughout) should not be more than 18 inches. It may be necessary to repeat the application at three to four weeks' intervals.

Spraying with Bordeaux mixture is desirable as it will, if properly applied, destroy the spores of various fungi later attacking both foliage and fruit.

Where for any reason healthy trees of vigorous constitution are unprofitable they should now be headed back—in fact, the whole of the top removed, leaving only a few selected "arms" of previous branches, all other branches being cut clean away at their base. Three or four main arms, whose length will vary from 2 to 4 feet according to the size of the tree, will form the future head of the tree, and from these numerous shoots will originate; these shoots in turn are reduced according to

circumstances, usually from two to five on each arm, and given fair attention they will be in a fit condition to receive selected buds from a prolific tree by next autumn. It is advisable when the shoots intended for budding have attained a length of about 6 inches to nip off their terminals for the purpose of stiffening their growth, otherwise they are liable to be blown off by winds. All branches or parts removed in pruning should be carefully collected and burned. Applications against pests and disease could hardly be satisfactory if the material for reinfestation is available throughout the orchard.

Working the land is essential, and disc implements give best results. Before ploughing it is advisable to apply the necessary fertilizer, not just around the trees beneath the branches, but over the whole orchard, the feeding roots mainly extending beyond the extremities of the branches. The depth to which ploughing should be effected will depend on the nature of the soil and its original preparation. Where the subsoil is of a permeable nature, or has been broken up in the first instance, ploughing could be much deeper than on land where due consideration had not been given to this practice. It will also be noted that among some of our light loams fertility is confined to a shallow depth, where it would be futile to persist in deep ploughing to force the roots into a subsoil from which they could derive but little sustenance. Following upon ploughing, the soil should be further treated until finely broken; the implement necessary will depend upon the constituency of the soil. Generally a good harrow will meet all requirements. On the completion of ploughing between rows an open furrow should not be left on the border or margin, but two or three furrows should be turned back to fill this and the whole then worked sufficiently to leave an even surface throughout the orchard. Except for the purpose of turning in fertilizer or green manure, a good type of disc cultivator can be substituted for the plough and will give at least an equal result.

The planting of trees may be continued and with the exception of custard apples (which should be left until the end of August) should be expedited. The attention of citrus growers should be confined mainly to good varieties like Jaffa and Siletta, with a lesser quantity of late Valencia. The preserving of orange juice will very materially assist in the absorption of our crop, and the fact that the trees develop much more rapidly in this State than in Southern producing regions is distinctly in our favour; also our fruit contains a much higher sugar content. This, however, is not to be accepted as an invitation to continue the practice of sending immature fruit to the Southern markets.

Grape vines should be pruned, and where cuttings for planting are required these should be selected, trimmed, and heeled in slightly damp soil. Canes intended for cuttings should not be allowed to lie about and dry out, but treated the day they are severed from the plant. Cuttings are frequently made of excessive length. Ten to twelve inches is a fair length, allowing for insertion in the soil to admit of the top bud with a short section of the internode to protrude. Growth is only desired from the upper or exposed bud.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELAND.

ALL pruning other than that applied to peaches and varieties which are late in coming into growth should be completed this month, and the planting of young trees, if not already done, should no longer be delayed. Early planting is preferred, the sooner after the fall of leaves the better. The time is opportune (when there is indication of the buds swelling) to work over (where the stock is reasonably vigorous) unprofitable trees. Strap grafting, as advised by the local field officers, is the most satisfactory method of top-working deciduous trees.

The pruning of vines should be postponed as long as circumstances permit, and these can only be gauged on actual observation as they are subject to much variation.

