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QUEENSLAND AGRICULTURAL JOURNAL.

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QUEENSLAND AGRICULTURAL JOURNAL

VOL. XXXIII. 1 JANUARY, 1930. PART 1.

Event and Comment.

Service—A Thought for the New Year.

ACKNOWLEDGING the welcome received by him at a recent Rotarian gathering in Brisbane, His Excellency the Governor, Sir John Goodwin, remarked that in the course of the preceding ten days he had visited twelve or thirteen schools and, without realising it, had been preaching Rotarian doctrines. He had tried to impress upon the children that their work did not end with their life at school; their duty to the State then really only commenced. One word that must be borne in mind was the word "Service." That word expressed practically everything that was required in a State like this. A comparatively young country, it could not make progress without service from everyone. Every man and woman must be prepared to give of his best. It was simply splendid to see the amount of work that was done in the way of service. Everywhere he went he saw people giving up time and energy, and, where they could afford it, money. It was all service for the community. He could not tell how gratified and delighted he was to see it. There was nothing more contemptible than idleness, and there was no person more despicable than the man who lived for himself alone—who never gave a second's thought to service for the community or for his country. In travelling through Queensland one saw the Rotary movement flourishing in many places. There were many other organisations giving similar service, and inculcating into the minds of the people the best principles and the highest ideals. The Rotary Club, Toc H, Boy Scouts, Girl Guides, and many other organisations were doing splendid work. He always considered that, with such ideals in view, Queensland, a young country with tremendous resources, must have a happy and prosperous future.

Soil Surveys.

FROM an agricultural point of view, one of the most important measures considered in the course of the Parliamentary Session just closed was the Soil Survey Bill, introduced by the Minister of Agriculture and Stock, Hon. Harry F. Walker, and passed through all its stages. The new measure gives the right of entry by authorised persons on to private lands within the State for the purpose of carrying on soil surveys. Provision is also made for the payment of compensation in certain circumstances for any damage that may be sustained by the land owner in the course of any survey; probably this is a new departure, but it was considered advisable by the Government. The onus of proof of any damage rests, of course, with either the owner or the occupier. The Bill, which is regarded as long overdue, is necessary not only for the purpose of investigating matters relating to plant life in agricultural areas, but for the purposes of stock research, particularly in pastoral districts. It is of the greatest importance, for instance, that the fullest possible knowledge should be obtained of the chemical and other characteristics of our natural grasses and edible shrubs, if we are to make the most of and do the best for our live stock industries. Our soil research work to date has been very limited, but the work that has been done has already proved of immense economic value, especially in some sugar districts where certain soil deficiencies demonstrated by survey and analysis were subsequently corrected with very satisfactory crop results. The main purpose of the new legislation is to make an inventory of Queensland soils, and this will be most valuable to the new settler and the man already on the land.

Tobacco Land in the North.

SPEAKING on the second reading of the Soil Survey Bill, the Minister in charge of it, Mr. Walker, referring to valuable investigations already made in the sugar and cotton belts, said that quite recently many analyses of Northern soils had been made with a view to ascertaining their suitability for tobacco growing. From the data obtained it could be shown that tobacco could be grown in North Queensland equal to that produced in any other portion of the Commonwealth. Other facts revealed by an effective soil survey, which had been necessarily limited territorially, added Mr. Walker, went to strengthen the case for the extension of tobacco growing in Queensland and, incidentally, showed what great benefits will follow a systematic soil study throughout the State.

The Cotton Industry.

PLANS for establishing the cotton industry more firmly in Queensland were announced by the Minister, Mr. Harry F. Walker, recently, and these include the active encouragement of the establishment of cotton manufactures within the State. In the course of his statement, Mr. Walker said that it was noteworthy that if the cotton manufacturing industries throughout the Commonwealth were developed to an extent comparable with Canada, and having regard to the difference in population, we would be growing and manufacturing in Australia close upon 200,000 bales of cotton, worth £10,000,000 per annum, whereas last year's production was 5,000 bales, worth only a few thousand pounds sterling. It was considered that a sixfold increase of production in Queensland would be attainable within a short term of years on existing lands with a continuous progressive increase. The average yield per acre in Queensland was slightly in excess of the average yield per acre in the United States, while the quality of Queensland cotton was, on the average, at least 100 points above American middling.

When a commencement was made upon the establishment of the industry at the beginning of the decade just ended, it was thought that the industry would be engaged in only as a side line by mixed farmers on small acreages. While this might probably always be so to some extent, the experience of the past three years had led to the view that specialising in the production of cotton seemed to be more profitable to the farmer, and more economical in production cost than the engaging in it as a side line with other crops. The most successful cotton growers were those who had concentrated on the growing of cotton on large acreages.

With respect to marketing, the chief item of cost in Queensland has been that of ginning, which was at least double that ruling in America. Plans for the cheapening of ginning costs for Queensland growers had been formulated. The taking of action had been suspended, pending a determination by the Commonwealth authorities respecting the duties, and now that the Commonwealth policy had been announced the matter would be brought to a head. The question of the establishment of co-operative ginneries also was about to be considered, as well as other matters relating to the stabilisation and further development of cotton growing and manufacture within the State.

Committee of Direction of Fruit Marketing.

EMPHATIC endorsement of the principle of co-operative selling has been given by the fruitgrowers of Queensland. On being asked to decide by postal ballot whether the operation of the Fruit Marketing Organisation Act, and therefore of the Committee of Direction, should be continued for a further five years, they recorded an overwhelming affirmative vote. Expressing his satisfaction at the result, the Minister, Mr. Walker, said that organised marketing was the only system under which farmers could successfully compete in, or against, the commercial world. The actual figures were—For continuance, 3,240; against, 476; informal, 32; majority for continuance, 2,764. As only a simple majority was required to give effect to the proposal, the Act will continue in operation. Altogether 5,332 ballot-papers were issued to fruitgrowers all over the State, and 3,748 were returned. This constituted a 70 per cent. poll, of which 87 per cent. was in the affirmative.

Dairying—The Best Season for Years.

DISCUSSING conditions in the dairying industry, the Under Secretary, Mr. Graham, says in his Annual Report that it is pleasing to record that the dairying industry had the best season for years. In the dairying areas conditions were generally favourable for high production. Early spring rains ensured good pasturage until the beginning of the wet season in mid summer. With grass and fodder in ample supply there was no evidence of the usual decline of output in the autumn.

Butter production for the year reached the highest point yet recorded in Queensland, being nearly 5,000,000 lb. above the record for the previous peak period. This gratifying position is due very largely to a general improvement in dairy practice and factory processes. The modernisation of manufacturing plants was also a factor in this advance.

The past year was remarkable for the number of new factories that were built to replace old and obsolete plants and to meet the rapidly expanding requirements of the industry. In the Upper Burnett dairying developed to such an extent in the newly settled territory that a factory had to be built to cope with the heavy cream output. In all these establishments modern manufacturing units have been installed.

In the State there are now fifty-two butter factories, seventy-three cheese factories, and one condensed milk factory in operation. These are supplied from 22,500 dairy farms, which include those supplying, wholly or partially, the domestic milk market. The capital invested in the industry in Queensland approximates £35,000,000. The value of the output for the period under review was approximately £7,600,000.

There is still room for improvement, however, in the quality of cream. The general use of motor transport has provided for regular and quicker cream deliveries; but it has also helped to increase competition among manufacturers who by this means are able to draw supplies from localities far beyond the limits of their natural territorial zones. This bidding for cream often tends to encourage laxity in methods of production and other forms of inefficiency which the Department seeks assiduously to correct. As stressed in previous reports, unregulated cream cartage is wasteful and generally unsatisfactory; an efficient transport organisation is an essential service to the modern butter factory.

Systematic instruction in the science and practice of dairying and regular inspection of dairies, which covered also the inculcation of hygienic principles when necessary, engaged the attention of the field staff in the course of the year.

There was a general improvement in manufacturing methods, and this cause for satisfaction is due largely to the employment of technically trained and qualified staffs. There are, however, some practices in regard to cream grading and some technical faults in manufacture that call for consideration and correction if we are to increase the quantity of best-quality butter and attain and maintain generally the highest standards of dairy production. The total quantity of butter manufactured for the year was 74,386,663 lb., which constitutes a record for the State.

The value of systematic herd testing is now recognised more widely, and it is satisfactory to report the cordial co-operation of an ever-increasing number of dairy farmers with officers of the Department.

It is also recognised more generally that the provision of fodder reserves and improvement of pastures are essential to increased and regular production. Too much dependence on natural grasses and herbage without any supplementary rations exposes the industry to undue seasonal risks, as well as to economic loss due to irregularity of supply.

Photo.: H. W. Mobsby, F.R.A.S.] PLATE I.

In the shade of Bartle Frere, the loftiest mountain in Queensland, nestles the flourishing town of Babinda, the centre of one of the richest regions on our far north coast, one of the most fertile provinces in the whole world. In the left centre is a beautiful bend of Babinda Creek, a tributary of the Russell River, bordered by well-tilled canefields, land that was formerly clothed luxuriantly in dense tropical jungle.

The Minister's New Year Message

To the Farmers of Queensland.

Department of Agriculture and Stock,
Brisbane, 31st December, 1929.

Optimism is an Australian characteristic, and why not! Though many new and perplexing problems confronted us during recent years, we have in a measure succeeded in settling some of them, while in respect to others of greater complexity we have advanced well along the road to their ultimate solution. With regard to many of them we have fortunately been able to erase old lines of cleavage, and to give of our best in healthy co-operation for the common good.

In respect of primary industry particularly, we are already bringing the advantages of scientific research to bear on questions of production, and are also applying them more widely in the field of distribution. Reduction of costs, the elimination of waste and the full utilisation of all our resources are regarded by most of us as essentials in the improvement of our economic life. We are coming to a better understanding of all these needs and, in the spirit of sweet reasonableness, we are rising above old and outworn distinctions. We are looking for the whole hearted co-operation of all concerned in doing the work of the country in all those things that call for vigorous and understanding effort along lines that will lead to social happiness and material prosperity.

Looking around on the world to-day and, notwithstanding all our present difficulties, which we do not discount and will not exaggerate, I know of no people more happily placed in a country more abundantly blessed.

At the beginning of another year and at the dawn of a new decade, with rapid and sound development in our primary industries; a corresponding expansion in our secondary enterprises and consequent extension of our home markets; and a deepening public appreciation of the call for social service we may look forward cheerfully and confidently to an early realisation of further benefits, added to those we now enjoy and which have given rise to the feeling of optimism that I have expressed.

I wish the producers of Queensland good seasons and good markets in the coming year and the years that are to follow; that prosperity will be brought to their homes and happiness to their families and that success will continue with them through a long and fruitful future.

Harry F. Walker

Secretary for Agriculture and Stock.

Bureau of Sugar Experiment Stations.

CANE PESTS AND DISEASES.

The following report (7th December, 1929) from Mr. W. A. MacDougall, Assistant to the Entomologist at Meringa, has been received by the Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby:—

Short trips were made to mill areas—Babinda (12th and 13th November); Tully (14th and 15th November); and Goondi (21st November).

The Beetle Borer (*Rhabdocnemis obscurus* Boisd.).

The infestation at Tully is negligible. The very little present could not be eradicated by Tachinid flies; it would not support the parasites.

As previously reported (17th October, 1929), the Goondi area is under systematic control. A further sixty flies were liberated in borer-infested Badila on river flats across the river from Goondi Mill.

It was pointed out that a borer infested banana plants also. The insects taken from the banana corms were the banana borer (*Cosmopolites sordida* Chev.), which species has never been found in cane sticks.

Trucks of cane in the Babinda mill yard were inspected for borer damage. About 10 per cent. of the cane in the yard, at the time of inspection, showed the presence of borer on the farms on which it had been cut. Unfortunately, it was found that these farms hadn't standover; therefore Tachinid flies cannot be liberated on them at present. During the past four years numerous liberations have been made on one farm in this area. In the localities close to the liberations the borer damage is comparatively lighter than that of a few years ago. In one block 300 yards from any liberations, 5-feet Badila sticks were found to have been completely riddled by borers. In some other instances the damage was at the top only or was confined to the lower 1 or 2 feet. Twenty of the heavily infested sticks were cut open and examined. An average of ten grubs and cocoons per stick was estimated. Of these one to two per stick had been killed by flies (an average of three puparia to an infested grub). The farmer in question plants, as far as possible, "clean" seed. To help the flies with such heavy work, traps of split cane should be spread, particularly during March and April. These traps, placed amongst the seedlings at the Experiment Station, South Johnstone, have been the means of catching hundreds of adult borers.

Emergence of Beetles (*L. caudata* Blkb.).

At Babinda, 89 points of rain fell during the last week in August. This liberated *Lepidiota caudata* Blkb. There were a few strays about during the last few days of August, but the big flight was during the first week of September. From reports, the adult habits seem to be similar to those of adults of *L. frenchi* Blkb. The last of these beetles (*L. caudata* Blkb.) was seen on 8th October.

At Tully, near swampy land, there were numerous *Anoplognathus smaragdina* Ohaus, resting on *Acacia* sp. The grubs of this beetle have never been recorded as attacking cane.

At Goondi, small patches of Pompey and Badila have been checked by grubs of *Anoplognathus boisduvali* Boisd. (Christmas Beetle). The damage was not extensive, and probably the existing weather conditions were responsible for the showing up of damage which, under more moist conditions, would not have been noticeable. Again, under normal conditions, it is very probable that these grubs would not attack cane at all. After over an inch of rain the "greybacks" were flying in Goondi area on the 19th instant. Previous to this numerous "strays" had been picked up dead.

Army Worms and Moth Borers.

As usual there were outbreaks of army worms at Harvey's Creek and Bartle Frere. The damaged cane has recovered. The spraying, with lead arsenate, of the cane immediately in front of an advance of these caterpillars on a farm at Tully was successful in its purpose. The advance was checked.

On examination of the few "dead-hearts" found around Mirriwinni it was found that the moths had emerged.

At Tully, some "dirty," flooded H.Q. 426 was found to be badly infested by the large moth borer (*Phragmatiphila truncata* Walk.). The cane was anything up to 3 feet long, but had been attacked anywhere along its length. Plants could not be cut from it as it would be practically impossible to get them "clean."

Minor Pests.

One patch of young cane, at Tully, was being attacked by nymphs of a grasshopper (unidentified). These nymphs attacked "blady" grass also. A species of bag-moth (*psychidæ*) and an *Atractomorpha* sp. were noticed feeding on cane leaves. At Mirriwinni, *Aphidæ* (plant lice) were plentiful, and occasionally every leaf of a young plant would be infested.

Along the headlands or in the nearby scrub, the following insects, amongst others, were taken:—*Amenia imperialis* R.D. (Dexiid fly), *Aesernia australica* Jac. (leaf-eating beetle), *Theogonis australis* Fabr. (Coreid bug), and a series of *Stephanitis queenslandensis* Hacker (Tingitidæ).

Thanks are due to the field officers at Goondi and Tully mills for help given and information supplied.

ENTOMOLOGIST'S ADVICE TO CANEGROWERS.

Apparatus for Fumigating Cane Grubs.

During the last twelve months a decided advance has been made in the construction of mechanical apparatus for treating grub-infested cane land. The importance of such mode of application was first stressed by the present writer in the year 1924, when several attempts were made to induce the firm of Massey-Harris to build a suitable machine, or adapt one of their corn-planters for such useful work (see Bull. No. 19 of this Office, pp. 19, 20).

A few years later (1926) I discussed this matter with Messrs. Gelling Brothers, of Cairns, and persuaded them to undertake the construction; with the result that they have just succeeded in completing a machine for injecting liquid fumigants, which will, I understand, be used this coming season by some of our canegrowers.

There is still room for some farmer of an inventive turn of mind to hit upon some simple method of applying dry paradichlor. to grub-infested cane land; either by constructing a machine for burying uniform doses of this fumigant alongside the cane rows, or by adapting some fertilising machine for such purpose. It is probable that during the coming season two machines, at least, for applying liquid injections will be tried out in our canefields.

Examine the Soil for Grubs of Greyback Cockchafer.

In localities where a few inches of rain chanced to fall early in November, grubs of this pest will be found to be in the first instar or condition of development. This stage, which covers the time from hatching of the eggs to the first moult or change of skin, lasts from four to five weeks, and may be at once distinguished by a glance at the head, which never exceeds one-eighth of an inch in width.

This simple character, together with the presence on the middle of the lower surface of the last body segment of the grub, of two parallel rows of tiny bristles (easily seen with a pocket lens), indicates that the grub in question is that of our common "greyback" cockchafer.

Farmers Take Notice.

Growers seeking advice or applying for the liberation of tachinid parasites to be made amongst borer-infested cane, are asked to forward at the same time a sample of the insect believed to be causing the damage.

Moth-borer injury is frequently mistaken for that brought about by the "weevil borer" (*Rhabdocnemis obscurus* Boisd.) since both of these insects are found tunnelling in cane sticks. No less than six different insects attack shoots of young ratoon and plant cane, all of which are responsible for damage of very similar appearance—viz., death of the central or heart-leaves, known commonly as "dead-hearts."

When uncertain as to the name or habits of any insect discovered to be injuring cane (whether the roots, sticks, or leaves) the specimen should be dropped into a small bottle containing methylated spirits and water (half and half), and posted at once to the Entomologist at Meringa Experiment Station for identification and advice.

THE QUEENSLAND SUGAR INDUSTRY.

By H. T. EASTERBY, Director, Bureau of Sugar Experiment Stations.

IN the following series of articles it is proposed to revise and bring up to date a Bulletin on the Sugar Industry, prepared by the writer some years ago. During the period that has elapsed the industry has developed to such a degree and the conditions have so altered that such a revision appears necessary. At the same time, it is recognised that the problem of the sugar industry in Queensland, which supplies some 96 per cent. of Australian-grown sugar, is so many-sided and is governed by so many factors, that it forms in itself a complicated study of no mean magnitude, and one which it is impossible to deal with completely in much less than a large volume. The industry has also during late years been closely bound up with politics, both Federal and State.

It is proposed to divide the subject under several heads, each of which will be dealt with as briefly as possible. These will include—

PART I.

(*a*) Short history of the Queensland sugar industry prior to federation.

(*b*) Review of the industry since federation.

(*c*) Scientific work, varieties of cane, cultivation, soils, pests, milling work.

(*d*) Comparison with other countries.

(*e*) Labour and wages.

(*f*) Health in the tropics.

(*g*) Utilisation of by-products.

(*h*) Present-day problems. Foreign settlement.

(*i*) National importance of the industry and need for protection.

(*j*) Expansion of the industry.

(a) Short History of the Industry Prior to Federation.

The cane-sugar industry in Queensland, like many others, commenced on an insignificant scale early in the history of the then colony.

It was stated in a report on the sugar industry made in 1880 by Mr. Henry Ling Roth, to whom I am indebted for many of the following details, that as far back as 1823 Mr. Thomas Scott, under the patronage of Sir Thomas Brisbane, succeeded in growing sugar-cane at Port Macquarie, in New South Wales, and manufacturing 70 tons of sugar. Mr. Scott worked hard, both practically and by ventilation of the subject in local newspapers, to prove that sugar could be manufactured in that colony. In 1849, proposals were made for the formation of a sugar company in South Brisbane, and there is said to have been a small plantation at Eagle Farm, on the Brisbane River, but apparently no sugar was made. Sugar-cane was cultivated in the gardens of several people in Brisbane about this time, and a considerable amount was also grown in the Government Botanic Gardens, for it has been stated that a patch of land was devoted to its cultivation; and here apparently the first definite effort was made to manufacture sugar in Queensland. This occurred at any rate some years before 1860; and if one may accept the evidence given by Mr. George Edmondstone, M.L.A., before a Select

Committee of the Legislative Assembly, the attempt was made by Thomas Bowden, "who was introduced by Dr. Lang for the purpose of commencing sugar-cane growing and manufacture of sugar, but he was not successful in the manufacture."

The first sugar produced in Queensland, according to Mr. Walter Hill, at one time in charge of the Botanic Gardens, Brisbane, was made as follows:—Sugar-cane was taken from the Botanic Gardens in December, 1859, and passed between two steel rollers. The juice was taken to Mr. Brooks's biscuit factory in Queen street, and about 6 lb. of sugar was made in a copper vessel. Others say this sugar was made at Mr. Fowles's bakery, next the Australian Hotel, in Queen street. In 1861, sugar-cane was exhibited at the first Queensland Exhibition, also a good quality of rum manufactured from same. The first sugar made in Queensland, however, of which there is any official record, was manufactured by Mr. John Buhot in 1862, and a committee consisting of Messrs. S. W. Griffith, Moreton, Buzacott, and Macrossan was subsequently appointed to inquire into certain claims made by Mr. Buhot. Its report was published in 1874; and from the report and the proceedings of the committee we get at any rate something definite. The committee found—

(*a*) That Mr. Buhot was the first person who actually made granulated sugar in Queensland from sugar-cane grown in the colony.

(*b*) That before 1862 (when Buhot succeeded in making such sugar) many persons had contemplated the possibility of growing sugar-cane to profit in the colony, but it was not ascertained whether sugar could actually be produced from such cane; and a recommendation was made that a free grant of 500 acres of land be made to Mr. Buhot as a reward.

In 1863, Captain Louis Hope had 20 acres under cane on Ormiston plantation, near Brisbane, and that gentleman is generally conceded to be the father of the Queensland industry. In recognition of his services to the State in that respect an Act in the Queensland Parliament was passed in which it was stated—"Whereas it is just and expedient that the important services of the Honourable Louis Hope in his endeavours to establish the production of sugar should be recognised . . . ." and then proceeded to authorise the Hon. Louis Hope "to select in one or two portions, the whole not exceeding 2,560 acres of land . . . . within 30 miles of the coast . . . . and to obtain a grant in fee simple of such land."

In 1863 the London Society of Arts offered a medal for the first ton of sugar made in the colony. The first sugar-cane plants were most probably imported from Java and Mauritius, and about this time the Queensland Acclimatisation Society took active steps in bringing over a large number of varieties. A tremendous impetus was given to the industry when land was made available for some years by the Government on remarkably easy terms for sugar growing, and in 1865 as much as 1,829 acres had been taken up. Shipments of cane plants were this year made to New South Wales farmers. Many people embarked on sugar-growing, who had no knowledge of the subject, but possessed a vague confidence that it would come out all right, and some even commenced planting cane on the Darling Downs in the most unlikely localities.

The early stages of the industry were almost entirely devoted to the production of cane and the extension of land under cultivation. In 1866 so great was the demand for plants that there was actually a scarcity of cane for planting.

By the end of 1867 there were nearly 2,000 acres under cane, and six mills had been erected which between them manufactured 168 tons of sugar. There was. however, an insufficiency of mills, which caused heavy losses to the famers, but it is stated that millowners did well, as they could buy cane for 4s. a ton.

However, by 1870 there was twenty-eight mills in operation and a number of others in course of erection. The principal cane districts were then the Albert and Logan, the Moreton Bay area, the Mary and Wide Bay, but the cultivation of cane now began to spread to Bundaberg, Mackay, the Herbert and Johnstone Rivers, and Cairns. It is in these places to-day that almost the entire output is manufactured, the extreme southern districts making very little.

The Hon. T. H. Fitzgerald and John Spiller are credited with having planted the first cane in Mackay, and the first mill in that district (Alexandra) was erected by Fitzgerald and Davidson in 1868. Shortly afterwards, the following mills were erected, viz.:—Pleystowe, Branscombe, Nebia, Dumbleton, Pioneer, Foulden, and Casada. According to statistics at the time there were 3,436 acres under cane in the Mackay district in 1872.

Sugar-growing continued to prosper, more land was brought under cultivation, and steam mills quickly superseded the antiquated cattle and horse power erections.

The following description of the work of an early sugar mill by Maior A. J. Boyd is interesting:—

> "In the early days of sugar-growing in Queensland there was no such thing as the modern sugar mill. One form of mill consisted of three upright rollers, about 2 ft. high and 15 or 18 in. in diameter. Some of these rollers were driven by four horses walking round a circular horse path and harnessed to each end of a beam to which one of the rollers was attached. The work was very heavy, and at least eight horses were required for relief. The "battery" consisted of two oblong pans into which the juice from the rollers was led. There it was clarified by liming on attaining a heat of about 140 deg. F. From these clarifiers the juice was led by pipes to two lower pans called subsiders. There the scum was removed by large perforated ladles, and then the juice went to the first pan (the green pan of the battery). There were four large square pans, and one circular one called 'the tache.' In the first four the juice was frequently skimmed while boiling, a roaring fire being maintained in the furnace beneath them. On arrival at the tache, the juice was bucketed into it, and it was boiled until it bubbled like porridge. At this stage a circular bucket with a valve at the bottom was lowered into the tache and conveyed the contents to the wooden coolers, where it was left to granulate. This process was repeated as fast as the tache was refilled from the pans. Should the sugar-boiler not be careful to note the appearance of the concentrated juice when boiling in the tache, the result would be that instead of granulating, in the coolers, a sticky slimy mass would be produced which went by the name of 'sling,' without any granulated sugar.

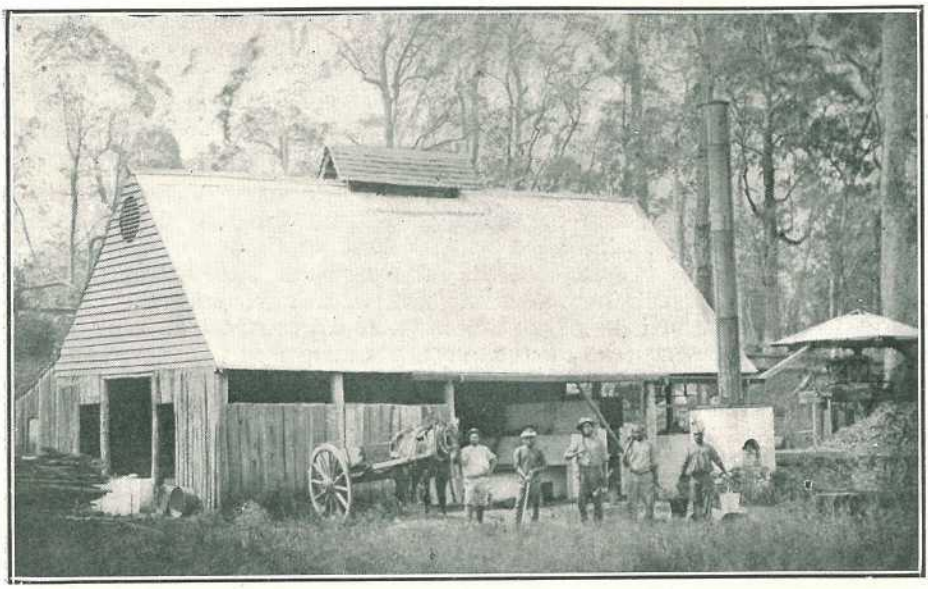

PLATE 2.

MAJOR A. J. BOYD'S SUGAR MILL AND BOILING HOUSE, "ORMEAU," PIMPAMA, 1869.

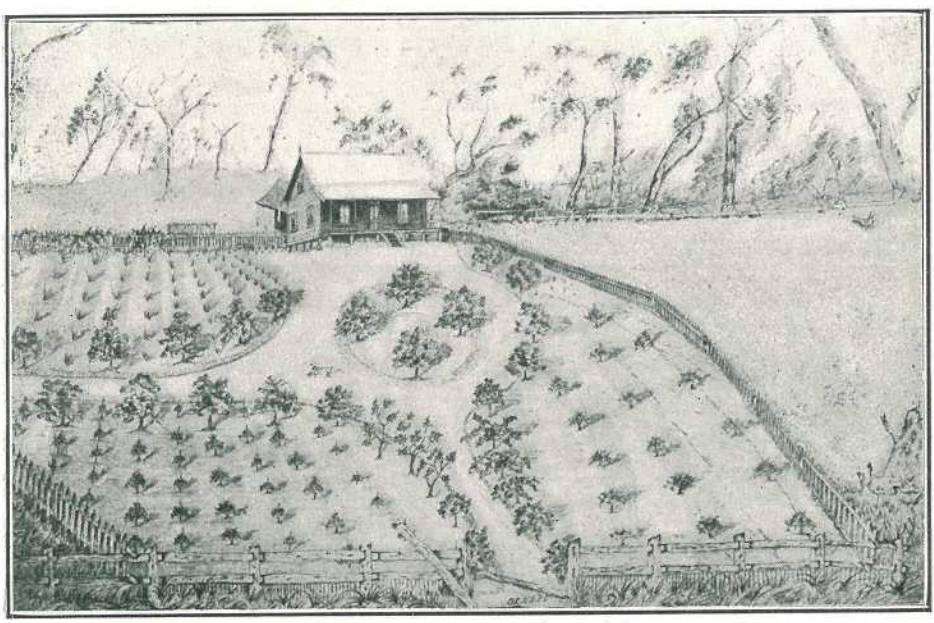

PLATE 3.

THE HOUSE AND GARDEN AND CANE NURSERY.

"To give an idea of the amount of work which such a mill would do daily, the writer, who erected one on his plantation, 'Ormeau,' Pimpama, about the year 1869, was well pleased if 1,800 gallons of juice were obtained from a day's crushing. The average was about 800 gallons, and it took about 20 tons of cane to make 1 ton of sugar.

"Some growers drained their sugar in wooden bins, the bottoms of which were perforated with numerous holes, into each one of which a stick of banana stalk was stuck. This was a terriby slow process, and the resulting sugar still held a certain amount of molasses, which in course of transit oozed through the mats in which the sugar was in those days marketed. One mill-owner, having read up the 'claying' of sugar in the West Indies, placed a layer of some kind of white clay on top of the sugar in the bins and freely watered it. To some extent, this watering washed away the molasses from the sugar, which then had a dull, gray appearance, but saleable at a slightly higher figure than the dark, brown 'Muscovado.' Later on centrifugals, Bauer-pans, and Wetzel pans were introduced, into which the steam passed through coils. Triple effets and vacuum pans had not then arrived. The cost of such a mill as I have described was about £200, and the crushing power was so weak that juice could be squeezed out of canes which had been passed through the rollers. And to conclude, how were the canes passed through? A man sat on the bedplate of the mill and fed the canes one by one. If three canes, or even two of extra thickness should attempt to pass together, the mill stopped. The number of hands required to work this primitive machine was a horse-driver, two cane carters, a sugar boiler, four men skimming the pans, one man at the final tache, one man working the crane, one fireman, one man at the subsiders, one man to feed the mill—a total of thirteen all told. When the centrifugals were installed in 1868 and an engine took the place of horses, two mechanics were needed."

It was soon ascertained that cane could only be cultivated profitably in areas that were at a small distance from the sea. "This distance differed in different localities, but 30 miles appeared to be the utmost limit, while the more tender canes seldom did well at a greater distance than 12 miles from the sea." It was also reported that frost was the most serious enemy which the canegrowers of Australia had yet encountered. During the winter of 1869 the cutting effects of frost laid low hundreds of acres of cane.

The industry at that period was almost entirely carried on by coloured labour introduced from the South Sea Islands. On 15th August, 1863, the "Don Juan" schooner arrived in Brisbane bringing about eighty Kanakas. This was the first recruiting vessel in the trade. As plantations increased this class of labour was brought over in larger numbers every year. In the absence of Government regulations, the traffic was greatly abused, and on 4th March, 1868, with, as it was said, nearly 1,000 Polynesians already in Queensland the first of several Acts passed by the Parliament of the colony dealing with this question received the Royal Assent. It was an Act intended to prevent abuses and to secure to the Polynesian labourers proper treatment and protection, as well as to secure to the employer the due fulfilment by the immigrant of his agreement.

Subsequent to 1868 in connection with the regulation of coloured labour, two Acts were passed by the Imperial Government between 1872 and 1875; eight by the Queensland Government from 1880 to 1913; and thirteen by the Commonwealth Government from 1901 to 1912.

The minimum rate of pay to Polynesian labour was about £6 per annum and food and clothing, the annual cost per head being about £27. The food allowed to Kanakas under the 1868 Act was bread or flour 1 lb., beef or mutton 1 lb. (or fish 2 lb.), 5 oz. of molasses or sugar, and 2 lb. of vegetables per day; 1½ oz. of tobacco, 2 oz. of salt, and 4 oz. of soap per week. The Kanakas generally arrived skinny and left in strong and healthy condition. When returned to their islands a good many came out again. There was considerable opposition, however, but an article in favour of black labour and its relation to Mackay stated that "were it not for sugar that town would in all probability consist of a couple of stores and a 'pub' or two, with a population of fifteen to twenty souls and the land in the hands of the squatters; but now, though small, it is one of the richest and most thriving towns in Queensland."

In 1875 a disease termed "rust" broke out in the cane. This, combined with an excessive rainfall, brought ruin to many sugar-growers. The financial institutions became alarmed, and refused to render further aid. Planters, however, were too energetic to let their estates go out of cultivation. The variety affected was known as the "Bourbon" cane, but it was noticed that small patches of "Rappoe" or "Rose Bamboo" were not touched. Those who survived the blow commenced the cultivation of this and other varieties, and confidence was soon restored, though many plantations changed hands.

Up to 1875 the varieties of cane grown were few, but subsequently large numbers were introduced. At this period it was stated that cane was bought by weight, and indeed it was so for a long time afterwards. The saccharometer was said to be used sometimes, but the polariscope was only known by hearsay. Vacuum pans were at that time coming into use in the mills, and the sugars were all centrifugalled in 1880.

During 1879 and 1880 a rush set in for Queensland sugar lands, and plenty of capital was made available. The production of sugar in 1870 and 1880 is given as follows:—1870—2,854 tons; 1880—15,681 tons.

At this period each Australian colony had its own tariff, and it would perhaps be of interest to record the rates in each State on sugar, molasses, rum, &c., as set out in Mr. Roth's report on the sugar industry, published in 1880. The tariffs are—

I. QUEENSLAND.

Import duty—

Refined sugar	6s. 8d. per cwt.
Raw sugar	5s. "
Molasses	3s. 4d. "
Rum	10s. per gall.

Excise—

Spirits distilled within the colony from sugar-cane, a duty of two-thirds of the duties which are payable upon spirits of a like description imported into the colony.

II. NEW SOUTH WALES.

Import duty—

Refined sugar	6s. 8d. per cwt.
Raw sugar	5s. "
Molasses	3s. 4d. "
Rum	10s. per gall.

Excise—

On spirits made or distilled within the colony from sugar which has paid Customs duty 9s. 5d. per gallon.

III. VICTORIA.

Import duty—

Candy sugar	2d. per lb.
Glucose	3s. per cwt.
Raw sugar	3s. „
Refined sugar	3s. „
Molasses	3s. „
Rum	10s. per gall.

IV. SOUTH AUSTRALIA.

Import duty—

Sugar	3s. per cwt.
Molasses and treacle	3s. „
Rum	10s. per gall.

V. WESTERN AUSTRALIA.

Import duty—

Sugar	3s. per cwt.
Molasses and treacle	3s. „
Rum	14s. per gall.

VI. TASMANIA.

Import duty—

Rum	12s. per gall.
Loaf and crushed sugar, net	1d. per lb.
Other sugars, net	6s. per cwt.
Molasses, net	3s. 6d. „

And so in proportion for all sugars or molasses for any greater or less quantity than 1 cwt., not being less than 28 lb.

The net price realised for sugar for the five years preceding 1880 was about £22 10s. per ton for raw sugar. Mills turning out good whites realised higher prices. Mr. Roth said the average was low, not merely on account of the quality of the sugars, but in consequence of many of the small men being pushed for funds they were obliged to sell whether the market suited them or not.

The following are the net returns given per ton of sugar for Alexandra Mill, Mackay:—

	£	s.	d.
1868	32	0	0
1869	31	14	0
1870	28	16	0
1871	25	19	9
1872	25	5	10
1873	24	0	0
1874	18	5	1
1875	22	16	1
1876	24	8	3
1877	21	4	9
1878	20	5	3

When Queensland began to export the balance of sugars manufactured above the amount consumed, the price fell to its value in the world's market. The largest return any mill had made up to 1880 was 33 per cent. on its capital.

The consumption of sugar in Queensland with a population of 210,510 in 1878 was given as 92·13 lb., and was higher than in any other State; the lowest being South Australia, 71·31 lb.

[TO BE CONTINUED.]

THE 1929 FIELD WHEAT CROP COMPETITION.

BY H. C. QUODLING, Director of Agriculture.

Although excellent rains fell in April throughout the wheat belt, the normal planting and growing season proved exceptionally dry, so much so that the initial arrangements made for the lodgment of entries and their confirmation at a later date could not be strictly adhered to. When good rains were experienced, however, in October the situation improved so rapidly that the Eastern Downs H. and A. Association, Warwick, made a special appeal and obtained a number of post entries, with the result that thirty-nine crops were judged in the Warwick and nine crops in the Toowoomba district respectively.

The competing crops gave indications generally of fairly high yields, these being obtained without recourse to fertilisers, the dominating factor in this respect being largely that of good preparatory cultivation, which undoubtedly enabled the crops to survive until the long-looked-for rains came just in time, as it proved, to ensure a bountiful harvest.

The practice of early planting once again demonstrated its value and enabled the wheat generally, not only to escape rust but to return also a higher yield. In the case of a few backward crops, however, soft and rapid plant growth, synchronising with exceptionally humid conditions, promoted the development of rust to such an extent that two entries were cancelled; otherwise the presence of the disease was not of a serious nature in the other competition crops, but cognisance had, of course, to be taken of it in allocating points.

PLATE 4.—"DUKE OF YORK" WHEAT, GROWN BY ZIESEMER BROS., BONGEEN, 1929.
Yield, 3,500 bags from 300 acres. The dark line near the skyline is the edge of an area of red-chaffed wheat.

Apropos of this particular competition, two classes of competitors were observed, the one who had made up his mind to compete before the season commenced; and the other who at the eleventh hour was out to assist his society in promoting a competition in the interests of the district. All credit is due to those who helped in this latter way, but the fact remains that too many points were lost for impure seed—for instance, the presence of barley, oats, &c.; also for ball and flying smut, and in a few cases for flag smut. Precautionary measures to meet these disabilities in the case of individual growers will naturally do much indirectly to ultimately improve the position of the industry. Obviously, also, the recent arrangement made between the Minister for Agriculture and the Wheat Board to have growing crops examined, with a view to obtaining grain as true to type as possible for use as seed next year after it is cleaned and graded, should be of some assistance to prospective competitors in future competitions. If the latter became a regular fixture much could be done by individuals to work up their own supplies of seed from ears selected in their own fields, or from pure stocks raised by the Department of Agriculture here, or as may be obtainable elsewhere. If, however, it is intended to import seed from the South, permission to do so should first be obtained from the Minister for Agriculture in Queensland so as to obviate the possible introduction of flag smut infected seed.

The standard of purity of crops in this State might reasonably be improved by confining the present or prospective Wheat Board premium for seed to those persons who enter for a crop competition, with the proviso that additional stocks of premium seed could be drawn, if required, from larger areas of land cropped with the same variety by each or any individual competitor.

FIELD WHEAT COMPETITION.

TOOWOOMBA DISTRICT.

Name and Address.	Variety.	Trueness to type and purity.	Freedom from disease.	Evenness of crop.	Condition.	Cleanliness.	Estimated Yield. Bushels per acre.	Total Points.
One point for each bushel up to 24 bushels, half a point for every additional bushel	..	20	30	20	10	20	..	..
*Zeisemer Bros., Bongeen	Duke of York ..	19·0	29·0	18·5	9·0	19·0	37·0	125·0
†G. J. Will, Kincora, Pittsworth	Duke of York ..	17·5	29·0	20·0	9·5	19·0	34·0	124·0
‡G. J. Will, Kincora, Pittsworth	Gluyas	18·0	29·0	18·5	9 0	18 5	36 0	123·0
C. Kreig, Brookstead	Duke of York ..	18·0	28·0	18·0	9·0	19·0	32·0	120·0
F. Flegler, junr., Irongate, Pittsworth ..	Clarendon	16·5	28·0	17·0	7·5	17·5	40·0	118·5
C. Kreig, Brookstead	Duke of York ..	18·0	27·0	17·5	8·0	18·5	33·0	117·5
H. C. M. Sharpe, Lavelle, Milmerran ..	Pusa	17·5	27·0	17·0	8·5	18·0	32·0	116·0
J. Flegler, junr., Irongate, Pittsworth ..	Currawa	16·5	27·5	17·0	8·0	17·5	34·0	115·5
Zeisemer Bros., Bongeen	Pusa	17·5	27·0	16·5	8·0	17·5	34·0	115·5

WARWICK DISTRICT.

*F. Armstrong, Headington Hill	Pusa	17·5	28·5	17·5	9·0	17·0	45·0	124·0
†P. Imhoff, junr., Elphinstone	Duke of York ..	19·0	28·0	18·0	9·0	18·0	36·0	122·0
‡E. T. Box, Junabee	Waratah	17·0	27·5	17·0	8·0	17·5	42·0	120·0
C. F. Gillespie, Junabee	Roma Red	18·5	28·0	18·0	8·5	18·0	33·0	119·5
Gillam and Vaughan, Spring Creek, Clifton	Pusa	16·5	26·5	18·0	8·5	18·0	40·0	119·5
Free Bros., Junabee	Waratah	12·0	28·5	18·5	9·0	18·0	42·0	119·0
S. L. Saal, Pilton	Pusa	17·0	26·5	16·5	8·5	17·5	42·0	119·0
N. Skoien, Pilton	Pusa	16·5	27·0	15·5	8·5	17·5	42·0	118·0
D. Conway, Swan Creek	Waratah	17·5	27·0	17·5	7·0	18·0	38·0	118·0
W. G. Skerman, junr., Willow Vale ..	Clarendon	15·0	27·5	18·5	9·0	17·5	37·0	118·0
Mrs. N. I. Skerman, Willow Vale ..	Clarendon	15·0	27·5	18·0	8·5	17·5	38·0	117·5
T. C. Fletcher, Tannymorel	Waratah	16·0	27·0	16·5	7·5	18·0	38·0	116·0
T. J. Martin, Hermitage	Duke of York ..	18·0	27·0	18·0	8·0	17·0	32·0	116·0
R. F. Kemp, Junabee	Pusa	16·5	28·0	16·0	8·5	17·5	35·0	116·0
J. McGovern, Headington Hill	Pusa	16·5	27·0	17·0	8·0	17·5	36·0	116·0

FIELD WHEAT COMPETITION—*continued.*

WARWICK DISTRICT—*continued.*

Name and Address.	Variety.	Trueness to type and purity.	Freedom from disease.	Evenness of crop.	Condition.	Cleanliness.	Estimated Yield. Bushels per acre.	Total Points.
One point for each bushel up to 24 bushels, half a point for every additional bushel	..	20	30	20	10	20	..	..
D. McVeigh, Junabee	Waratah	16·0	22·0	18·0	8·5	17·0	42·0	114·5
E. J. Walsh and W. Palmer, Maryvale ..	Pusa	17·0	26·0	15·5	7·5	17·5	38·0	114·5
J. Brownlie, senr., Junabee	Duke of York ..	15·5	27·0	17·5	7·5	17·5	32·0	113·0
W. Sprott, Pilton	Pusa	15·0	26·0	15·5	8·5	16·0	40·0	113·0
J. Hallman, Freestone	Pusa	16·0	26·0	16·5	7·5	17·0	34·0	112·0
Con Roche, Maryvale	Pusa	15·0	27·0	15·5	8·0	17·0	34·0	111·5
L. T. Gillespie, Pilton	Currawa	15·5	24·0	17·5	7·5	16·5	35·0	110·5
J. J. Kemp, Junabee	Waratah	17·0	22·0	16·0	8·0	16·5	38·0	110·5
E. G. S. Bell, Clifton	Currawa	14·0	25·0	17·0	7·5	16·0	38·0	110·5
Gordon White Killarney	Waratah	15·0	26·0	16·5	8·0	15·5	34·0	110·0
S. F. Turner, Sladevale	Pusa	17·5	27·0	16·0	6·5	16·5	28·0	10·95
J. J. Booth, Junabee	Clarendon	13·0	22·0	18·0	6·0	18·0	38·0	108·0
W. T. Crane, Elbow Valley, Warwick ..	Waratah	14·0	28·0	14·0	6·5	16·5	32·0	107·0
F. E. Gillespie, Swan Creek	Clarendon	17·0	23·0	16·0	5·0	17·0	34·0	107·0
E. McConville, Swan Creek	Pusa	14·5	25·0	17·5	7·0	17·5	27·0	107·0
D. R. Brownlie, Junabee	Clarendon	16·0	20·0	17·0	8·0	16·0	34·0	106·0
Carey Bros., Warwick	Waratah	14·0	25·0	16·5	7·0	14·5	34·0	106·0
T. A. Brownlie, Junabee	Waratah	15·0	23·0	16·5	7·0	16·0	30·0	104·5
W. Chandler, Ellinsthorpe	Pusa	12·0	27·0	16·0	5·5	12·0	39·0	104·0
Alex. Johnson, Swanfels	Clarendon	15·0	24·0	15·5	7·0	14·5	32·0	104·0
P. Conway, Willow Vale	Clarendon	13·5	18·0	17·0	5·0	17·0	38·0	101·5
P. C. Gillespie, Swan Creek	Pusa	14·0	20·0	16·0	5·0	18·0	32·0	101·0
G. H. Guard, Junabee	Clarendon	8·0	22·0	17·0	7·0	16·0	33·0	98·5
J. A. Christmas, Mount Sturt	Pusa	13·0	20·0	18·0	6·0	8·0	39·0	96·5

* First. † Second. ‡ Third.