Late spraying against San José scale where present should be applied with an efficient oil emulsion before any growth appears. Each particular brand has its advocates. Where the scale is persistent a 2 per cent. solution of Volck may be applied subsequent to the appearance of foliage. Both of these sprays are efficacious against peach or other aphis at a much reduced strength. One per cent. has given satisfactory results. The usual winter working of the land is essential for the retention of moisture and aeration of the soil, but in shallow soils in which many orchards are planted deep working is most detrimental. The matter of seedling stocks for apples and the inferior plants frequently received from Southern nurseries prompts a query as to how many seeds have been stratified for spring planting, and if any effort is being made towards raising a local supply of nursery stock.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

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

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall	
	May.	No. of Years' Records.	May., 1933.	May., 1932.		May	No. of Years' Records.	May., 1933.	May., 1932.
North Coast.	In.		In.	In.	*South Coast*—continued—	In.		In.	In.
Atherton	2·10	32	2·05	6·65	Nambour	4·73	37	1·03	2·34
Cairns	4·49	51	4·59	11·76	Nanango	1·52	51	0·26	0·91
Cardwell	3·59	61	5·26	7·97	Rockhampton ..	1·66	62	0·47	3·15
Cooktown	2·87	57	0·95	3·68	Woodford	2·91	46	0·02	1·11
Herberton	1·64	47	3·47	4·97					
Ingham	3·56	41	6·32	10·97					
Innisfail	12·30	52	8·85	19·57	*Darling Downs.*				
Mossman Mill ..	3·79	20	4·17	10·53					
Townsville	1·31	62	0·48	2·25	Dalby	1·29	63	0·23	0·55
					Emu Vale	1·19	37	0·39	0·83
Central Coast.					Jimbour	1·19	45	0·32	0·73
					Miles	1·49	48	0·14	1·04
Ayr	1·15	46	0·61	3·04	Stanthorpe ..	1·87	60	1·17	1·12
Bowen	1·32	62	1·07	2·16	Toowoomba ..	2·19	61	0·71	1·12
Charters Towers ..	0·80	51	0·37	1·61	Warwick	1·56	68	0·42	0·85
Mackay	3·75	62	1·32	5·33					
Proserpine	4·32	30	4·58	6·95					
St. Lawrence ..	1·79	62	0·64	3·21	*Maranoa.*				
South Coast.					Roma	1·43	59	0·20	2·16
Biggenden	1·72	34	0·64	1·23					
Bundaberg	2·65	50	0·98	2·09					
Brisbane	2·78	82	0·55	1·66	*State Farms, &c.*				
Caboolture	2·87	46	0·00	1·23					
Childers	2·13	38	0·55	1·14	Bungeworgoral ..	0·94	19	0·10	2·44
Crohamhurst ..	4·94	40	0·40	2·38	Gatton College ..	1·55	34	0·45	0·52
Esk	1·97	46	0·21	0·77	Gindie	0·93	34	..	1·32
Gayndah	1·56	62	0·25	1·11	Hermitage ..	1·24	27	0·34	0·66
Gympie	2·86	63	0·69	1·36	Kairi	1·96	19	2·82	4·85
Kilkivan	1·83	54	0·62	0·56	Mackay Sugar Experiment Station	3·28	36	1·72	4·52
Maryborough ..	3·05	61	0·95	1·17					

GEORGE E. BOND, Divisional Meteorologist.

TO NEW SUBSCRIBERS.

New subscribers to the Journal are asked to write their names legibly on their order forms. The best way is to print your surname and full christian names in block letters, so that there shall be no possibility of mistake.

When names are not written plainly it involves much tedious labour and loss of valuable time in checking electoral rolls, directories, and other references. This should be quite unnecessary.

Some new subscribers write their surname only, and this lack of thought leads often to confusion, especially when there are other subscribers of the same surname in the same district.

Everything possible is done to ensure delivery of the Journal, and new subscribers would help us greatly by observing the simple rule suggested, and thus reduce the risk of error in names and postal addresses to a minimum.

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.