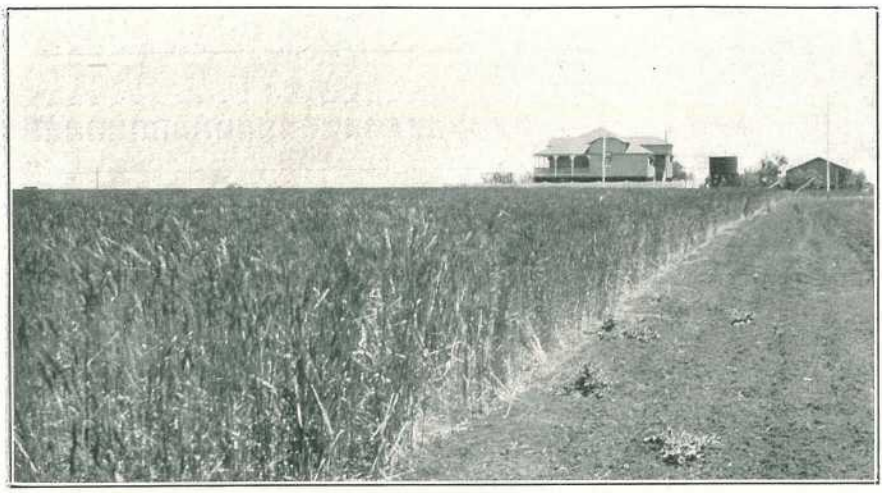

PLATE 5.

With this fine crop of "Duke of York" Messrs. Ziesemer Brothers, of Bongeen, Cecil Plains, were first in the Toowoomba District Competition (125 points) and in the Grand Championship.

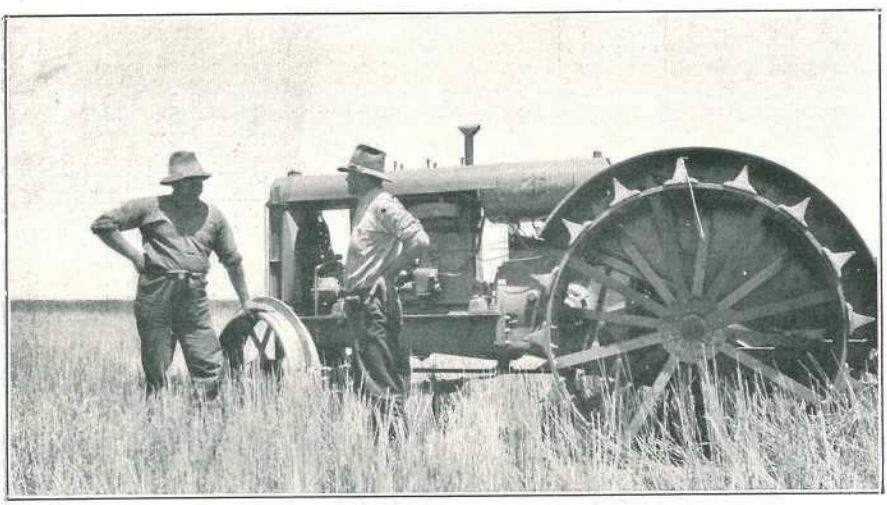

PLATE 6.—WINNERS OF THE GRAND CHAMPION PRIZE IN THE FIELD WHEAT COMPETITION, 1929.

Messrs. Ziesemer Brothers alongside one of their tractors on Bongeen, Cecil Plains.

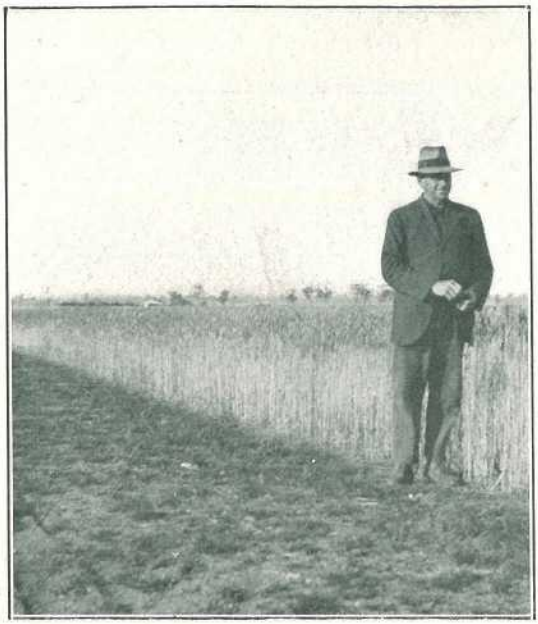

PLATE 7.—MR. G. J. WILL'S FIELD OF "DUKE OF YORK," KINCORA, PITTSWORTH.

Second, Toowoomba District Competition, and Second place with F. Armstrong in Grand Championship with 124 points. It was the only crop that gained full points (20) for evenness.

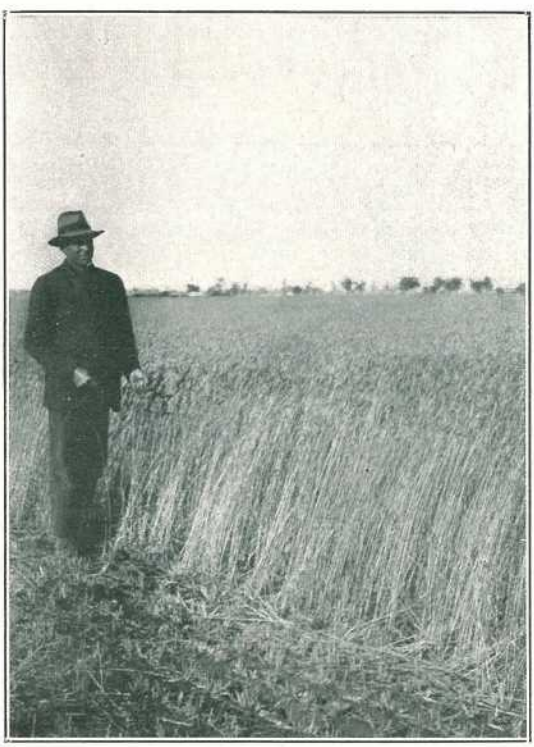

PLATE 8.—MR. G. J. WILL'S STAND OF "GLUYAS" AT KINCORA, PITTSWORTH.
Third in Toowoomba District Competition with 123 points.

PLATE 9.—MR. C. KREIG'S FINE CROP OF "DUKE OF YORK" AT BROOKSTEAD.

Mr. Kreig is a prominent member of the Wheat Board, a keen advocate of Wheat Crop Competitions as a stimulus to progress in farming.

PLATE 10.—J. FLEGLER, JUNR., AND HIS 1,500-ACRE CROP OF "CLARENDON" AT IRONGATE.

Mr. Flegler is one of the pioneer farmers in the Bongeen district who is cultivating a large area.

PLATE 11.—MR. H. C. M. SHARPE'S FIELD OF "PUSA" ON LOVELLE, MILMERRAN.
This farm is on Belah and Brigalow country, backed by a stand of virgin "scrub."

PLATE 12.

Another view of Messrs. Zeisemer Bros.' crop of "Pusa" on Bongeen, Cecil Plains. Last year 1,600 acres were under wheat, and 3,000 acres have been broken for this year's sowing.

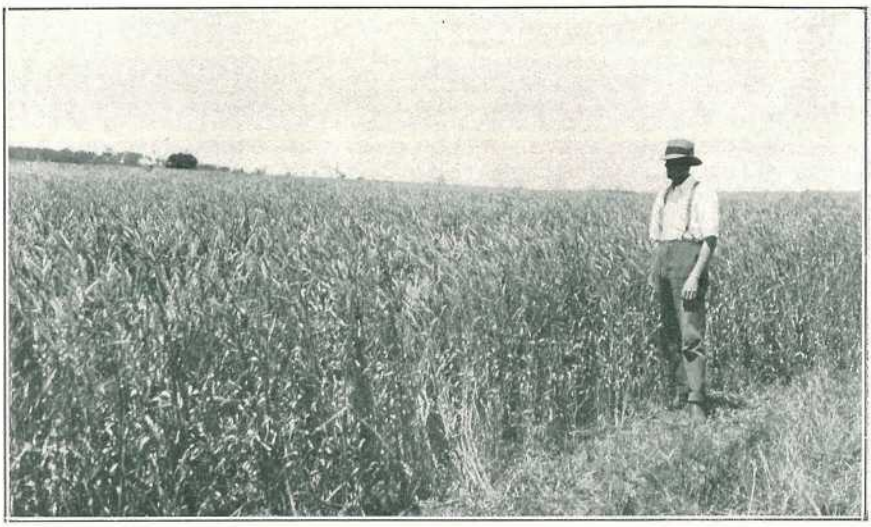

PLATE 13.—THE WINNING CROP. MR. F. ARMSTRONG'S FIELD OF "PUSA" AT PILTON.

First Prize Warwick District Competition (124 points) and Second with G. J. Will (Duke of York) in Grand Championship.

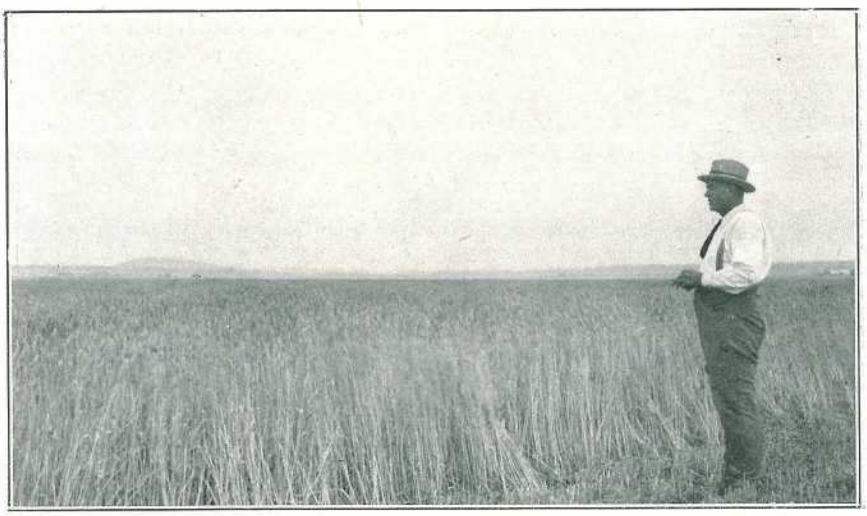

PLATE 14.—THE CROP—"DUKE OF YORK"—OF MR. P. IMHOFF, JUNR., AT ELPHINSTONE.

"Oh, I am the grass that has conquered man
I am the King that is Bread!
Your armies and fleets are but fragile things
That await a nod of my head."

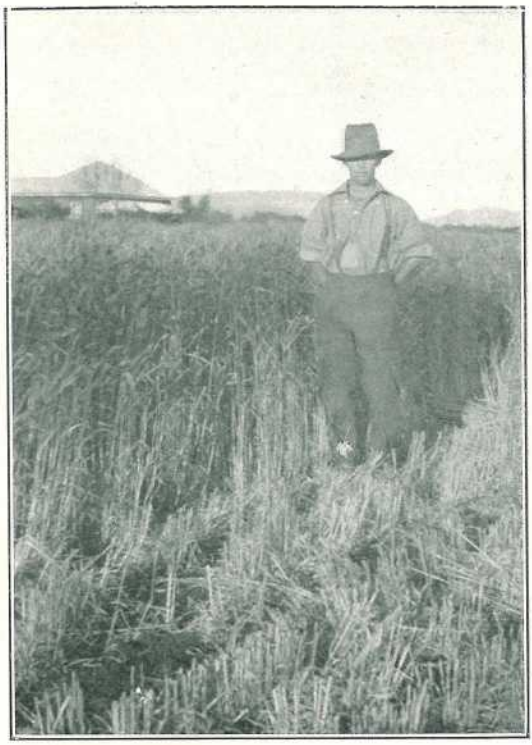

PLATE 15.—MR. E. T. BOX'S FIELD OF "WARATAH" WAS THIRD IN WARWICK DISTRICT COMPETITION WITH 120 POINTS.

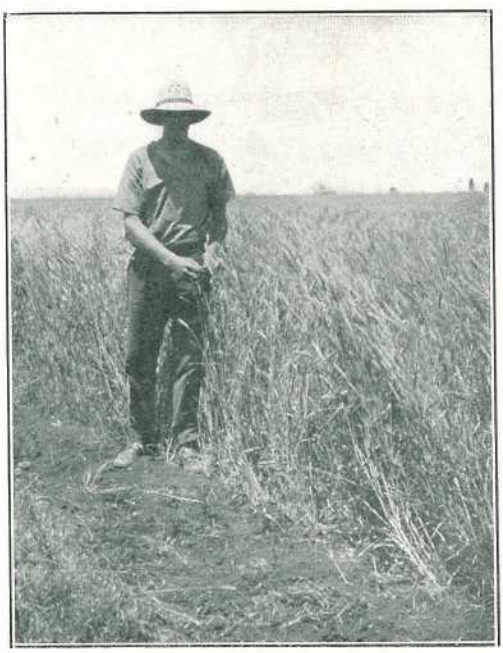

PLATE 16.—MR. D. R. BROWNLIE, OF JUNABEE, HAD A GREAT SHOW OF "CLARENDON." D. R. is a son of J. Brownlie, junr., a pioneer farmer in the Junabee District.

PLATE 17.

This crop of "Roma Red" on Mr. C. F. Gillespie's Junabee property, near Warwick, was remarkable for its trueness to type and purity.

PLATE 18.—"PUSA" WHEAT ON MR. S. L. SAAL'S FARM AT PILTON.

Mr. Charles Clydesdale, Assistant Instructor in Agriculture, who, in co-operation with Mr. R. Soutter, Manager of the Roma State Farm, and under the direction of Mr. H. C. Quodling (Director of Agriculture), has done much to contribute to the success of the wheat-growing competitions, is in the picture.

PLATE 19.—MR. N. SKOIEN'S EXCELLENT STAND OF "PUSA" AT PILTON.

PLATE 20.—MR. JAMES MCGOVERN'S PADDOCK OF "PUSA" AT HEADINTON HILL.
The bonny colleens, Misses Kathleen and Norah McGovern, typify very charmingly the spirit of young Australia.

PLATE 21.—ANOTHER FINE CROP WAS THAT OF MR. W. G. SKERMAN, JUNR., WILLOWVALE, WHO SPECIALISED IN "CLARENDON."

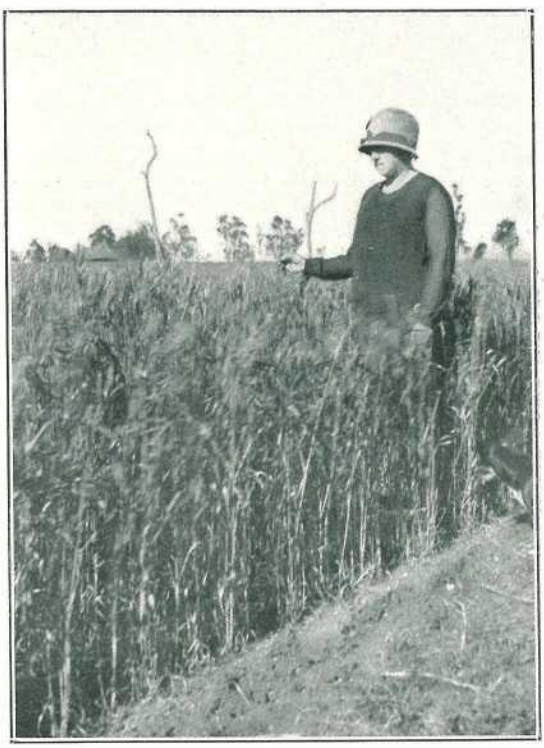

PLATE 22.—MR. D. MCVEIGH HAD AN EXCELLENT CROP OF "WARATAH" AT JUNABEE.

MRS. MCVEIGH, WHO IS ALSO KEENLY INTERESTED IN CROP COMPETITIONS, IS IN THE PICTURE.

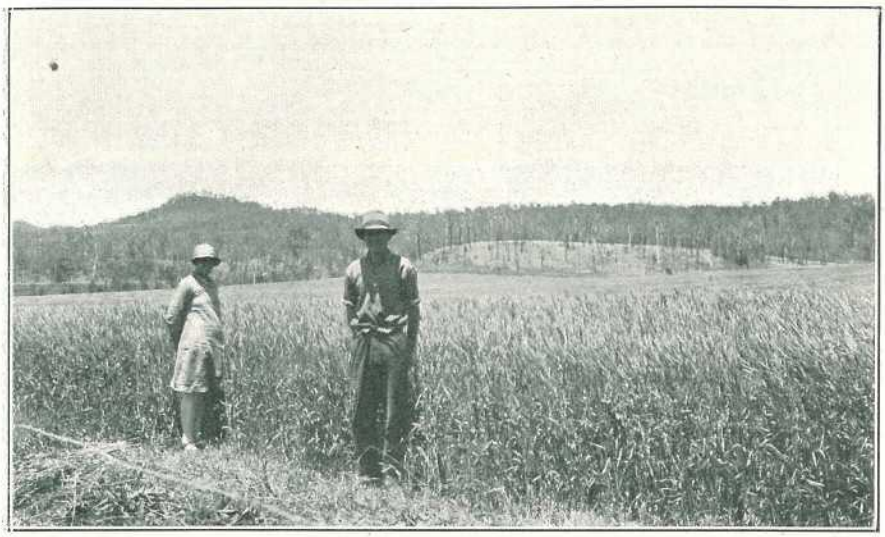

PLATE 23.—A FIELD OF "PUSA" ON THE PROPERTY OF MESSRS. E. J. WALSH AND W. PALMER, MARYVALE.

Mrs. Walsh, who is in the picture, is another keen agriculturist.

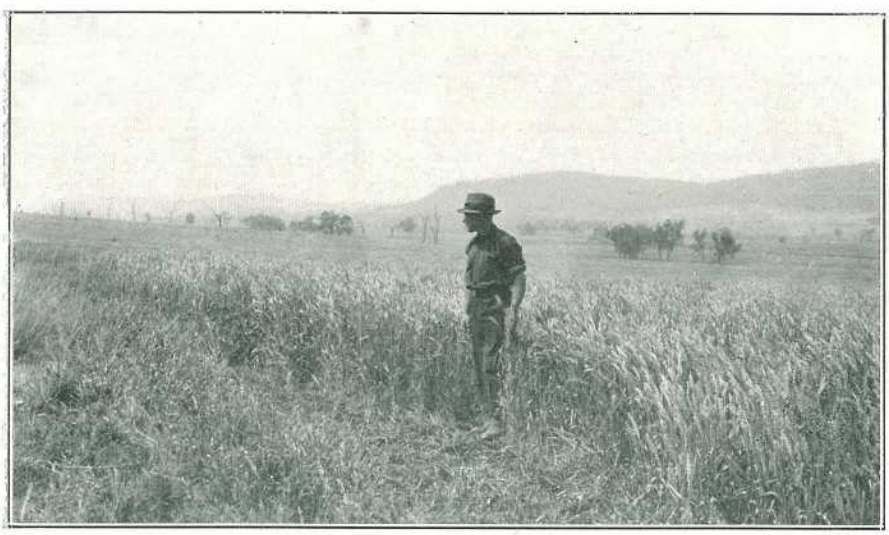

PLATE 24.—MR. W. SPROTT, OF PILTON, HAD A FINE CROP OF "PUSA."

A portion of Pilton Station is used for share farming. Mr. Sprott was the winner of a previous competition.

"I am a song that the need of man has sung
From the soil at his feet;
Food-giver, keeper and saviour of life,
I am the grain that is wheat."

PLATE 25.—MR. J. HALLINAN, OF FREESTONE, HAD A FINE CROP OF "PUSA."

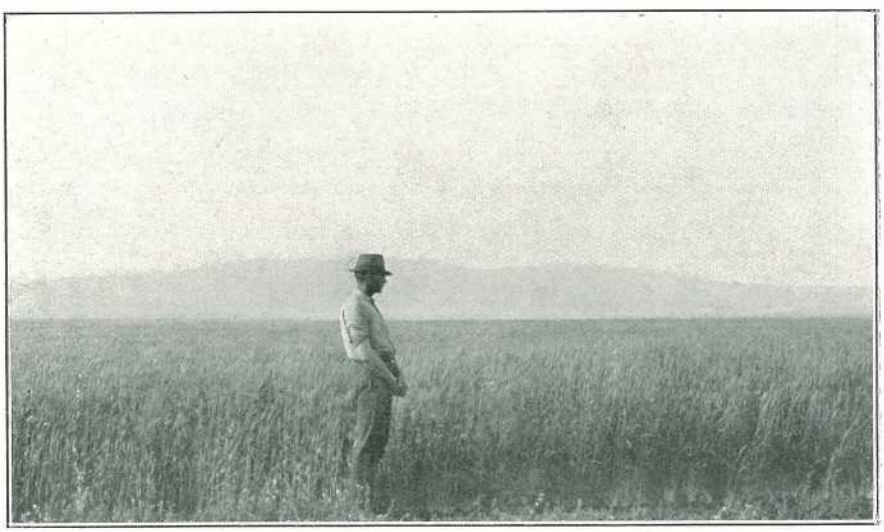

PLATE 26.—MESSRS. CAREY BROS.' FINE CROP OF "WARATAH" AT WARWICK.

"Over the face of your rolling hills, over your plains afar,
I have strung you a necklace of gold to wear whose fame is like a star."

PLATE 27.—"PUSA" WHEAT ON MR. W. CHANDLER'S PROPERTY, ELLINTHORPE, DARLING DOWNS.

There is some rich country on Talgai West, and the young farmer in the field is obviously proud of his share in raising the crop.

PLATE 28.—A FIELD OF "NOVO" ON MR. W. MCKENZIE ALLEN'S FARM AT EMU VALE.

This crop was non-competitive.

PLATE 29.—A FIELD OF "DUKE OF YORK" ON MR. J. T. MARTIN'S PROPERTY AT HERMITAGE.

To-day wheat-growing has become a highly specialised business on the Darling Downs, and progressive farmers in every district give close study to the details of agricultural practice that make for high yields.

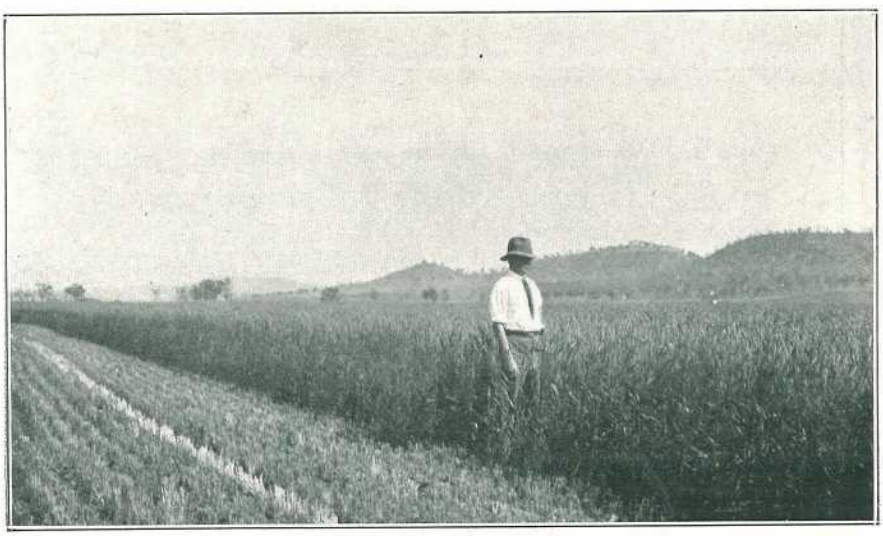

PLATE 30.—A NON-COMPETITIVE CROP OF "PUSA" GROWN ON MR. EVANS' FARM, PILTON.

PLATE 31.—REAPER THRESHERS AT WORK ON ZIESEMER BROS. FARM AT BONGEEN. 1,200 bags were taken off first round; three tractors and five harvesters were employed.

THE BOUNTIFUL SOUTH BURNETT.

The "South Burnett Times" has this to say of district progress:—Twenty-five years ago the South Burnett district was of no greater account than dozens of other similar localities in the State where the forest lands fattened a fair quota of Herefords and the scrub lands were looked upon merely as harbours for vermin and refuges for "scrubber" cattle. True that Nanango was then an old township as the administrative centre of the then pastoral district; but Kingaroy and Wondai were in swaddling clothes; Murgon's only architecture was an 8 by 10 galvanised iron railway station; and Goomeri comprised only the railway buildngs and trucking yards. What a metamorphoris has been effected in the interim—how the primeval wildernesses of scrub-clad wastes and far-flung little-improved cattle runs have been transformed into what may be confidently stated to be the most productive district in a rich State—is revealed in the "Report of the Registrar-General on Agricultural Production for the year 1928" recently to hand. In last issue it was commented that the maize production for 1928 of Nanango and Weinholt districts comprising the South Burnett, 1,129,502 bushels from 24,822 acres was easily first, Atherton with 901,642 bushels from 21,408 acres being next. But it is perhaps in the figures of the dairying industry that the productivity of the South Burnett is best displayed. The number of cows in milk in Weinholt-Nanango is shown as 58,284 (next Gympie, 38,906), dairying establishments 1,844 (Gympie 1,163), milk production 20,766,965 gallons (Gympie 12,511,288) and butter made 10,741,654 lb. (Gympie 8,025,578). Yet more remarkable, however, is the extent in which the South Burnett outstands in the pig industry. The number of pigs in Nanango-Weinholt is shown as 32,462, both of the subdistricts exceeding Gympie's 12,365, the next being Beaudesert with 9,401. In the matter of areas of artificially sown pastures (Rhodes grass, paspalum, &c.) Gympie's acreage of 102,436 exceeds the South Burnett total of 94,199, though the Registrar-General would probably find some difficulty in explaining why Nanango's total of 54,954 acres in 1927 should have dropped to 47,362 acres in 1928 although additional scrub areas had been felled and grassed. In area under cultivation South Burnett with 92,777 acres comes first, with Clifton 91,820 acres next. In the value of farm machinery and implements South Burnett's total of £419,980 is second only to Ayr with £673,910 (sugar production) though it is a big drop to the next, Mackay (also sugar) £333,672. In farming and dairying, 6,322 persons are employed in the South Burnett as against 4,808 in the next district (Gympie). In the number of poultry on farms South Burnett's total of 72,367 is second only to Brisbane's 75,428, the third highest figures being for Maroochy. The report does not disclose the South Burnett domination of the peanut industry of a gross annual value of upwards of six figures sterling, but the area under "other crops" in Nanango and Weinholt is shown at 9,126 acres, although 994 is the largest area under similar heading in any other district. The pre-eminence to which our district has attained in matters agricultural and pastoral is proof positive of the progressiveness and industry of its pioneers, but its potentialities are in no way exhausted, and further records will yet be achieved by our rich heritage.

A DISCUSSION ON CALCIUM AND PHOSPHORUS DEFICIENCY OF THE SOIL IN RELATION TO ANIMAL NUTRITION.

In December, 1928, a meeting was arranged by the Veterinary Association of South Australia, for the purpose of discussing some of the aspects of mineral deficiency of the soil in relation to animal nutrition.

Members of the Department of Agriculture, of the Waite Agricultural Research Institute, of the University of Adelaide, of the Nutrition Laboratory, Council for Scientific and Industrial Research, and of the Veterinary Association met together for the purpose of the discussion, which was opened by the reading of the following papers:—

1. *"Some Diseases of Stock in South Australia Considered to be Due to Mineral Deficiency." C. T. McKenna, B.V.Sc., M.R.C.V.S.*
2. *"Soil Deficiency in Calcium and Phosphorus." Professor J. A. Prescott, M.Sc. (Manc.).*
3. *"The Physiology of Phosphorus and Calcium in Animal Nutrition." Professor T. Brailsford Robertson, Ph.D., D.Sc.*

These papers were published in "The Journal of Agriculture of South Australia" for July, 1929, and through the courtesy of that Journal they are now reprinted for the benefit of our readers.

PAPER I.

SOME DISEASES OF STOCK IN SOUTH AUSTRALIA CONSIDERED TO BE DUE TO MINERAL DEFICIENCY.

Arranged and presented for the Veterinary Association by C. T. McKENNA, B.V.Sc., M.R.C.V.S., Veterinary Officer, Stock and Brands Department, Adelaide.

CALCIUM and phosphorus are necessary for the development of the skeleton of animals as well as for bodily functions. A deficient intake of these minerals places a limit on the full development of an animal; but, apart from this, there are definite diseases which result from an inadequate or an unbalanced intake. In many instances it is mainly a matter of the degree of the deficiency which determines the presence or absence of frank abnormality or disease.

It is in dairy cattle, and to a much less an extent in sheep and pigs that diseases of mineral deficiency have been principally observed. The horse in this State appears to be comparatively free from frank manifestations of such diseases. Cases of Pica have occurred, where licking of earth, gnawing of bark off trees, and eating of superphosphate have been observed. Only one case of bone-chewing has been recorded, and that occurred in an outbreak of Botulism in farm horses at Mannum. A condition usually known as Osteoporosis of the horse, which is common in Victoria, has not been observed in this State.

There are several diseases in dairy cattle which are recognised as being due either to deficient intake of phosphorus or calcium, or to disturbance of the metabolism of these minerals which may be associated with deficient intake either of the minerals or some other substance essential to their proper assimilation and use by the animal. These diseases are:—

1. Pica.

Pica or depraved appetite, which manifests itself in a desire to chew bones chiefly, and to a less extent, dirt, putrefying carcases, leather, &c. Badly affected cattle are usually in poor condition, unthrifty in appearance, move in a listless manner, and their milk supply is below normal. The best cows, i.e., the best milkers, are generally the worst cravers. It is considered that the eating or chewing of putrefying bones and flesh denotes a bad case of Pica, or in other words, a bad craver. Again, there is a seasonal incidence. The craving is acute during the dry time of the year, and tends to diminish or disappear when the flush of feed comes on. During periods of drought Pica is more common and more intense in its manifestations.

With the probable exception of certain small, rich areas of country like the Booborowie Flats and Reclaimed Murray River Lands, there are no parts of South Australia where we can say that Pica does not exist.

Some of the worst "Pica" areas of the State are:—

(*a*) Coastal area extending north of Adelaide to Port Wakefield.
(*b*) All newly opened mallee lands.
(*c*) Kangaroo Island.
(*d*) Coastal areas of the West Coast (Eyre Peninsula).
(*e*) Lake district (River Murray Mouth).

BOTULISM.

Pica is associated so closely with one disease which is common in cattle—I refer to Botulism—that that disease is worth mentioning here for two reasons:—

(*a*) It is an indication of the incidence and severity of bone-chewing in the State, and

(*b*) Many cases of so-called "Paralysis" in cattle associated with bone-chewing are met with, which are termed Botulism, but which may only be a form of nutritional disease.

Up to a few years ago Botulism was exceptionally prevalent in the mid-north areas of this State. At that time it was known as "Dry Bible." Orroroo, which was then a big dairying centre, was a particularly notorious area for losses from this disease. With the advent of phosphatic manures in wheat cultivation, the eradication of vermin, and the proper disposal of carcasses, much of this trouble has now ceased, though it is still comparatively common in this area.

Botulism in cattle in due to the absorption from the digestive canal of toxin produced by at least three types of Bacillus Botulinus. The toxin is formed in damaged food or in decaying animal tissues. When the disease is produced by the ingestion of decaying animal tissues, Pica is usually an essential link in its production. Botulism is usually fatal. The symptoms are briefly as follows:—(1) In-co-ordination of movement, which is first indicated by stiffness of gait. There is a general loss of muscle power, and later the animal goes down and is unable to rise. (2) There may be paralysis of powers of mastication and deglutition. (3) Obstinate constipation and unthriftiness.

2. Paralysis.

Under this heading are grouped various forms of paralysis which are met with all over the State. These cases are extremely common, and are met with under the most diverse conditions. It is possible that these diseases have a nutritional basis, but it is not certain. Some examples are:—(*a*) *Milk Fever* (Parturient Paresis).—Recent investigation of this disease has emphasised the fact that Tetany is the essential clinical manifestation, and the belief is expressed that the essential nature of this is a Parathyroid failure, with a resultant fall in blood calcium. (*b*) *Post Partum Paralysis.*—Cows in high condition are most frequently affected. They go down after a normal calving and cannot rise. The hindquarters appear to be paralysed. (*c*) *Anti Partum Paralysis.*—The symptoms are similar to the post partum type, but the disease usually occurs within the month prior to calving. (*d*) Another type of "Paralysis" has been reported from various parts of South Australia, and particularly, during the last two years, in dairy herds in the Salisbury district. A number of the herd go down suddenly and are unable to rise. They attempt to do so, but cannot use the hindquarters. Otherwise the affected animals appear normal. They are in different degrees of lactation, and cases have been recorded from March to September.

3. Stiffness.

Several types of so-called "stiffness" have been noted and recorded in cattle. Affected animals have an unthrifty appearance, and are poor milkers. They move in a slow, listless manner, and they take short, stilted steps. Many suffer from constipation. The condition is generally associated with bone-chewing, and marked improvement is obtained by the regular administration of bone-meal to affected cows.

4. Rickets.

Cases of this disease have been observed in young dairy stock, but it would appear to be a rare condition in this State.

DISEASES OF SHEEP.

The diseases of sheep which may be mentioned are as follows:—

1. Pica.

This affection is uncommon in sheep, and has only rarely been recorded. A case of bone-chewing is mentioned later.

2. Paralysis.

As in cattle, sheep show various forms of this condition. Examples are:—

(*a*) *Pregnancy Disease.*—It is very common on the wheat and sheep farms of the Mid-north, and also in those parts of the State where breeding ewes are kept on small areas of rich feed. Severe losses have occurred during last weeks (2-4 weeks usually) of pregnancy. They are commonly in high condition, and usually are carrying twin lambs. Signs of the malady are that ewe lags behind and separates from the rest of the flock. Nervousness, grinding of the teeth, and a high-stepping movement have been noticed. Some ewes apparently suffer from loss of sight, which appears to be of nervous origin. Twitching of muscles around nostrils and mouth has been noted. Later there is loss of control of hindquarters, and ewe goes down and is unable to rise, though attempts to do so are made. The post-mortem examination shows an abnormal condition of liver (fatty infiltration of a severe type). Although this disease probably has a nutritional basis, there is as yet no definite evidence that it is associated with a deficient mineral intake.

(*b*) This type of Paralysis can best be described by giving a description of two outbreaks:—

(1) Coomandook Outbreak (October, 1928).—A wheat and sheep farm in this area was concerned. The farm had been established twenty years, and all pastures had been topdressed. The Paralysis was confined to lambs, 2-4 months old, and 11 per cent. were clinically affected. The trouble started at the beginning of August. *Symptoms.*—Affected lambs lag behind flock and go down after a short walk. They get worse, and are unable to rise, or if they do only stagger a few yards and go down again. Some are affected chiefly in hind limbs, others in fore limbs. Muscular trembling of limbs was noticed. Otherwise the affected lambs appeared normal.

(2) Keith Outbreak.—A similar condition was observed in a mob of 200 lambs about four months old on a wheat farm in this area; forty were affected. The majority were lying down when first seen; on disturbing them, they only remained on their feet for a few minutes. Some only showed a stilted gait. Their condition was good. Several which were examined showed muscular tremblings in their hind limbs. In connection with this outbreak, the following information was obtained:—For portion of year sheep were put on bush country, which is a part of the 90-mile Desert. Whilst there sheep have been frequently observed chewing bones. Again, limbs of some are easily fractured, and bones of many can be cut with a knife.

3. Lameness.

A peculiar lameness in sheep has been observed and reported on certain holdings in the north-east of the State. On one station 40 per cent. of the ewes in 1921 showed lameness, and many of these had a deformity of the elbow joints. In 1925 a similar per cent. of the ewes showed the same condition. Certain areas (watercourses) of the holding seem to be associated with the trouble.

The condition is an osteo-arthritis of elbow joints chiefly; all joints of limbs may show more or less erosion of articular cartilages. The bony changes have developed over a considerable period. No evidence of an infective process has been found.

4. Brittleness of Bone.

Reports have been received from farmers in the areas given below that sheep show brittle bones. When catching sheep by a hind limb it commonly fractures. These areas are South-East (Kingston), coastal area of Eyre Peninsula, and southern end of Yorke Peninsula.

In conclusion, we may mention one of the nutritional diseases in the pig. It is recognised that dietary factors, housing, and other forms of management of this animal play an important part in producing the disease. The following condition is very frequently reported:—

The affected pig is first noticed to be paddling with hind legs whilst feeding. There is later slight loss of control of hind legs, accompanied by knuckling over at the fetlock joints. Finally pig goes down and seems to be paralysed in hindquarters. It often sits up like a dog and can pull itself along with the forelegs to feed. Swine of all ages can be affected, and they are usually in good condition. Although this disease is apparently nutritional in origin, its exact cause has not yet been determined.

PAPER II.

SOIL DEFICIENCY IN CALCIUM AND PHOSPHORUS.

By J. A. PRESCOTT, M.Sc. (Manc.), Waite Professor of Agricultural Chemistry, University of Adelaide.

In dealing with the subject of soil deficiencies, the agricultural chemist in the past has considered the problem mainly from the point of view of crop production and plant nutrition, rather than from that of animal health. The chemical and physical characteristics of the soil are known to have a direct influence on the character of the pasture, and the main object and interest in the top dressing of pasture land has been that of increasing the carrying capacity of the land rather than the improvement in the health of the stock, although the two were naturally known to be frequently associated. Of the elements essential for the proper nutrition of plants, only three—nitrogen, phosphorus, and potassium—have acquired the status of recognition as artificial fertilisers, salts of calcium being usually considered as soil amendments rather than as plant foods, the purpose being to correct soil acidity or alkalinity, or the improvement of physical properties.

The quality of a pasture from a nutritional point of view is controlled by a number of purely botanical factors, such as stage of growth and the relative proportions of grasses, leguminous plants, and what are generally known as miscellaneous herbage. Modern livestock, with their higher output of meat, wool, and especially milk, make special demands on the pasture, and what may possibly be a bare maintenance ration for the frugal Merino sheep may be seriously deficient for a dairy cow in full milk.

It is a well-known fact that the energy-value of poor and healthy pastures is approximately the same—in the neighbourhood of 270 calories per 100 gms.—but that in mineral content the variation is much more important. At the present stage of investigation, the study of the soil and of the pasture must be correlated with experimental work with the animal, and our diagnosis of soil deficiency must be based rather on the report of the veterinarian than on a chemical examination of the soil, until such times at least as a standard of reference has been established.

The known deficiency of the soils of the Australian wheat belt in phosphorus has been established, not so much by a chemical analysis of the soil as by an important series of field experiments in the various States, although the chemical analyses certainly directed the attention of our agriculturists to the need for these experiments.

Soil Calcium.

In Australian soils, calcium may exist in at last four forms—

Gypsum. Calcium Carbonate. Exchangeable Calcium. Mineral Calcium.

Gypsum occurs either as a natural product of soil and rock weathering, or when in larger amounts as a saline deposit such as would occur under estuarine or salt marsh conditions. Crystals of gypsum generally occur in the lower horizons of some of the heavy black soils characteristic of parts of New South Wales and of the Wimmera, while soil horizons rich in gypsum are known from the irrigation settlements of Mildura and Renmark.

Calcium carbonate is a universal soil constituent in our more arid regions, and most of our soils receiving 20 in. and less of rain show a characteristic lime enrichment in the lower soil horizons. It is difficult to believe that under these conditions

a true deficiency of calcium can exist. Even where calcium carbonate is absent, calcium forms the principal reactive constituent in the exchangeable bases of the soil, and a leaching out of the calcium in this form soon shows itself in soil acidity. Mineral calcium may be taken to indicate the calcium which is present in the unweathered silicate minerals, and will consequently have a low availability. The first three forms of calcium are all readily available, and in fact the soil solution consists primarily of a dilute solution of calcium bicarbonate.

The safest index of relative calcium deficiency in the soil is probably the hydrogen ion concentration. On the pH scale, with a neutral point at pH7, calcium carbonate in equilibrium with the carbon dioxide of the atmosphere gives a value of pH 8.4, while in Australia acid soils are known from pH 4.0 on the acid side to pH 9.6 on the alkaline soil. The reaction of the soil appears to depend on two principal factors, one the amount of leaching by rain or swamp drainage, and the second the amount of calcium carbonate present in the original parent material. The volcanic ash of Mount Gambier is, for example, relatively rich in calcium carbonate, and hence soils on this formation are frequently less acid than would be expected from a 30-in. rainfall. A critical pH value for many pasture plants would appear to be in the neighbourhood of pH 6, although some crops, such as oats and potatoes, will flourish in more acid soils. In South Australia, soils more acid than pH 6 occur only when the rainfall is 30 in. or more, and it is mainly in the Adelaide Hills that one would look for cases in which the soil would be likely to respond to treatment with lime. The lower Murray Swamps are also characteristically acid soils.

It is evident that veterinary troubles, due directly to calcium deficiency in the soil, could be expected to occur in a relatively limited area of the State.

Soil Phosphorus.

All soil phosphorus must ultimately owe its origin to the apatite that occurs in most igneous rocks. In soils derived from sedimentary rocks, the phosphorus present may have passed through organic form at some time or other, but will probably be found in the soil principally as calcium phosphate or fixed in the complex reactive alumino silicate portion of the soil which is responsible for base exchange. The quantity of phosphate in the soil is much less dependent on climatic conditions than is the case with calcium, and as it is never very high, is probably mainly related to the geological origin of the soil. In South Australia few soils have a high content of phosphoric acid. The volcanic ash of Mount Gambier is outstanding in this respect.

A statistical review of the information available in the records of the various State chemical laboratories concerning soil phosphate and the correlation of this information with the result of field experiments, and the occurrence of stock disease would be of considerable value; but it will be sufficient to indicate a few cases in which such definite information is available, using the total phosphoric acid present as a crude, but only available, measure of the phosphorus content of the soil. Table I. is very instructive indeed, and illustrates the relative poverty of South Australian soils in this respect.

Phosphate Content of Some Australian Soils, with Special Reference to Phosphorus Deficiency Diseases in Stock.

	Per cent. P_2O_5.
Queensland: Good grazing land	0.37
New South Wales: Black soils	0.18
New South Wales: Red soils	0.12
New South Wales (South Coast): Healthy	0.11
Mount Gambier (South Australia)	0.20-0.40
Wimmera (Victoria)	0.05
Mallee (Victoria)	0.05
New South Wales (South Coast): Bone chewing	0.03-0.05
Queensland: Osteomalacia	0.02
Kybybolite (South Australia): Unthrifty stock	0.014
Waite Institute (South Australia)	0.04
Lower North (South Australia)	0.03

PAPER III.

THE PHYSIOLOGY OF PHOSPHORUS AND CALCIUM IN ANIMAL NUTRITION.

By T. BRAILSFORD ROBERTSON, Ph.D., D.Sc., Chief of the Division of Animal Nutrition of the Commonwealth Council for Scientific and Industrial Research, at the University of Adelaide, South Australia.

Phosphorus.

We are acquainted with four distinct functions which are performed by phosphoric acid in the animal body. These are as follow:—

1. As an integral constituent of nucleic acid, phosphoric acid enters in an essential fashion into the composition of the nucleus of every cell in the body. Since the constituent of the nucleus which stains with haematoxylin is nucleic acid and modern genetic research has shown that those elements of the nucleus which stain with haematoxylin (chromosomes) are the actual conveyors of hereditary characteristics from parent to offspring, it becomes clear that in this sense phosphoric acid forms an essential constituent of one of the governing factors in development.