	July. 1933.		August. 1933.		July. 1933.	Aug. 1933.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					MOONRISE.	
1	6·45	5·7	6·35	5·21	a.m. 11·38	p.m. 12·19
2	6·45	5·7	6·34	5·22	p.m. 12·10	1·18
3	6·45	5·7	6·33	5·22	12·47	2·24
4	6·45	5 7	6·33	5·23	1·33	3·33
5	6·45	5·7	6·32	5·24	2·31	4·43
6	6·45	5·7	6·32	5·24	3·35	5·52
7	6·45	5·8	6·31	5·25	4·46	7·8
8	6·45	5·8	6·31	5·26	5·58	8·0
9	6·45	5·9	6·30	5·26	7·5	9·2
10	6·44	5·9	6·29	5·26	8·13	9·56
11	6·44	5·10	6·28	5·27	9·17	10·53
12	6·44	5·11	6·27	5·27	10·14	11·52
13	6·44	5·11	6·26	5·28	11·11	..
14	6·43	5·12	6·25	5·28	..	a.m. 12·47
15	6·43	5·12	6·24	5·29	a.m. 12·8	1·40
16	6·43	5·13	6·23	5·29	1·4	2·34
17	6·42	5·13	6·23	5·30	2·0	3·26
18	6·42	5·14	6·22	5·30	2·53	4·12
19	6·42	5·14	6·21	5·31	3·49	4·57
20	6·41	5·15	6·20	5·32	4·42	5·37
21	6·41	5·15	6·19	5·32	5·33	6·10
22	6·41	5·15	6·18	5·33	6·19	6·40
23	6·40	5·16	6·17	5·33	7·0	7·10
24	6·40	5·16	6·16	5·34	7·38	7·42
25	6·39	5·17	6·15	5·34	8·7	8·13
26	6·39	5·17	6·14	5·34	8·39	8·47
27	6·38	5·18	6·12	5·35	9·9	9·26
28	6·38	5·18	6·11	5·35	9·39	10·14
29	6·37	5·19	6·10	5·35	10·12	11·9
30	6·37	5·19	6·9	5·36	10·48	12·11
31	6·36	5·20	6·8	5·36	11·30	1·16

Phases of the Moon, Occultations, &c.

7 July	○	Full Moon	9 50 p.m.
14 ,,	☽	Last Quarter	10 23 p.m.
23 ,,	●	New Moon	2 3 a.m.
30 ,,	☾	First Quarter	2 43 p.m.

Perigee, 6th July, at 10·24 p.m.
Apogee, 19th July, at 9·20 a.m.

On 2nd July the Earth will be in Aphelion, 94,450,000 miles from the Sun, or 3,120,000 miles further away from it than on 3rd January.

Mercury will be at its greatest elongation 26 degrees east of the Sun on the 2nd, and will then remain above the horizon for nearly 2 hours after sunset.

Between 9 and 10 p.m. on the 9th Saturn will be occulted by the Moon. Observers should look out at an early hour for Saturn on the eastern side of the Moon, which two days after being full will make Saturn less conspicuous.

The Moon will be passing Uranus soon after midday on the 15th when Uranus is 5 degrees to the southward.

On the 25th Venus and the Moon, only 2 degrees apart, will rise soon after 8 a.m., but too near the Sun to be visible.

The Moon will be passing 2 degrees south of Neptune at 7 a.m. on the 26th.

On the 27th at 8 a.m. the Moon will be passing 4 degrees southward of Jupiter. The Moon will not rise till after 9 a.m., but it will be interesting to look for Jupiter and the young Moon.

Mercury will be at inferior conjunction with the Sun on the 30th, its distance from the Earth being 55,953,000 miles.

Mercury sets at 7.4 p.m. on the 1st and at 6·53 p.m. on the 15th.

Venus sets at 6·30 p.m. on the 1st and at 6.54 p.m. on the 15th.

Mars rises at 11·7 a.m. and sets at 11·7 p.m. on the 1st; on the 15th it rises at 10·33 a.m. and sets at 10.46 p.m.

Jupiter rises at 10.44 a.m. and sets at 10.20 p.m. on the 1st; on the 15th it rises at 9.55 a.m. and sets at 9.34 p.m.

Saturn rises at 7.51 p.m. and sets at 9.11 a.m. on the 1st; on the 15th it rises at 6.53 p.m. and sets at 8.12 a.m.

The Southern Cross will be erect on the southern meridian (position XII. about 6 p.m. on 1st July, and about 4 p.m. at the end of the month if the observer is near the 150th meridian.

6 Aug.	○	Full Moon	5 31 a.m.
13 ,,	☽	Last Quarter	1 49 p.m.
21 ,,	●	New Moon	3 47 p.m.
28 ,,	☾	First Quarter	8 13 p.m.

Perigee, 4th Aug., at 2.36 a.m.
Apogee, 16th Aug., at 12.48 a.m.
Perigee, 31st Aug., at 3.30 p.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.