2. As an integral constituent of the phospholipins, in the form of a substituted glycero-phosphoric acid, phosphoric acid again enters into the composition of every living cell. The phospholipins, in turn, perform a multiplicity of functions. They are unique substances in that, being fats and having the physical properties and solubilities of fats, they are nevertheless soluble in water. When dissolved in water they are able to carry other fats, not normally soluble, into solution. By their influence upon surface-tension they modify the permeability of cells—that is, their capacity to take up from surrounding media materials which are not soluble in water. (Overton, Nathanson, Heilbrunn.) There is reason to suspect that phospholipin is the mobile form of fat in the body, just as glucose is the mobile form of carbo-hydrate. (Bloor.) As structural materials and, perhaps, for the reason that they are very readily oxidisable materials, the phospholipins enter to a remarkable extent into the composition of nervous tissues. To Liebig we owe the aphorism:—"Ohne phosphor, keine gedanke." Of course, as Verwon pointed out, exactly the same aphorism might have been enunciated for nitrogen or carbon or, for that matter, for hydrogen, oxygen, and other elements; but Liebig's statement serves to emphasise the fact that phosphoric acid is singularly concerned in the maintenance of the normal functions of the nervous system.

It also appears, from recent work, that phospholipins can catalyse the synthesis of protein in the tissues, through orientation of the molecules of amino-acids at their surfaces in such a fashion that the amino- and carboxyl-groups of adjacent amino-acid molecules are brought nearer to one another (Robertson, Marston, Wasteneys, and Borsook), and it has been shown that the mitochondria, fine granules in the protoplasm of cells which are believed to be the centres of protein synthesis, are largely composed of phospholipin (Arnold, Horning, and others).

3. The investigations of Embden have shown that the anaerobic oxidation of glucose in muscular tissue, with production of lactic acid as the side reaction, involves the preliminary formation of a hexose phosphate. Phosphoric acid must, therefore, be essential for the normal oxidation of carbohydrate and the production of muscular energy.

4. In the form of disodium phosphate, phosphoric acid plays a minor but essential part in maintaining the neutrality of blood and other tissue fluids (von Bunge, Henderson, van Slyke), through the occurrence of the reaction:—

$$Na_2HPO_4 + CO_2 + H_2O = NaH_2PO_4 + NaHCO_3$$

whereby CO_2 is neutralised without appreciable effect upon the neutrality of the mixture.

5. Finally, as a structural element, in the form of tricalcic phosphate, phosphoric acid is essential for the construction of bones, and, in consequence, the mechanical support of the tissues. This is usually the only function of phosphoric acid to which any attention is devoted in studies on the nutrition of farm animals. A perusal of the foregoing list of ascertained functions of phosphoric acid will reveal at once the inadequacy of this conception of the role of phosphoric acid in the body of an animal. It is obvious that deficiency of this substance in the dietary of an animal must injure its welfare in a multiplicity of ways, and we must expect the pathological syndrome consequent upon such deficiency to be of a very complex character and far-reaching in the modifications of normal function which it may induce.

Calcium.

Calcium, on the other hand, plays, so far as our knowledge as yet extends, only a limited number of roles in the bodily economy. As a structural element it enters, with phosphoric acid, into the composition of bone. For some reason not yet fully understood, but probably related to the maintenance of the colloid structure of protoplasm, calcium ions must always be present in tissue fluids in a certain proportion to the sum of sodium and potassium ions, otherwise normal permeability of the cell-surface cannot be maintained, and disordered function or death will ensue (Leob, Osterhout). In the aggregate of tissues forming a vertebrate animal, the first tissues to display disorder when this ratio is upset are the nervous tissues (Loeb). If the upset of balance is acute and sudden, the cerebellum is the first part of the nervous system to be affected, and the power of the animals to orient and equilibrate themselves in space is lost (Robertson and Burnett). If, however, the upset of ionic balance is gradual and chronic, supplies of calcium are mobilised from other tissues and rendered available to preserve an approximation to the normal ionic (Ca to Na) ratio in the blood. This is shown by the fact that a definite tolerance to citrates can be established by continued injection (Robertson and Burnett), and also by the well-known fact that a continued heavy drain upon the calcium stores of the body, as in heavy milk production with insufficient intake, or continued consumption of plants of the type of *Oxalis*, which are rich in oxalic acid, the bones may be rendered thin and fragile, showing that the calcification of bone is a reversible process, and that the bones are really reservoirs of lime, which can be drawn upon when the need of the animal is sufficiently urgent.

Owing to the diversity of the functions performed by phosphoric acid in comparison with calcium, the proportion of phosphoric acid contained in the body as a whole is somewhat in excess of that required to form tricalcic phosphate. Phosphoric acid must, in other words, be assimilated in excess of the amount necessary to combine with the calcium contained in the body. This is particularly true in the embryo, in which the proportion of nuclear material is high and the bones are, as yet, barely calcified at all. As the animal grows to the adult condition, the proportion of tricalcic phosphate in the body as a whole increases. The changes in the proportions of phosphoric acid to lime which accompany growth have been studied by Sherman and Quinn (''Journ. Biol. Chem.,'' vol. 1926, p. 667). They show that, in the new-born animal, the proportion of calcium to phosphorus is about one atom of Ca to two of P. During suckling the phosphorus in the body increases sevenfold, the calcium, however, twelvefold, from which we may compute that Ca and P atoms are assimilated at this stage in the proportion of one to one. Now the proportion of Ca to P in tricalcic phosphate is three to two, while the proportions assimilated in suckling are three to three. In other words, there is still 50 per cent. excess of phosphoric acid intake over that necessary to form bone from the lime intake. Corresponding to this we find in milk, besides tricalcic phosphate, a considerable excess of phosphoric acid compounds containing a smaller proportion of lime (casein, phospholipins, &c.). On the whole, between birth and the attainment of adult dimensions, the ratio of Ca to P assimilated is 2.5 to 2—*i.e.*, corresponds to a mixture of equal parts of dicalcic and tricalcic phosphates. During prenatal growth, on the contrary, the proportions approximate to those in monocalcic phosphate.

Monocalcic phosphate	$Ca(H_2PO_4)_2$;	Ca : P = 1 : 2
Dicalcic phosphate	$Ca_2(HPO_4)_2$;	Ca : P = 2 : 2
Tricalcic phosphate	$Ca_3(PO_4)_2$;	Ca : P = 3 : 2

The diversity of purpose for which phosphoric acid can be employed in the tissues of an animal involves its presence therein, as I have indicated, in a diversity of combinations. This raises the question whether any of these various compounds of phosphoric acid, other than inorganic phosphates, may not be more readily utilised by an animal if presented to it in a preformed condition, as they are in the natural herbage, rather than when phosphoric acid is presented in the form of inorganic phosphates. It will be clear from the foregoing that it is not sufficient guarantee of normality to find that bones grow normally, or that the phosphoric acid content of the blood, or even of the whole animal, is normal. Before we can be thoroughly satisfied that the requirements of the animal have been fully supplied, we must ascertain that the relative proportions of the three main classes of phosphoric acid compound in animal tissues—namely, nucleic acids, phospholipins, and phosphates—are present in the animal in the proportions natural for its age.

I have raised this question for two reasons. In the first place, investigations in my laboratory have shown that even such closely related compounds of phosphoric acid as animal and plant nucleic acids may be differently utilised by animals. In the second place, so far as I have been able to observe, attempts to supplement pastures which are deficient in phosphoric acid by means of licks containing inorganic phosphates, although successful in overcoming the most severe symptoms of

deficiency, nevertheless fail to restore complete normality. Even the bones remain more friable than those of animals fed upon pastures which are comparatively rich in phosphoric acid.

Quite apart from the question of organic *versus* inorganic compounds of phosphoric acid, there is another very important reason why the administration of phosphates in a lick may fail to accomplish all that we might hope.

Phosphates taken by mouth cannot be absorbed to any appreciable extent from the stomach. On arrival in the intestine, however, they meet an alkaline medium, and, if lime be present, phosphoric acid will be precipitated as di- or tricalcic phosphate, wholly or in part, in proportion to the calcium present and the degree of alkalinity. It is possible that a part of the calcic phosphates may be held in suspension by colloids, and thus, notwithstanding their insolubility, may conceivably be absorbed from the intestine in a colloidal condition. If absorption does not precede precipitation, or the precipitated phosphates are not absorbed from a colloidal suspension, then the precipitated phosphates of lime must pass through the intestine unaltered, and into the fæces, and thus become lost to the animal and restored to the soil. Reduction of lime in the diet will facilitate absorption, but then some of the phosphoric acid which is absorbed cannot be utilised in bone-formation for lack of sufficiency of lime to manufacture tricalcic phosphate, and consequently the excess over that which can be utilised for other purposes in the body appears in the urine and is lost to the animal by this channel. On the other hand, increase of lime in the diet increases utilisation but diminishes absorption. The animal must, therefore, steer a very fine course between defective absorption on the one hand, and defective utilisation on the other, to obtain the lime and phosphoric acid which it needs for bone formation. It is, in fact, quite readily possible to induce a rachitis-like condition in animals on a diet containing abundance of either phosphoric acid or lime, by simply administering an improper proportion of the two. (McCollum, Hess, and many others.) It is for these reasons, also, that even on a diet of natural foodstuffs the phosphates are rarely utilised to a greater extent than 50 per cent.

Experiments have been undertaken in which the phosphoric acid and lime were administered separately to milch cows, and at different times of the day, with a view to keeping them apart in the intestine by interposing a space between them. Phosphoric acid was administered in the form of sodium phosphate, calcium in a hay which was very rich in lime (Meigs and Woodward, United States Department of Agriculture, Bulletin No. 945, 1921), but I am not aware that the advantages of this procedure have ever yet been quantitatively evaluated. Increase of milk yield was obtained, of course, but was not compared with the increase which might have been obtained by administering the calcium and the phosphoric acid together. Organic compounds of phosphoric acid, however, possess the advantage over inorganic phosphates that the phosphoric acid is only slowly liberated during digestion, and may be absorbed before the concentration of phosphoric acid in the intestine reaches the critical value at which precipitation of calcium phosphates occurs. Glycerophosphoric acid, in particular, which is derived from the partial digestion of phospholipins, forms a soluble calcium salt, and all the salts which it may form in the intestine are so soluble that it is conceivable that they are absorbed as such, without the liberation of free phosphoric acid.

Interesting Experiments.

In this connection, the experiments of Forbes, on the utilisation of various compounds of phosphoric acid and hypophosphorous acid by pigs, are of exceptional interest. (Ohio Agric. Expt. Station, Technical Bulletin No. 6, March, 1914.) The pigs were fed upon a diet which was very deficient in phosphoric acid, and not containing quite enough lime to fulfil the maximum requirements of the animals. It is not certain, therefore, that the utilisation of phosphoric acid was in any instance the maximum attainable had the diet contained more lime. The phosphates, glycerophosphates, and hypophosphites administered were mixtures of the salts of sodium, potassium, calcium, magnesium, and iron. The nucleic acid was derived from yeast. Ten-day periods were employed. In the first experiment, illustrative of the rest, the following were the results obtained:—

Phosphorus Compound Administered.	Per cent. of Phosphorus Administered which was Retained.
Phosphates	51
Nucleic acid	58
Glycerophosphates	47
Hypophosphites	20

It is at once evidence that the reputed value of hypophosphites is mythical.

Although the utilisation of glycerophosphates was not seemingly so good as that of phosphates or nucleic acid, in all of the experiments these animals were the most spirited and lively. They were the only animals which consistently maintained their appetite and displayed no tendency to develop digestive disorders in consequence of the addition of the phosphoric acid supplement to the diet. In a repetition of the experiment, on comparing the breaking-strength of bones from the different lots, the following were among the figures obtained. (It is necessary to bear in mind the fact that all of the diets were moderately deficient in lime):—

Phosphorus Compound Administered.	Gain (+) or loss (—) in Breaking Strength.	
	Femora. Per cent.	Tibiæ. Per cent.
Hypophosphites	— 37.0	— 39.1
Hypophosphites + Nucleic Acid ..	— 11.6	— 26.4
Glycerophosphates	+ 28.7	+ 16.4
Phosphates	+ 11.3	— 4.1
Low phosphorus basal ration ..	— 26.5	— 29.5

It is at once evident, from such results as these, that it is not at all a matter of indifference in what form phosphoric acid is administered to animals to supplement their pasture. In our field-station experiments in phosphoric acid deficient districts we propose to administer various supplements, rich in phosphoric acid, and investigate, not only the growth and condition of the animals and their wool, but the effects of the supplements upon the proportions of the three main classes of phosphoric acid compound in the tissues of the animals. This has not hitherto been possible, owing to the lack of a convenient method of estimating nucleic acid. As a result of nearly two years' work, however, we have recently perfected a method which will permit the estimation of the nucleic acid content of 20 grammes of tissue to within 1 per cent. of its value. Standard methods of estimating phosphoric acid in phospholipins and phosphates are, of course, available. Definite organs will be sampled and analysed in normal sheep, sheep upon deficient pastures, and sheep upon deficient pastures which have been supplemented in various ways, and the results of these analyses supplemented by blood and bone analyses. From such experiments it should ultimately be possible to ascertain what admixture of inorganic phosphates and organic supplements will most closely approximate to the provision of phosphoric acid in the forms and proportions in which it is conveyed to animals by pastures which have been heavily supered, or which are naturally rich in available phosphoric acid.

DROUGHT FEEDING OF SHEEP.

FEEDING OF YOUNG LAMBS.

By THOMAS L. ARMSTRONG, Corona, Queensland.*

It will be remembered that in my article in the January issue I remarked that it was anticipated that the losses during the feeding period of the previous year would probably not exceed 6 per cent. This anticipation was more than realised, as is shown by the fact that for the period of twelve months, i.e., from May, 1928, to May, 1929, the total losses were under 5 per cent., and during that period 34,000 lambs were marked and reared (the number entered in the books being the actual number marked), so that it may, I think, be reasonably claimed that our feeding operations during last lear were a success.

The results of a small experiment in the feeding of young lambs which was carried out here in the early part of this year may be of interest to graziers generally.

In February last, owing to the imminent failure of the home pastures, it was found advisable to remove as many as possible of the breeding ewes to agistment areas, and as the ewes had only just finished a second lambing for the twelve months, the result of which was about 33 per cent., it was necessary that the dry ewes should be taken out of the various mobs in order to send them away.

During the mustering and handling necessary to accomplish this object lambs to the number of 511 lost their mothers, and it was decided to endeavour to save their lives by artificially feeding them. For this purpose they were collected in a motor

* In the "Pastoral Review" for October (No. 10, Vol. XXXIX., p. 952).

lorry from wherever they happened to drop out of the various mobs and taken to one of the out-stations, where they were kept in two enclosures, each about 5 acres in extent, and fed in troughs on mixed fodder prepared as follows:—280 lb. ground maize; 150 lb. lucerne chaff; 440 lb. bran; 200 lb. linseed meal.

These ingredients were thoroughly mixed together, and supplied in troughs, which were made from 18-inch strips of plain galvanised iron with rolled edges, which were suspended on parallel wires (which were run through the rolled edges) at a sufficient height so that the lambs could just reach into the bottom of the trough, as it was found by having the troughs as high as possible the danger of smothering through overcrowding was almost entirely done away with.

When the feeding was commenced the lambs ranged in age from two to eight weeks, being mostly of the younger age, and were in a more or less exhausted condition. For the first three weeks they were allowed a ration of 5 oz. of the mixed fodder per day. After the expiration of that period the allowance was increased to 7 oz. per day. After about the fourth week a ration of 2 oz. per day of lucerne hay was supplied to the lambs three times a week, and on the days when the hay was supplied the allowance of mixed fodder was reduced by 1 oz. per head. Fresh water was supplied to the lambs in the enclosures where they were kept. A lick composed of one part of coarse salt to three parts of Nauru phosphate was supplied to the lambs in separate troughs, and of this they partook regularly, though sparingly.

After being fed for eight weeks, during which period there were two wet days during which 5½ inches of rain fell, some of it fairly heavy, the lambs were turned at large on the natural pastures, which as a result of the abovementioned rain were then sufficient. The losses amongst these lambs for the whole period during which they were being fed amounted to eight.

About four weeks after being turned at large, these lambs, with 7,700 other lambs of the same drop which had not been taken from their mothers and which had from the time they were dropped (with the exception of a period of three weeks, when they and their mothers were supplied with artificial fodder) grazed on the natural pastures, were shorn. It was then found that the lambs which had been fed, although of a younger average age than those which had been with their mothers, cut more wool. The respective weights were not kept separate, but the difference was quite appreciable, amounting to probably 3 oz. per head, the average clip obtained from all the lambs being 1½ lb. per head.

Quite recently it became necessary to truck some 5,000 ewes, with their lambs, some 200 miles, and as the ewes had only finished lambing some few days before being trucked, some of the lambs lost their mothers in transit; these lambs were, after being untrucked at the completion of their train journey, carted by motor lorry for 30 miles and then fed in the same way as the 511 previously referred to, and although, as was inevitable considering their exhausted condition, some losses occurred, these ceased almost entirely after the lambs had been on the feed for a week, and they are all now thriving well, and as was the case with the first mob, the wool appears to be growing faster upon them than upon the balance of the lambs of the same mob, which have been with their mothers all the time. However, it is still too early to say definitely that such is the case.

The results obtained from these experiments would therefore appear to indicate that the nourishment received by the lamb from its mother's milk is productive of fat rather than wool.

I understand from Professor Brailsford Robertson, who is in charge of the Division of Animal Nutrition for the Council for Scientific and Industrial Research, that their investigations appear to emphasise the importance of the presence of cystine in rather large quantities in the food of sheep for wool production, and that whilst the milk of ewes is exceptionally deficient in cystine, this element is present in better quantities in the proteins of wheat bran, maize, and lucerne hay, so that it would appear that lambs fed on well-balanced rations including these fodders would grow more wool than those running with their mothers and drawing the greater portion of their sustenance from their mothers' milk.

Favourable Effect of Feeding on Growth of Wool.

One outstanding feature of our feeding operations during the past drought, or at least since we adopted the feeding on mixed fodder in troughs, has been the pleasing way in which the growth of wool continued throughout the period of feeding and its generally well-nourished condition. This has been so marked that upon handling the wool after being shorn it has been very difficult to believe that the sheep had been artificially fed, and that the wool was not grown under favourable natural conditions.

The Need for Scientific Research into Feeding Problems.

This is a factor which, it appears to me, must in future feeding operations be given the greatest consideration, and graziers, when faced with the necessity for feeding their flocks, must not only give very serious consideration to the question of what is the cheapest fodder upon which their sheep can be kept alive, but also to the question of what fodder will give the best ultimate return, and will produce the best results as far as the production of wool and lambs and the maintenance of the general health of the flock is concerned.

This is only one of the directions in which scientific investigation can and will benefit the grazing industry, and it is possible that the rendering of financial assistance to the furtherance of scientific investigation into the many problems affecting the pastoral industry is one of the best investments the grazier can make at the present time, and the one which is the most likely to be of benefit to the grazing industry in particular, and Australia as a whole. At the present time the future prosperity of Australia as a whole appears to a very great extent to be dependent upon the prosperity of the grazing industry, and the prosperity of that industry in the immediate future at least appears to depend entirely upon a reduction in the present outrageously high cost of production and an increase in the productiveness of our flocks, and in this latter direction it appears that we can confidently look to scientific research to assist us in the solving of many problems.

Too Much Salt in Licks.

It is quite evident that lick will be much more extensively used in Central and North Queensland in the future than was the case prior to the commencement of the present drought (I use the present tense advisedly in speaking of the drought, as over a very great proportion of the Central-West and Western districts the drought is as bad to-day as at any time during the past four years), and in this connection it appears to me that the prices of practically all proprietary licks at present on the market are unduly high, and also that their salt content is quite unnecessarily and possibly dangerously high.

There is to my mind not the slightest doubt but that the losses in sheep through the excessive consumption of salt during the present drought, and particularly during 1926, when a great many graziers were using licks and artificially feeding for the first time, and in many instances paying a ruinous price for their experience, were very great, as few graziers then realised that salt in excessive quantities is a deadly poison, and even where the sheep have not been actually killed by the excessive amount of salt consumed, in many instances a great deal of harm has been done to pregnant ewes as well as to those suckling lambs.

Scientific investigation points to the conclusion that the great deficiency in the natural pastures in both Central and Northern Queensland as stock fodder appears to be the absence of phosphoric acid in the necessary quantities to maintain the stock in a thriving condition, particularly during those periods following seasons of excessive rainfall, when the grass is both very rank and dry. It would therefore appear that the supply of phosphoric acid to the stock in comparatively large quantities should be one of the chief objects of any lick, and not the supply of excessive quantities of salt.

Linseed Meal to Make Licks Appetising.

We have for some considerable time past been experimenting with various salt licks, mostly prepared upon the place, and the chief difficulty with which we have had to contend has been to induce the sheep to consume the amount of phosphate which appears necessary to attain the best results, and for this reason it seems needful to add to the lick some element attractive to the sheep, and which will mix with the phosphate so thoroughly that the stock will be unable to pick it out by itself. The greatest success which has been achieved in this direction up to the present has been gained by the incorporation of a considerable quantity of linseed meal in the lick, and in this way a lick has been prepared which is sufficiently palatable to the sheep to induce them to consume relatively large quantities of phosphates. The formula in use for the preparation of this lick is as follows:—558 lb. ground rock phosphate; 184 lb. coarse salt; and 200 lb. linseed meal.

Even with this comparatively large proportion of linseed meal the sheep at first exhibit considerable reluctance to consume any reasonable quantity of the lick, and to overcome this reluctance the proportion of the linseed meal is increased by the addition of another 100 lb. to each mixing until the sheep have taken to the lick really well, after which the extra 100 lb. of linseed meal is discontinued.

A cheap and possibly effective substitute for the linseed meal might perhaps be a small quantity of molasses diluted with a sufficient quantity of water to enable it to be sprayed on to the salt and phosphate during the preparation of the lick, and our next experiment will probably be in this direction.

The cost of the above lick prepared on the place works out at about £14 10s. per ton with 200 lb. of linseed meal, or about £15 14s. with 300 lb. of meal. Without the meal, but with the addition of sufficient molasses to render the large quantity of phosphates palatable to the sheep, the cost would only be about £9 12s. per ton, whereas the cost of the various proprietary licks ranges from about £15 15s. to £17 10s. at the seaboard, and on top of that we have 467 miles of rail and 30 miles of road carriage to pay.

From the above it might appear rather strange that we have persevered with the use of linseed meal, considering the high cost of same, but the reason for this is that when artificial feeding was discontinued in March last we had a very large amount of this meal on our hands, and were unable to dispose of it except at a very considerable loss, which we did not feel disposed to do, hence the somewhat lavish use of it in the preparation of the lick without regard to its cost. We could increase the quantity of meal used and still have a cheaper article, and possibly a more effective one, than many of the proprietary licks.

The use of iodine in the preparation of licks may be necessary in certain districts, but it appears probable that where the sheep are consuming a reasonable quantity of crude salt this will sufficiently supplement the supply of iodine available for them.

PLATE 32.—"AN ENEMY HATH DONE THIS!" ANOTHER GOOD KILL!

Cochineal, Chelinidea, and Cactoblastis, natural enemies of the pest, have been widely distributed throughout the pear area, and admittedly a 95 per cent. control has been exercised on the fruiting of prickly-pear. The most pessimistic landholder in the pear area therefore must agree that by mechanical means the Prickly-pear Commission has made it possible to maintain clear areas free from pear, and by the introduction of cactus-destroying insects it has controlled the further spread of pear. On the other hand, it would not be unduly optimistic to contend that by the use of mechanical and biological agencies the prickly-pear is gradually and surely being forced back, and should no disease or parasite adversely affect the cactus-destroying insects within the next few years, the pear problem in Queensland will be solved.

THE DEVELOPMENT OF THE SHORTHORN.

PROBLEMS OF BREEDERS.

By W. F. McLAREN, Naemoor Estates, Scotland.*

There are great breeds of beef cattle other than the Shorthorn—as, for instance, the Polled Aberdeen-Angus, which for quality of beef in unrivalled, except by the cross Aberdeen-Angus Shorthorn, the Hereford, and others, which have improved vastly during the last few decades, but I think I will stand uncontradicted when I state that no single breed of cattle is so universal, so cosmopolitan, as the Shorthorn. He stands, *par excellence*, as the "grader-up" of the world's race of cattle. He has the three big "Q's" in his pedigree—*Quantity, Quality,* and *Quick Growth.*

This evolution of the Shorthorn from the big, raw-boned late maturing and coarse animal of the eighteenth century. to the mellow, smooth-fleshed, early maturing and symmetrical animal of the twentieth century, has not been an accidental or casual evolution, owing nothing to the hand and mind of man. On the contrary, the reins of the evolution have been in the hands of great and far-seeing men, men with great hearts and great minds not untouched with genius, and the imprint of their work has been as permanent and as important, if not so spectacular, as that of better-known figures in the history of our civilisation.

Now nothing is further from my mind than to suggest that science should not have a connection, and a close connection, with successful evolution in cattle-breeding as in other industries; indeed I am all in favour of enlisting the co-operation of science into all and every department of agricultural activity, but I *do* want to suggest that without the master mind of the cattle-breeder, without the inherent and instinctive knowledge of that master mind in the ethics of his subject, science in itself would have had little hand in equipping the world with the improved race of cattle which is the only monument to our great master breeders.

Financial Returns.

Of the problems which confront the Shorthorn breeder their name is legion. First and foremost there is the problem of £ s. d. Prices at the moment are far from remunerative for purebred pedigreed Shorthorns, except in very exceptional cases, and it cannot be too generally impressed upon the general public and the farming community that the earnest and capable breeder of pedigreed stock must necessarily get a greater return than mere commercial price. His capital outlay and his running expenses are heavy, and he cannot carry on indefinitely without some concrete return and recompense for his services.

One hears a lot these days of the endeavour to improve the standard of store cattle; one hears of meetings and conferences to abolish the use of "scrub" bulls, but so long as we have the type of farmer or breeder who grudges to pay the extra pound or two which will procure him a decent bull when he can get his cows in calf by purchasing the worst "scrub" in the market, so long will we have the "runt" cattle which are the bane of the grazier's and feeder's life.

I do not see at the moment how we *can* abolish the "scrub" bull, but I do see how essential it is in the interest of the cattle population of the world why the buyer should be educated up or encouraged to use, not the "scrub" which he can pick up at the cheapest price, but the good pedigreed bull with a record behind him which he can purchase at just a little more. Stock breeders, and especially those in the pedigreed ranks, are, as a rule, men with an ingrained love of cattle, whose chief delight is to breed something which will do not only themselves and their herds, but the breed, credit, and whose enthusiasm is amply rewarded by an occasional outstanding production, but it must be admitted that a predilection on the part of the farmer to place his average, or nearly average, production on a par with the ordinary "scrub" is the reverse of encouraging or remunerative.

Problem of Pedigree.

For many years what I might call *paper* pedigree had a tremendous vogue among Shorthorn breeders. If a female was a "Lavender," or a "Princess Royal," or a "Crocus," or a "Duchess of Gloucester," or a "Clipper," or an "Augusta," or one or other of the few lines of families which seemed to have captured the popular fancy, she would sell at a great price no matter what were her intrinsic qualities, but breeders seemed to forget that a pedigree descends through the male side as well as the female side, and that what has originally been a "Lavender" line, in later generations had been crossed with all sorts and conditions of bulls, whose influence may have been good or bad, but was certainly unknown to most and unconsidered by many.

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* In the "Pastoral Review" for October (No. 10, Vol. XXXIX.).

There is, of course, quite a feasible explanation of this craze. It originated in some eminent and successful breeders of past generations sticking to one family name on the female side. If a cow was called "Butterfly," her daughter was "Butterfly 2nd," and her great-great-great-grand-daughter "Butterfly 50th," or something like that.

Females which had been in the hands of these eminent breeders, and had produced something outstanding, naturally acquired a reputation, and when they or their female descendants fell into the hands of other breeders they stuck to the family name, but unfortunately they could not, or did not, stick to the same class or type of stock bull, and often produced only inferior stock. Notwithstanding this a sort of glamour still surrounded the family name, but the vogue was the means of inflating prices and "boosting" rather middling cattle, to the prejudice of the breed and the disgust of inexperienced though enthusiastic breeders. Fortunately this state of affairs is quickly being remedied, and breeders are taking a much more sensible view in their choice of pedigree. Really great breeders of this country lay much greater stress upon good top crosses and general excellence in breeding than upon family name.

Problems of Type.

One cannot emphasise too much the importance of *type* in cattle-breeding, and especially in the breeding of beef Shorthorn cattle. The alpha and omega of breeding beef Shorthorns is to supply the largest possible portion of the world with its requirements in beef, and towards this end type in the general is of vastly greater importance than super-excellence in the particular. A herd of cows of one uniform type, with perhaps none of them very outstanding, makes a greater appeal to the true breeder than a herd with one or two cows of outstanding merit, the others being a mixture of all the types.

It is the type which tells in the long run. How often has one heard the remark, "Now, there is a good animal; he has lots of faults, but he is the *right type*"; and again, "he may be a good animal; he certainly hasn't many faults about him, but he is the "*wrong type.*" Take two animals, each representative of the quoted remarks, and which of the two finds most favour? Other things being equal, the latter may gain some fleeting and transient success in the show ring, but in the herd the former scores nine times out of ten.

It is quite possible for an animal to be at the head of a class at a show—and perhaps rightly so—and yet be inferior in intrinsic qualities to others in the class. Such an animal may be approaching the nearly perfection in almost every respect, and yet hardly conform to that perfect type which every true breeder has in his mind's eye, but can hardly define in actual words. It is a matter of instinct almost, and that is one reason why the inexperienced or inexpert breeder may do himself and his herd irreparable harm in securing at great cost an animal which has been a prominent show winner, and without taking into consideration the essential question of type.

To some extent the question of markets must govern the question of type. At the present time there are two distinct standards of type which command attention in the beef Shorthorn world. There is the short-legged, short-coupled, square-built animal, carrying a wealth of flesh, evenly distributed, on moderately fine bones. He, generally speaking, responds quickly to good feeding, develops early, and is generally recognised as the standard bullock of Britain, the Argentine, the United States, and Canada. In Australia and South Africa, more especially in Australia, the demand hitherto has in the main been something rather different. They have been breeding longer, rangier animals, the idea being that some length of leg was required to enable the animal to travel long distances to water.

I have, however, of recent years seen reports of some of the more important Australian shows and sales, and from these and the evidence of some of our home breeders who have visited the country it seems certain that the Scotch type of Shorthorn is rapidly gaining in favour and ousting the Australian type.

The ablest breeder in the world cannot, consistently, breed nothing but the best; he is bound at times to produce something which is below standard, and at this point I should like to enter a plea for the more drastic use of the knife in eliminating these outsiders from the ranks of pedigree breeding. It takes a strong mind in a breeder to see in the bull calf bred by himself from stock that he considers of merit—a rag of a beast which is not fit to procreate his own species, but the castration of this calf before he reaches the breeding age is the fastest and cheapest road to raise the standard of Shorthorn cattle and to fix permanently the true type and character of the breed.

The same principle of course applies on the female side, but its observance is the more important on the male side, where the bull is half the herd.

FRUIT AND VEGETABLE STORAGE.

By DR. LAURENCE P. McGUIRE,* Physiologist, Banana Research Station, Imperial College of Tropical Agriculture.

INTRODUCTION.

Generalisations regarding the optimum conditions for the cold storage of food products are, to say the least, difficult even for fruits or vegetables of a single genus. So much depends on the particular species or variety, the pre-storage conditions of nutrition (soil and climate), the stage of ripeness attained at the time of harvesting, the duration of the particular storage temperature, the amount of ventilation, the composition of storage atmosphere—humidity and concentration of carbon dioxide and volatile auto-toxins.

It must be borne in mind that up to the present experimental storage trials with vegetables have, for the most part, been confined to those grown in the temperate zones. In the case of vegetables cultivated in the tropics, it will be by experiment, and experiment alone, that consistent successful transport from season to season may be expected. The present paper, culled from current literature, is submitted in the hope that it will provide prospective shippers with the rudimentary knowledge with which experimental shipment may be commenced. Experience gained in the course of smaller preliminary trials will later justify large-scale operations.

It will be seen that investigators in different parts of the world recommend different optimum temperatures for the same fruit; in the absence of definite knowledge as to the variety, which is frequently not specified, this information appears at first sight to perplex, rather than assist. The references are given so that in the event of unsatisfactory transport at one temperature the other temperatures may be resorted to in turn.

Lastly, many fruits may be held successfully over compartively long periods at ordinary temperatures; as a general rule, the average storage expectancy of these fruits may be increased by storage at lower temperatures. Refrigeration is recommended during transport firstly to reduce, to a minimum, wastage due to the activities of putrefactive organisms and fungal growth generally, and secondly to allow, if necessary, of further storage at the port of destination in the event of a glut of the same commodity from a different country of origin (c.f. citrus on the English market from South Africa, Palestine, Azores, Canary Islands, &c.). The advantage under such circumstances of being able to delay senescence for a further period will be readily conceded. A careful study of Trade Commissioners' reports, based on first-hand information as to the trend of the market, would be helpful in this connection.

A.—VEGETABLES.

By way of introducing this aspect of the subject, reference will be made to the work at Norrköping, Sweden, of Lorenz Rasmusson[23], who carried out storage trials on a number of Swedish vegetables; after this, individual vegetables will be dealt with. He claims that in the case of Swedish Cauliflowers, Leeks, Red Cabbages, Brussel Sprouts, Artichokes, Jerusalem Artichokes, Beetroots, Horse-radish, Celery, Parsnips, Cabbages, Carrots, Sweet Marjoram, Thyme, Parsley, Dill and Turnip Cabbages, he has increased the length of storage life to an extent varying from four to nine months, and in the case of Salad, Spinach, and Tomatoes to two months. Krause[22] observes further that (1) Cauliflowers should be stored perfectly dry, otherwise they soon assume a greyish-white appearance and become covered with black sooty spots, which diminish their value considerably; (2) Artichokes, Celery, Parsnips, Beetroot, and Horse-radish kept best in dry sand† and in premises without light; (3) Marjolaine, Thyme, Fennel, and Parsley are inclined to lose their flavour in open crates. Zinc cans were found highly suitable.

All these vegetables were kept at a storage temperature of 32 to 33.5 deg. Fahr., and humidity 70 to 80 per cent. Generally speaking, vegetables should be packed in latticed crates in such a way as to ensure adequate ventilation, vitiated air being removed by periodically opening the storage doors for a short while.

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* In "Tropical Agriculture" (Trinidad B.W.I), October, Vol. VI., No. 10.

† For the purposes of transport dry packing material would be substituted for sand.

Tomatoes.

This commodity presents difficulties in storage, and advice as to the optima conditions of such storage must, of necessity, be guarded, owing to the considerable variation in keeping quality.

Rasmusson[33] (Norrköping) kept tomatoes for two months at 32 deg. Fahr.; Plank[31] and [23], of Karlsruhe, kept them for thirty-four days at the same temperature, remarking that on the fourth day after removal from storage deterioration due to mould formation was considerable.

According to D. B. Adam,[1] with tomatoes picked when three-quarters ripe and stored at 33 to 34 deg. Fahr. in ventilated chambers where humidity is relatively low, the average storage expectancy of seven to ten days may be lengthened to three weeks.

On the other hand, Barker,[3] of the Low Temperature Station, Cambridge, experimenting with both green and fully coloured tomatoes, is of opinion that the extension of the ripening and senescence of the tomato to any considerable extent by cold storage is not feasible. The experiments, which are by no means complete, suggest that the optimum storage temperature lies in the neighbourhood of 55 to 60 deg. Fahr. Storage at 34 deg. Fahr. might be recommended for the preservation of tomatoes as provisions for ships, where consumption would take place shortly after removal from storage.

H. C. Diehl[11] reports that experiments conducted with small lots of Acme, Globe, and Stone varieties gave results which indicated that such tomatoes were not injured when held for one day at 30 to 31 deg. Fahr. When subsequently stored at 50 deg. Fahr. for nine days they ripened very gradually, and if then held at room temperatures of about 70 deg. Fahr. they matured normally in five to seven days—a storage life of about fifteen days. (Tomatoes of the same stage of development, held at 32 deg. Fahr. for periods varying from fourteen to thirty days, failed to ripen, and quickly broke down at room temperatures.) If this procedure is adopted in transport, the preliminary cooling at 31 deg. Fahr. should be carried out in the Harbour pre-cooling station, after which the crates should be quickly conveyed to the boat chamber kept at a temperature of 50 deg. Fahr.

In harvesting tomatoes a small portion of the stem should be left on the fruit, and, furthermore, the use of individual wrappers for the fruit, which have been shown to retard the ripening process perceptibly, should be encouraged.

It should be clear from the foregoing that different varieties require different sets of conditions, which will be determined in the course of experiment only.

Onions and Garlic.

Experimental work at Norrköping[34] (Sweden) shows that at temperatures of about 30.5 deg. Fahr. onion tissue is altered by putrefaction, mould, and germination. On the other hand, very low temperatures—19.5 to 23 deg. Fahr.—kills the tissue and coagulates the albumen, which, after thawing, remains denatured. At 27 deg. Fahr. the tissue remains unaltered, and on removal to higher temperatures is similar to that of fresh onion, chemical analyses supporting the view. Cultivated Garlic may be kept at 21 deg. Fahr. without danger; nevertheless 27 deg. Fahr. is quite adequate for satisfactory preservation. V. R. Boswell[5] studied the behaviour of onions during, and subsequent to, storage at 32, 40, and 50 deg. Fahr., and found the lowest temperature most suitable. Furthermore, onion plants from the bulbs stored for eight months at 32 deg. Fahr. showed extraordinarily vigorous leaf growth.

For the purposes of a short voyage of fourteen days Onions, Garlic, Leeks, and possibly other members of the same family—viz., Spring Onions and Eschalots—could be safely carried at 32 deg. Fahr.

Potatoes.

Keeping potatoes at a temperature of 32 deg. Fahr for long periods (four months) helps sugar aggregation, since at this temperature respiration is slower than saccharification. Even at 36.5 deg. Fahr. sugar aggregation is noticeable in the slightly sweetened taste if the potato has been kept for any length of time at that temperature. From this point of view storage at 37 to 41 deg. Fahr. is advisable.[40]

Stuart *et al.*[37] observe that the range for complete dormancy of bulk-stored potatoes is between 36 and 40 deg. Fahr., and for normal potato storage a room temperature of 37 deg. Fahr. is apparently sufficiently low to prevent germination, at the same time insuring as low a transpiration and respiration loss as is desirable.

Storage of potatoes (1) at 35 to 37 deg. Fahr. eliminates storage rots[13] among seed potatoes, and (2) at 36 to 40 deg. Fahr. for fifteen days kills the caterpillars, pupæ, and eggs of the potato moth (*Phthorimœa operculella* Zell.). It is further to be noted that the germinating power of seed potatoes kept at cold temperatures for as long as six months is not impaired at all, such seeds giving rise to a more uniform crop of sturdier plants. This view is supported by Etheridge[12] and co-workers of the Missouri Station.

As a result of his study of the relation between the storage temperature and the incidence and spread of storage dry-rot, Morris[27] advises holding potatoes in well-ventilated rooms maintained at 35 to 40 deg. Fahr.

Kimbrough,[21] having measured the initial rate of respiration when potatoes are removed from storage at different temperatures, found 40 deg. Fahr. to be the most suitable.

The concensus of opinion, then, favours storing potatoes at approximately 40 deg. Fahr.

Sweet Potatoes.

J. I. Lauritzen,[24] working on the temperature and humidity relation of black rot in sweet potatoes in storage, claims that at temperatures of 43 to 50 deg. Fahr. and humidity below 90 per cent. it is believed possible to eliminate, almost entirely, the incidence and spread of this disease. Thompson[38] reports that when sweet potatoes are thoroughly dried or cured the temperature for long storage should be maintained at as near 55 deg. Fahr. as possible, Crider and Albert[7] advancing a similar recommendation. Sweet potatoes, then, should carry favourably at 50 to 55 deg. Fahr.

Carrots.

Carrots were kept twenty-two weeks at 32 to 35 deg. Fahr and 39 to 40 deg. Fahr., losing 7 per cent. and 26 per cent. of their weight respectively. Hasselbring[15] observes that the hydrolysis of sucrose into reducing sugars was more rapid at the higher temperature. As the flavour is correlated with the sucrose content the lower temperature is recommended—viz., 32 to 35 deg. Fahr. Lauritzen[25] has shown that at such temperatures infection and decay, due to black-rot disease, are reduced to a minimum.

Celery.

Care should be taken to pack in dry material[22] and to ensure ample ventilation. A temperature of 31.5 to 32 deg. Fahr. has been found most suitable.[42]

Asparagus.

Plank's[31] investigations at the Institute of Refrigeration, Karlsruhe, indicate that asparagus in baskets may be kept approximately three to four weeks at a temperature of 32 to 35.5 deg. Fahr. and humidity 80 per cent. Bisson, Jones, and Robbins[4] recommend that asparagus should be stored as quickly as possible after harvesting in chambers at slightly above 32 deg. Fahr.

French Beans.

Scarlet runner beans[23] were held with favourable results in loose heaps for three weeks at a temperature of 32 to 38 deg. Fahr and humidity 85 per cent. They lost 20 per cent. of their weight in this period of storage.

Parsnips.

Boswell,[6] studying the parsnip from the point of view of changes in quality and chemical composition during storage, found that roots may be rapidly brought to a state of high table quality by storage at 32 to 34 deg. Fahr, the hydrolysis of starch and other polysaccharides, with consequent accumulation of sucrose, proceeding much more rapidly than at ordinary temperatures. The commercial value of this product is enhanced by holding at a temperature of 32 to 34 deg. Fahr. for three weeks.

Squashes.

Squashes may be conveniently kept for long periods at 50 to 55 deg. Fahr.; at temperatures higher than this squashes undergo a great loss of weight. Cummings and Jenkins[8] point out that squashes kept at 74 deg. Fahr lost 63 per cent. of their

weight in five months, while a comparable lot held at 55 deg. Fahr. for the same period lost only 20.1 per cent. In a storage test of squashes and pumpkins the mammoth cheese pumpkin kept in good condition for seventeen months. A storage temperature of 50 to 55 deg. Fahr. seems adequate.

Topepos.

Topepos have been kept unrefrigerated, and only towards the end of a period of eighteen days was a slight inclination to shrivelling noticeable. On maturing, the orange colour turned to deep red. Experimental transport might be commenced at temperatures in the neighbourhood of 50 deg. Fahr.

B.—FRUITS.

Citrus Fruits.

Citrus fruits, generally speaking, should present no difficulty to the shipper in the matter of a fourteen-day journey. Ocean transportation studies indicate that if pre-cooled to 50 deg. Fahr. citrus fruits may be shipped from Porto Rico[26] to New York in the ventilated holds of non-refrigerated ships, the temperature not rising much above 60 deg. Fahr. Citrus fruits (Grape-fruit, Oranges, Tangerines, Mandarins, &c.) are exported from South Africa at 38 to 40 deg. Fahr.

Grape-Fruit.

Hawkins and Barger[16] have shown that cold storage of grape-fruit is commercially practicable. Records show that for fruit to be held for six weeks in storage, pre-curing by exposure to from 70 to 75 deg. Fahr. at a humidity of 65 per cent., or by exposure to the gases generated in the incomplete combustion of kerosene stoves, reduced skin-pitting injury. The latter treatment is superior in being beneficial also in the loosening of the stem buttons, the absence of which tended to reduce disease infection in the fruit. These authors further point out that fruit picked early in the season can be readily stored for six weeks to two months at 32 deg. Fahr.

Oranges.

The investigations of D. B. Adam[2] with Washington Navel and Valencia oranges indicated that 34 deg. Fahr. is the most favourable storage temperature, taking into consideration both keeping quality and freedom from spotting. G. B. Tindale[39] considers 37 deg. Fahr. to be the most suitable temperature for Valencia late oranges, as a fluctuation of three degrees either way would not be attended with harmful results.

Lemons.

As a result of curing and storage tests of lemons at Gosford, W. B. Stokes[35] concludes that lemons harvested green may be held successfully in a well-protected storeroom for several months at a temperature of 70 deg. Fahr. or below, and relative humidity 80 to 85 per cent. Read[25] further supports the view that with careful handling, picking, curing, &c., lemons may be kept in ordinary cool storage for six months in excellent condition. For the purposes of short transport, then, refrigeration, in the ordinary sense, seems unnecessary.

Limes.

When picked fully grown but still quite green limes last comparatively well in ordinary cool storage—shipments of this fruit from Trinidad at temperatures in the neighbourhood of 45 deg. Fahr. have, on arrival at market, been favourably commented upon.

At temperatures of approximately 38 to 40 deg. Fahr.—the South African practice—or more widely 35 to 45 deg. Fahr.—the transport of citrus fruits should prove successful.

Mangoes.

Higgins and Punzalan,[19] from experimental storage of varieties of mangoes at temperatures of 36, 40, and 50 deg. Fahr., state that sound, green, but fully matured mangoes may be kept in satisfactory condition for eighteen to thirty-days at 36 deg. Fahr.; at 40 deg. Fahr. fungus injury was prevalent, and at 50 deg. Fahr. shrivelling and decay soon occurred.

Pineapples.

While individual cases of pineapples sent home in the ship's provision room have reached their destination in good condition, this is by no means the rule. Experience has shown clearly that pineapples cannot endure low temperatures, on removal from which they rapidly break down—a view supported by Davies.[9] Studies at the Porto Rico Station[26] show that exposure to 35 to 40 deg. Fahr. will stop maturity changes considerably, whether fruits are green or mature—storage at this temperature for six days did not interfere with proper ripening, subsequent to removal from the store. Transport at 43 to 45 deg. Fahr., with adequate ventilation, is recommended.

Grapes.

Malaga (South African) grapes, harvested in late March and early April and packed in boxes with sulphite tissue paper and wood-wool, were kept at 32 to 33 deg. Fahr. for five months in excellent condition. De Castella[10] further confirms the view that 33 deg. Fahr. is the most suitable temperature for the transport of grapes.

Melons and Cantaloups.

Uurbina,[41] in an article on the transport of melons from Chili, is of the opinion that 32 to 34 deg. Fahr. is the best temperature for the preservation of melons in excellent condition. He stresses the importance of (1) careful handling to obviate mechanical injury, and (2) adequate ventilation, and recommends that the storage compartments be loaded to two-thirds of their height. With suitable "dunnage" between crates and adequate circulation of the air, this precaution may reasonably be omitted. For short journeys Californian cantaloups are carried at 40 deg. Fahr.

Pomegranates.

On account of the texture of the skin, this fruit will withstand a deal of abuse. After harvesting, the fruits, which should be clipped rather than pulled, will keep for months if stored in a cool, dry place. Although the bright lustre of the fruit is lost and the fruit shrivels somewhat, the flavour is not impaired in any way. Hodgson[20] further observes: "On account of the common habit of splitting, the fruit of most varieties must be picked before fully mature. Fortunately, the pomegranate is one of those fruits which, after reaching a degree of maturity, continues to ripen in cold storage, where it will keep in excellent condition for five to six months. Not only does it ripen, but the quality is improved, the flavour becoming richer and more vinous."

This commodity, then, should present no difficulty to the shipper.

Papaws.

Careful packing is absolutely essential in the transport of papaws. J. E. Higgins,[18] of the Hawaii Experimental Station, reports:—"The use of crimped strawboard as an exterior wrapper to go about each fruit in addition to the paper wrapper (glazed) is recommended. This provides a very valuable elastic cushion, against which the fruit rests, and which saves the fruit much bruising. . . . Refrigeration can be recommended for the shipping of papaias. No deterioration in the flavour of the fruit could be detected after it had been in refrigeration throughout the voyage to San Francisco, nor were there any other evil effects apparent."

An experimental shipment at 38 to 40 deg. Fahr. of a few cases from South Africa to the London market (about twenty-four days altogether in transit) suggests that the West Indian papaws, in view of their proximity to the market, might be exported with success at this temperature.

Avocado Pears.

Overholser[29] reports as follows:—"40 deg. Fahr. proved to be satisfactory for all varieties tested, except the Fuerte, which required 45 deg. Fahr. to prevent blackening of the skin. It was found that quick storage after harvesting, and care in handling, aided in keeping the fruits in satisfactory condition. Fruits picked just before the commencement of softening kept best and attained excellent quality. In proper storage the Dickinson, Royal, Taft, and Queen varieties kept for approximately two months; Spinks, Sharpless, and Challenge, five to six weeks; Rey Fuerte and Kist, for about four week." Several varieties[28] gave indication that they might be kept without injury at a temperature of 32 to 35.6 deg. Fahr.

Litchis.

At the Hawaii Experiment Station[17] it was found that "Refrigeration, where it is available, furnishes the best means of preserving the litchi for a limited period in its natural state." Unfortunately, no actual temperatures are given, but it is to be remembered that the fresh fruits keep quite well at ordinary temperature for two to three weeks without deteriorating in flavour, although the attractive red colour of the fruit is lost. Refrigerated fruit, on the other hand, showed no loss in colour or flavour during storage for a fortnight. Experimental shipment might be commenced with temperatures in the neighbourhood of 40 to 45 deg. Fahr.

Jujubes (*Zizyphus* spp).

According to Popenoe[32] no weather appears too hot for its cultivation, and it has withstood, without perceptible injury, a temperature as low as 13 deg. Fahr. In storage trials conducted by Overholse[30] jujubes have been kept at 32 deg. Fahr. in open containers for forty-five days, and remained marketable for five days after removal. The chief difficulty encountered was the cracking of the skin and wilting. In closed containers, at 32 deg. Fahr., cracking and wilting were lessened, and the fruits kept for eighty-five days.

The Kaki or Japanese Persimmon.

According to storage trials at the California Experimental Station,[30] Persimmons (Japanese) were held at a temperature of 32 deg. Fahr. for two months—upon removal from storage they remained marketable for a period of eight days.

Nuts.

Walnuts, almonds, and pecans have been held, both shelled and unshelled, for periods of four years in cold storage, with only slight deterioration in the flavour. Storage at 32 deg. Fahr. gave the best results, the depredations of worms[22]—a major evil of these commodities in storage—being successfully held in check.

Bananas.

Bananas of the Gros Michel variety are carried in well-ventilated holds at a temperature of 53 to 54 deg. Fahr. On arrival at their destination they are conveyed to ripening rooms of high humidity (90 per cent.) and a temperature between 70 to 80 deg. Fahr., according to the rapidity with which they are to be ripened to meet the market demand for ripe fruit.

Figs.

According to the "Revista Commerciale Itala-Americana," a new method of treatment[13] is being applied—the figs are immersed twice in a preparation with a paraffin basis (for large quantities a rolling carpet machine is used). In this way a rigid envelope is formed around the fruit, which prevents loss of aroma by evaporation. The paraffin substance is quite inoffensive and is removed with the peel—there seems, therefore, no objection from the hygienic point of view. In this way a delicate and highly perishable product may be put on the market in excellent condition, despite long journeys.

Good results have been obtained with figs stored at 32 to 34 deg. Fahr.

CONCLUDING OBSERVATIONS.

I.—The storage temperature and the commercial storage life at these temperatures are given for a number of fruits and vegetables either indigenous to, or which may be grown in, the tropics.

II. The maximum and minimum temperatures for safe transport, which would be valuable to prospective shippers, are given in a few instances only, as, unfortunately, the shipment of vegetable food products of tropical origin over long distances has received comparatively little attention; accounts of storage trials give, as a general rule, little more than the commercial storage life of a commodity at one particular temperature; in transport, the storage chambers should be maintained at as near that temperature as possible. Experiment will later define the margin of safety.

III.—With cargoes which are to be carried at low temperatures (32 to 40 deg. Fahr.), pre-cooling of the fruit at the harbour cold store, immediately prior to shipment, is very strongly recommended.

IV.—In storage compartments, particularly where refrigeration is effected by exposure to cold brine pipes (stagnant cold air as opposed to the cold air blast system), the use of "dunnage"—thin strips of wood nailed on the crates—to allow of the passage of cold currents between successive tiers of crates has proved decidedly advantageous.

V.—Care in harvesting and packing, to avoid mechanical injury, is essential to consistent successful shipment. The determination of the optimum conditions of transport, by the often slow process of elimination of unfavourable conditions, has frequently been delayed unnecessarily, through failure to observe carefully this condition; for the purpose of experiment the use of material, other than carefully picked, unbruised, thoroughly sound specimens, cannot be deprecated too strongly.

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CLIMATOLOGICAL TABLE—NOVEMBER, 1929.

SUPPLIED BY THE COMMONWEALTH OF AUSTRALIA, METEOROLOGICAL BUREAU, BRISBANE.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.				Total.	Wet Days.
		Max.	Min.	Max.	Date.	Min.	Date.		
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·88	88	76	95	27	65	5	106	3
Herberton	..	87	63	99	6	48	4	505	6
Rockhampton	29·88	91	69	102	4	62	3	315	7
Brisbane	29·88	84	64	100	25	54	8	125	10
Darling Downs.									8
Dalby	29·85	89	61	104	24	49	7, 27	215	4
Stanthorpe	..	78	51	93	24	34	7	265	9
Toowoomba	..	82	56	96	24	45	7	199	7
Mid-interior.									
Georgetown	29·82	99	72	107	6	58	4	110	5
Longreach	29·79	99	70	112	24	63	28, 2	69	5
Mitchell	29·84	90	62	105	24	46	7	201	4
Western.									
Burketown	29·82	98	76	105	5, 28	68	4	82	2
Boulia	29·80	102	64	113	24	57	28	61	2
Thargomindah	29·81	91	67	106	3	59	28, 6, 7	115	3

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF NOVEMBER IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1929, AND 1928, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Nov.	No. of Years' Records.	Nov., 1929.	Nov., 1928.		Nov.	No. of Years' Records.	Nov., 1929.	Nov., 1928.
North Coast.	In.		In.	In.	*South Coast*—continued:	In.		In.	In.
Atherton	2·07	28	4·22	5·54	Nambour	3·77	33	2·52	0·64
Cairns	3·91	47	0·87	7·11	Nanango	2·62	47	0·92	3·22
Cardwell	4·06	57	2·58	9·43	Rockhampton ..	2·17	42	3·15	1·70
Cooktown	2·63	53	1·06	4·39	Woodford	3·17	42	2·30	1·78
Herberton	2·50	42	5·05	5·15					
Ingham	3·71	37	2·05	13·89					
Innisfail	6·13	48	3·26	13·68	*Darling Downs.*				
Mossman	3·99	16	5·04	13·51					
Townsville	1·82	58	0·25	3·59	Dalby	2·66	59	2·15	2·70
					Emu Vale	2·62	33	1·74	1·09
Central Coast.					Jimbour	2·37	41	1·29	3·99
					Miles	2·39	44	0·73	2·25
Ayr	1·70	42	0·20	3·96	Stanthorpe	2·72	56	2·65	1·73
Bowen	1·31	58	0	3·49	Toowoomba ..	3·24	57	1·99	1·63
Charters Towers ..	1·49	47	0·99	5·04	Warwick	2·59	64	1·48	2·02
Mackay	2·98	58	0·51	10·75					
Proserpine	2·87	26	0·31	6·53	*Maranoa.*				
St. Lawrence	2·28	58	0·64	5·29					
					Roma	2·06	55	1·33	1·52
South Coast.									
					State Farms, &c.				
Biggenden	2·66	30	5·15	2·03					
Bundaberg	2·50	46	2·38	1·49	Bungeworgorai ..	1·99	15	1·41	1·06
Brisbane	3·71	78	1·25	2·90	Gatton College ..	2·76	30	1·70	1·77
Caboolture	3·34	42	1·67	1·73	Gindie	2·07	30	0·60	2·65
Childers	2·65	34	3·93	1·51	Hermitage	2·63	23	1·16	1·30
Crohamhurst ..	4·28	36	3·44	0·91	Kairi	2·11	15	2·41	6·14
Esk	3·20	42	2·32	1·68	Mackay Sugar Experiment Station ..	2·66	32	0·90	6·87
Gayndah	2·82	58	2·52	1·93	Warren	2·96	14	..	4·17
Gympie	3·11	59	2·49	1·38					
Kilkivan	2·52	50	3·32	1·38					
Maryborough ..	3·06	57	4·26	0·91					

GEORGE G. BOND, Divisional Meteorologist

RURAL LIFE IN OTHER LANDS—VIII.

By the EDITOR.*

LAND TENURE.

BEFORE continuing our consideration of some phases of rural life in other lands I should like to say something on forms of land tenure that exist and have a great influence on farming life in some of the countries of Europe, and of which one saw many examples in actual application.

The Scandinavian countries, and more particularly Denmark, show the most satisfactory results from their system of land tenure than any other of the older countries from what I was able to gather and as far as my knowledge goes.

Of course, we are now dealing with countries of well-established primary industries, thickly populated, with markets at every gate, and guided by many centuries of experience and tradition. And, though it is always worth while studying the systems whether of land tenure or of farming practice in the older countries, we remain conscious of the fact that, under an entirely different set of conditions as exist in Australia, they might not be so successful.

Systems of Land Occupation.

Before going into the details of the more or less identical Danish or Swedish systems and methods, and the results produced from them, it would be as well, perhaps, to survey rapidly the different systems of land occupation which have been tried, and still survive in one form or another, since man emerged from his wandering tribal days. I am using the word tenure in its general sense, with no legal or technical limitation. For example, where the majority of farmers own their farms, the system of tenure is occupying ownership. Where they rent the farms they occupy, they do so under the tenancy system, whether they rent their land from an individual or from the State. Where, as in some parts of Europe, the commune or local authority owns the land and allots it to its members, we have the communal system. And when the farmers, instead of working individual holdings, cultivate the soil collectively, then we have the communistic system of tenure. There are very few examples of the communistic system, however, and none that I know or have read of, outside religious orders, are very successful. Where a country or State owns the land on behalf of its people, we have a system of State ownership. The system of ownership by the commune and State ownership are closely related, but there is a vast difference between them and private occupying ownership.

Evolution of Land Ownership.

A study of the history and evolution of civilisation tells us that at one time, in the earliest ages, there was no ownership of land. Primitive man did not own land either collectively or individually, and probably did not want to own it. To him his country was nothing more than a hunting-ground, more or less happy according to the abundance of game and the risks he had to take in getting it.

Then, in the next stage, our forefathers in the long ago thought it would be a good idea to domesticate some of the animals they spent most of their time in hunting. They found it more convenient and certain to keep to-morrow's breakfast or next week's supplies tied up near their gunyas or tethered to a sapling just outside their cave, just as our own aboriginals in some parts of Australia are said to keep their next day's dinner—a crocodile, perhaps—tied up under the house. Sheep in a station ration paddock to-day is evidence of the survival of this custom.

Then followed the tribal system under which a tribe had a more or less right to certain areas over which its members hunted, and on which their stock grazed. Any encroachment by another tribe on their selection was promptly and forcibly resisted. This system survives to-day in Australia among aboriginal tribes who are still more or less beyond the range of European settlement.

As civilisation advanced, not only did these tribal areas become more clearly defined, but portions were allotted gradually to individual members of the tribe to cultivate. Land may have been cultivated collectively in some cases, but there is little evidence of this, and, in any case, that system was soon superseded by individual cultivation of plots allotted by the tribe or commune. As civilisation further developed, the desire of the individual to own the land he tilled became stronger and stronger, until to-day we see in all of the older civilised countries most of the land in the hands of private individuals.

* In a Radio Talk through 4QG.

Security of Tenure a Natural Desire.

To own the land one cultivates, or to have at least absolute security of tenure, seems to be a very general human instinct. We are all familiar with the evils that have grown up around the monopoly of land; we have seen, as in England during the past century, the control of vast areas of country concentrated in the hands of comparatively few people. So the tenancy system grew, and we know the efforts of British statesmen in recent times to mitigate some of the obvious evils that grew out of that system, and which still present a perplexing problem. In comparison, I should say the Scandinavian system of occupying ownership, as against the British system (changed somewhat, admittedly, in later years) of tenant farmers, is far better.

On the other hand, France gives examples of the ridiculous extremes to which the principle of occupying ownership can be carried. Small farming properties there have been so divided and subdivided until, in many cases, an unworkable unit is arrived at. In one extreme case a farmer (one could hardly call him a farmer on such an area) owned a strip of land, little broader than a single furrow, just a yard wide and half a mile long.

A Danish Example.

In Denmark these evils have been remedied or avoided; in districts where small holdings are the rule, no one individual is allowed to buy out his neighbours and turn an aggregation of small areas into one big farm. The influence of the old system of primogeniture—that is the succession to the land title by the first-born or eldest son—has also been against excessive subdivision.

About eighty years ago the land conditions in Denmark were similar to the rural conditions in other countries of Europe to-day, and the Danes discovered that there was something "rotten in the State of Denmark." Eighty years ago 88 per cent. of the occupiers of Danish farms were tenants of great landowners, and only 12 per cent. of the farmers owned the land they cultivated. The Government of the day realising that the tenancy system was against the best development of the land, and that it did not encourage high standards of cultivation, set about increasing the number of occupying owners. In this work the Government, oddly enough, received every assistance from the big landed proprietors, who saw the business in the idea from a national point of view. All sections worked to raise the standards of agriculture and the status of the agriculturist. To-day only twelve out of every hundred farmers in Denmark are tenants of a landlord. The other eighty-eight own their own land. And the result of this policy, carried out more scientifically and wisely than perhaps in any other country, is that we see in Denmark to-day a nation with a highly developed country life and prosperous rural industries. The country people there, too, enjoy a very high standard of rural education, and consequently there is no difficulty in securing united co-operative effort to still further develop agriculture in every direction.

A Balance between Individualism and Collectivism.

In Denmark one sees the most perfect balance between individualism and collectivism, for the Dane as an individual is an active, virile, independent man, working on his own and for himself: yet he is sufficiently educated to understand that at a certain point collective action is necessary—not only for the good of the community, but to secure the full result of his efforts as an individual. In this attitude of mind, in the results of the balance of individualism and collectivism there are, if I may so suggest, some sound lessons for the Queensland farmer.

There is no standing still, or marking time, or waiting for the weather to break, or until after Christmas, about the Danish people. The area of the land under cultivation is being constantly and successfully extended; bog land has been drained and turned into rich productive soil; light sandy soil has been built up gradually and turned into excellent easily-worked land for small holdings. Yields have steadily increased, and the scientist is yoked up in double harness with the field worker, and with it all the Danish farmer has been able to provide a sound business organisation at the selling end of every crop.

Denmark remains the only example in the world of a country in which it is possible—and it has been done—for a working man to found an agricultural college.

The resourcefulness of the Danes is illustrated in another way. During the war her coal supplies from England on which she depended for light and fuel were cut off. To meet this situation the agricultural co-operative societies erected electrical plants to provide power, heat, and light to carry on their essential industries.

The whole history of Denmark is one of progress, and, in my opinion, the primary cause of that progress was the substitution of a system of occupying ownership for occupying tenancy.

SOOTY OR PITCHY MANGE IN PIGS.

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

Note his been made on several occasions recently of a form of skin disease in pigs, technically referred to as Sooty or Pitchy Mange and which, to the eye of the layman, resembles the condition illustrated in Plate 33 of a pig suffering from Sarcoptic Scab, another type of skin disease, much more serious in its effect on the animal and much more difficult to eradicate. Sooty or Pitchy Mange, according to Mr. C. J. Pound, Government Bacteriologist in Queensland, is frequently a symptom of internal disease of such a nature as to cause general ill-health and result in the skin and hair becoming hard, dry, scurfy, and altogether unhealthy.

It is impossible with the naked eye to definitely determine the real cause of these skin diseases, for the parasites responsible for these troubles are so minute. This disease is differentiated from true mange by the very intense itching, but with certainty only by the discovery of the parasites which is usually easy upon microscopic examination.

The diseases are sufficiently important and their effect on the animals so serious, that no effort should be spared to have the cause of an outbreak investigated, and in this connection farmers whose pigs are affected with skin diseases are invited to communicate with officers of the Department of Agriculture and Stock with a view to having the condition investigated.

The following treatment is likely to prove useful in both forms of Sooty or Pitchy Mange (i.e., where due either to parasitic infection or to internal trouble).

Cleanse the affected parts thoroughly by washing with warm, soapy water, to which some disinfectant solution has been added; then dry with a soft cloth and dress with a mixture composed of—

Raw linseed oil	1 quart.
Hycol disinfectant	1 teaspoonful.
Flowers of sulphur	4 oz.

Mix the flowers of sulphur with a small quantity of the oil first, then add balance of the oil and finally add the Hycol disinfectant, stirring the latter well into the mixture before applying to the skin. Repeat the application for several days and keep affected stock isolated from healthy animals and under improved hygienic conditions, feeding liberally on soft, nourishing foods, allowing ample supplies of clean drinking water, greenstuff, and mineral matters. The pens or yards in which the affected animals have been housed or fed should be thoroughly cleaned up and all rubbish and litter burned. The woodwork should be limewashed and/or disinfected, and kept clean and free from accumulations of mud and filth.

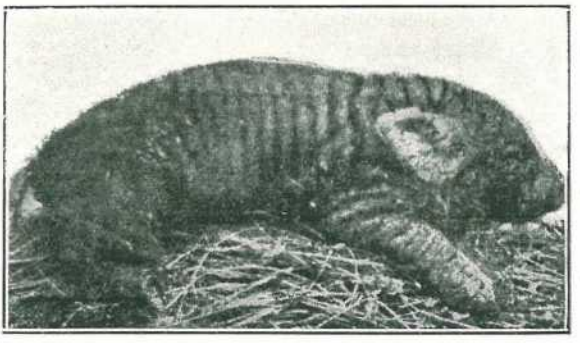

PLATE 33.—SARCOPTIC SCAB IN THE PIG.

A disease of the skin causing the animal intense pain and irritation and affecting growth and appearance to such an extent as to render affected stock unmarketable and distinctly unprofitable. Pigs affected with Sooty or Pitchy Mange have a striking resemblance to the pig affected with Sarcoptic Scab.

OTHER FORMS OF MANGE IN PIGS.

*Mange Mites.

Mites belonging to two genera cause mange in swine, *Sarcoptes scabiei suis* and *Demodex folliculorum suis*. These parasites spend their entire life on the host and live on the blood and tissues of the animal they attack.

The body of the Sarcoptic mite is rounded above and flat below. Its size is about one-fiftieth to one-sixtieth of an inch. The thoracic and abdominal regions are more or less united, the epidermis is transversely striated, and bristles are present on the back. The mandibles are shaped like a crab's claw. They possess four pairs of short thick legs. In the male the hind legs are equal in length, suckers being present on the first two pairs of legs. The males are smaller than the females. If the mites are placed on a dark background they are just visible to the naked eye, but a lens or the low power of a microscope is necessary for identification.

The female mange mites burrow into the skin and lay eggs in the burrows. In from three to ten days the eggs hatch and the young mites, after moulting several times, begin to lay eggs in ten or twelve days. By this time they are near the surface, due to the normal shedding of the epidermis and to the rubbing of the infested animal. The young mites then make fresh burrows in the under surface of the skin and repeat the process. The irritation is severe, and the sensitive areas become inflamed and swollen. The swollen areas are larger than pinhads and have dried serum adhering to them. As the number of mange mites increase the raised areas become closer together, the hairs fall out, scabs are formed which rub off, and the serum oozes out and often a raw surface is left. Later the skin is corrugated, and in chronic cases wrinkles are left. If badly affected the animals become emanciated, and if left untreated will die.

Diagnosis consists in finding the mites by means of scraping the affected parts of the skin with a blunt-edged knife and examining the scrapings under a magnifying glass or by treating the scrapings with a hot 10 per cent. solution of caustic potash and examining under a microscope.

Sarcoptic mange is contagious and is generally spread directly by contact of one infested animal with another. Man may become infected and extreme irritation results for about thirty days, but the mites will not live much longer than that on another host. Crowding and unclean conditions predispose to the rapid spread of the disease. Weak, unthrifty animals are more prone to mange than healthy ones, and pigs fed upon a vitamin-deficient ration are very apt to suffer from this and many other diseases. The mites do not multiply after leaving an animal, but remain alive for two or three weeks or longer, and their eggs can survive for nearly as long under suitable conditions.

Pigs suffering from Sarcoptic mange should be treated with (1) crude petroleum, (2) cotton-seed oil and kerosene in equal parts, or (3) kerosene and lard, 1 half-pint of the oil to 1 lb. of the lard. These preparations may be applied with a brush or cloth and rubbed well in. Freshly treated pigs should not be allowed to become chilled, should not be moved rapidly, or subjected to strong sunshine. All litter should be destroyed by burning and the sty thoroughly disinfected before using for healthy pigs.

*Demodectic or Follicular Mange.

This is caused by a very small mite, *Demodex folliculorum suis*. It is wormlike in shape; the cephalo-thorax is followed by a transversely striated abdomen which gradually tapers towards the end. It is about one-hundredth of an inch in length; the male is smaller than the female. These parasites are found in the hair follicles and sebaceous glands of the skin, where the whole of the life cycle is completed. The parts of the pig's body most favoured by the parasites are the under parts of the head, neck, and abdomen and inside the thighs. The lesions often commence round the snout and the eyes and spread to the surrounding parts. The parasites are generally found in clusters and cause pustules, which often run together and form cavities and scales. If badly affected, pigs will become unthrifty, and septic sores and scabs on the animal appear and give an opportunity for bacteria to gain an entrance to the skin. The condition is not a very common one in swine, and is more serious in the dog; other animals affected may be cattle and goats. The best method of treatment for pigs affected by these parasites is the regular application of crude petroleum to the affected parts.

*From an article on "Some External Parasites of Swine," by Mr. K. D. Downham in the "Pig Breeders' Annual," 1929-30, and reproduced also in "Q.A.J." October, 1929.

THE BATTLE OF THE BREEDS.

E. J. SHELTON, Senior Instructor in Pig Raising.*

Conditions in the live stock world in these twentieth century days are vastly different to those common during the eighteenth century and during earlier years when improvement in live stock really began, and when our forefathers took up in real earnest the domestication, selection, breeding, and development of the several types of live stock they were able to secure and control on a commercial basis.

Nowadays, it is quite a difficult contract to differentiate between the various breeds as to which is actually the most profitable, and quite as difficult to determine whether there is any one breed so much better than the others as to warrant it receiving special consideration when the question of selection of a breed is under review.

We speak of the battle of the breeds then as indicating the struggle for supremacy in which the various breeds are engaged. In the pig world in Australia we have nine different pure breeds of pigs, all of which are catered for and included in the herd-books of the Australian Stud Pig Breeders' Society.

These breeds are known by names which largely indicate their place of origin or the country or State in which they were originally developed and popularised, and comprise two principal groups, first the British breeds, and secondly those originating in America and coming to us through Canadian avenues.

The Berkshire.

Of British breeds the most widely distributed is the Berkshire, originating in Berkshire and adjacent counties in England, and now distributed throughout almost every country in the world. The Berkshire, black in colour with white points, is of a dual purpose nature, good alike for use in the production of pigs for the pork and bacon trade and for stud purposes. Standing at the head of the list in the Australian pig world, the Berkshire issues a challenge to all other breeds to be up and doing.

The Yorkshire.

The Yorkshire breed, of which we have two distinct types—the Large Yorkshire, or Large White, and the medium type known as the Middle York, or Middle White—is well known also, and has been popular in Australia ever since pig breeding first began. These White Yorkshire pigs have, however, in recent years in Queensland lost a good deal of their former popularity, and are not now so widely bred as they were a few years ago. This falling off in popular favour is not altogether due to any particular weakness in this class of pig, but is largely due to an inherited tendency in the breed to produce pigs which, while of excellent quality and capable of complete development, are, nevertheless, somewhat soft in the skin, and are subject to sunburn and sunscald unless they are carefully tended and given improved conditions in regard to housing and accommodation. The Large Yorkshire has not as yet (January, 1930) been introduced or popularised in Queensland, but it is quite certain that before very long enthusiastic fanciers of this type will have available for sale selected males and females of this very desirable breed. The Middle Yorkshire has been with us for many years, and was for quite a long time popularised and distributed by that grand old Berkshire-Yorkshire fancier, the late Mr. W. J. Warburton, popularly known as "Old Warby," of the Northgate Stud, Northgate Junction, a few miles outside Brisbane. Unfortunately, the original stud was dispersed on the death of its founder, though one or two of the sons still carry a few of these popular pigs. These breeds were originally also distributed largely through the efforts of that venerable and enthusiastic citizen, Mr. W. R. (or more frequently known as "Billy") Robinson, of Toowoomba, who has, through a long series of years, interested himself and many others in the gospel of "better pigs on every farm."

The Tamworth.

It is forty or more years since the Tamworth, the red pig of old England, was first introduced into this part of the world, and all through these years the breed has been spoken of as one of the best for crossbreeding with Berkshires and similar types for the production of prime quality, fleshy bacon. Originally developed and distributed from Tamworth, one of the midland counties of England, this red breed has, during recent years, had a very wide distribution throughout the world, and

* In a radio talk from 4QG.

though decidedly unpopular still with many of the old-time farmers, is gradually breaking new ground, and is becoming more popular as the years go by. We must thank the Chirnside family in Victoria, and the Hawkesbury Agricultural College in New South Wales, for the introduction of this type, and for the part they have played in periodically introducing fresh strains. The Tamworth's red colour distinguishes him from any of the other British breeds, and his suitability for the purpose for which he is kept stands almost unchallenged.

The Gloucester Old Spot.

It is but a dozen years or more since the Gloucester Old Spot—also spoken of as the G.O.S. breed—was introduced from Great Britain, the country of its origin. For many years this was the most popular local breed in Gloucestershire and adjacent counties in England, and was looked upon there as the ideal pig for general farm use. Its introduction into Australia in the care of Mr. A. E. Ball, now of Victoria, was arranged through the G.O.S. Pig Society of England, the objective being to widen the field and pave the way for a very liberal, though later, importation of this class of pig into the Commonwealth. The G.O.S. has had a very good run, it has become popular in all the States, and bids fair to become one of the most popular of all the breeds in this great Southern land. Black and white spotted in colour, and of a very growthy type, this old-world breed has a special appeal to all those who like big roomy stock capable of rapid development, early maturity, and an ability to put on large quantities of flesh with a minimum of feed and attention. The breed has a popular reputation both for pork and bacon production, and also for stud-breeding purposes, and has already proved in the show ring as well as in commercial pig keeping its ability to stand up to the conditions and make good progress. The Kingston Pig Farm Company have the largest stud of this breed in Queensland, and were among the first to have them introduced.

The Large Black.

Originally referred to as the British Large Black or the Old Devonshire breed, this old-world large black breed is whole black in colour, and has the long drooping ears characteristic of both this and the G.O.S. breeds. Long and deep in body and of a distinctly bacon type, the Large Black has been introduced specially for crossing with Berkshires, Poland-Chinas, Yorkshires, and similar breeds for the production of bacon pigs of a fleshy and desirable type. Popularised very largely in the first instance in New South Wales by Mr. Herbert Garrett, of the Loch Maree Stud then at Randwick, this breed has had a wide distribution, though during recent years the older strains have given place to more recently imported and more up-to-date types. The breed was recently introduced into Queensland through the generosity of Captain H. N. Callcott, of the Wattle Herd of Large Blacks at Gigarre, Victoria, who presented to the Queensland Schools Pig Club Scheme a very fine Large Black boar, since then the winner of many championships here, and the foundation sire of Mr. George Davison's stud at North Arm. The winning of this boar at a Pig Club Contest by Master George Davison led to the purchase for their stud of a very fine sow, Wattle Violet, a profitmaker of the very best type, and thus the breed has been introduced into this Northern portion of the Commonwealth. There are many fanciers of this roomy, deep-bodied type, and they have a good future before them.

The American Breeds.

The battle between the British and the American breeds is being waged in quite a businesslike way, for both sides are out to win, and both are prepared to spend both time and money in the struggle for first place.

Of American breeds we have but three, as against six of British origin, but there are several extremely enthusiastic breeders of the American types who count this no great hindrance to their progress.

The Poland-China.

The Poland-China, black in colour with white points, was the first of the American breeds to be introduced and distributed, and for many years this breed has forged ahead against the odds and has won considerable ground, their only disadvantage being that, unless very carefully handled, they are of a type that fattens rather too readily on the class of food largely used in pig-breeding activities in this State. The breed crosses remarkably well with the Tamworth, and doubtless in years to come a very great deal more will be heard of this popular cross than at present.

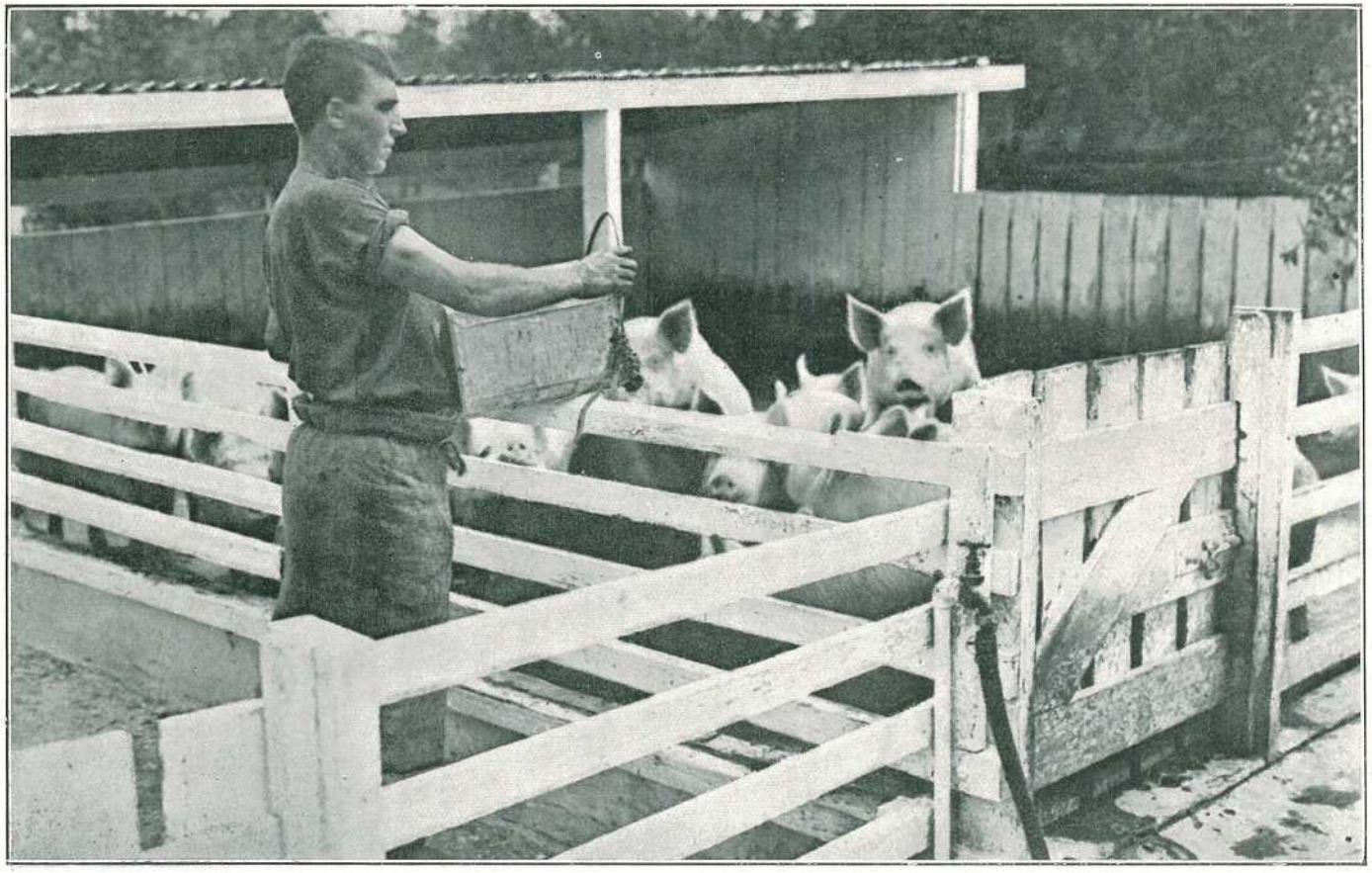

PLATE 34.—DOWN ON THE FARM.

A familiar scene on the farm where pig raising occupies the position its value and importance demands. These Yorkshire-Berkshire cross pigs are of a type much in demand by both pork butchers and bacon curers, and were healthy, well developed, and full of profit.

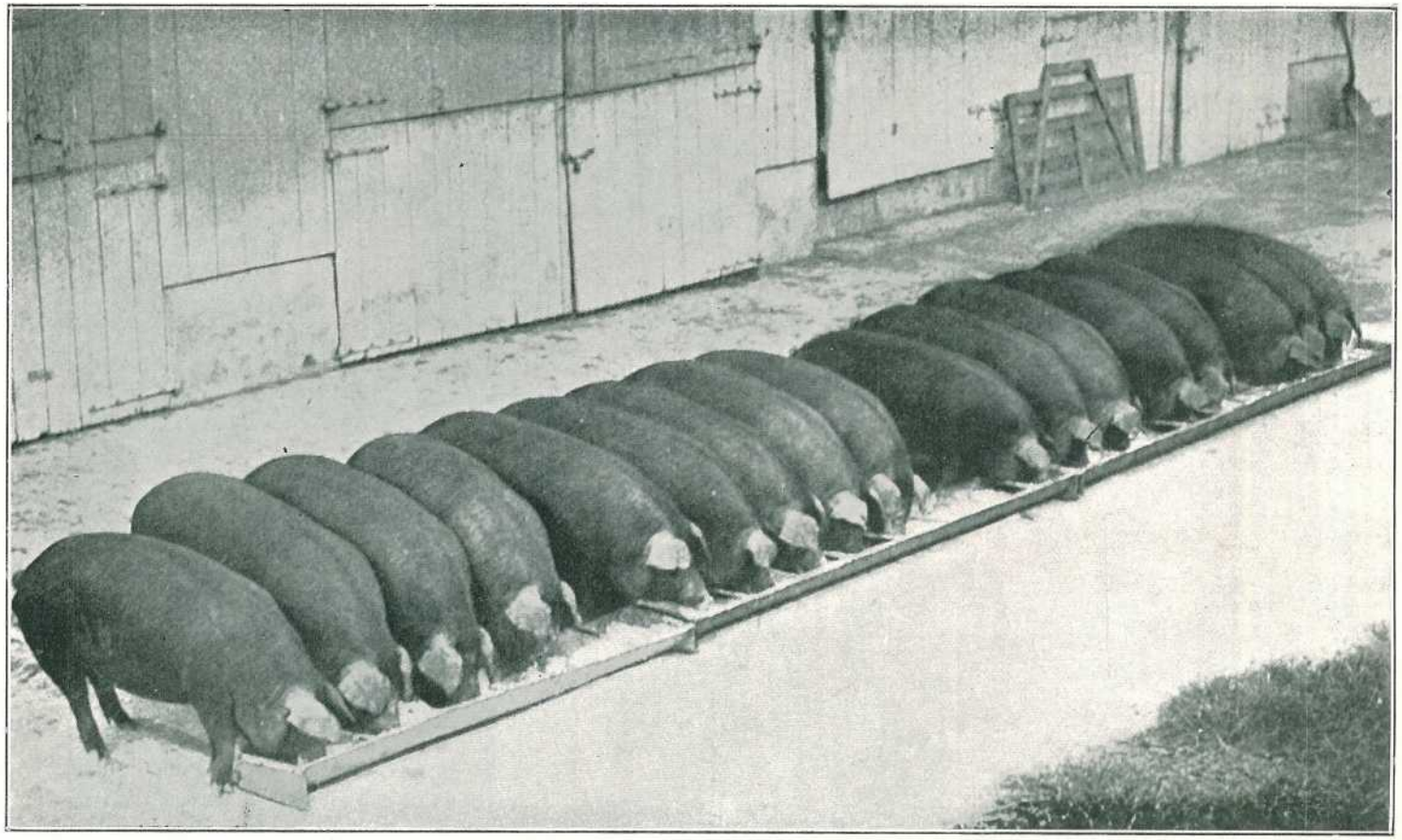

PLATE 35.—PIGS FOR PROFIT.

This is the litter that, in 1928, was classed as the World's Champion Litter of Duroc-Jersey Pigs—seventeen pigs in one litter weighing more than two tons when six months old. They were described as profit makers of the most up-to-date type. They were born and bred in the corn belt of the United States of America.

The Duroc-Jersey.

In the Duroc-Jersey, the red pig of American origin, we have a breed very similar in shape and appearance, but quite distinct in colour to the Poland-China, and a breed that has gained immense popularity during the comparatively short period it has had a place in our pig industry. Useful alike for crossbreeding for pork and bacon production and for stud-breeding purposes, these American breeds have taken a stand from which it will be difficult to shift them, and as they are already popular, it would appear they will be well worth watching as time goes on.

The Chester White.

More recently still another American breed—the Chester White—has been introduced and is taking its place for the purposes of crossbreeding, probably principally for bacon pig production, though they have a good reputation in the United States of America as a good all-round farmers' pig. This breed is distinctly white in colour, and also has small lopped or drooping ears, a characteristic familiar to all the American breeds we have so far introduced, though the ears are smaller than in the case of the Large Black and G.O.S.

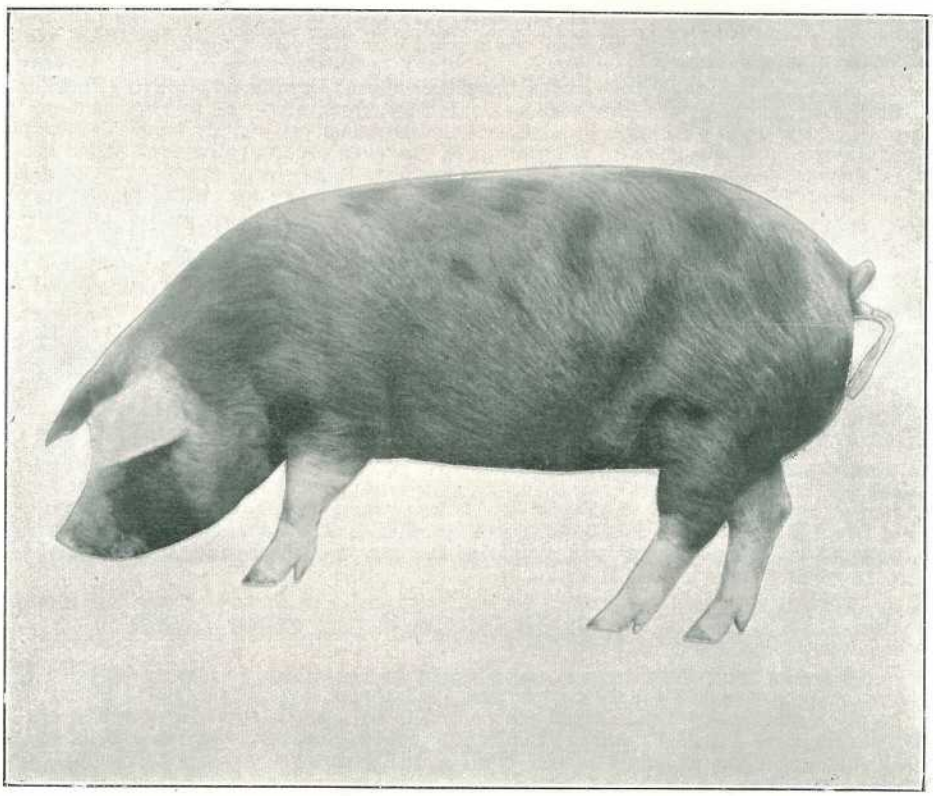

PLATE 36.—A PRIME QUALITY BACON PIG OF DESIRABLE TYPE AND WEIGHT.

Queensland bacon factories pay top prices for prime quality baconers, 95 to 120 lb. dressed weight, and for such there is an ever-increasing demand.

It will be seen, therefore, that with nine excellent quality and well-recognised breeds of pigs, six of British and three of American origin, all competing together in the battle of the breeds, some interesting results may be looked for; while a considerable amount of publicity will be necessary to still further popularise all or any of these that show distinct evidences of superiority, and that are able to stand up to the competition better than others in this fight for commercial supremacy in the Australian pig world.

THE BABCOCK TEST OF PORK PRODUCTION.

Through the courtesy of Dr. John M. Evvard, the American authority on swine production, accorded to the Senior Instructor in Pig Raising, Mr. E. J. Shelton, we are able to publish the following outline of what he refers to as the Babcock Test of Pork Production, a story in which readers generally will be interested, whether they are engaged in the production of pigs or not. Dr. Evvard has written many interesting and informative reports, and though the figures refer to American conditions, they are equally applicable in their own way to conditions in Australia.—ED.

Speedy gains are the key to what we may call the "Babcock Test of Pork Production." You know all about the Babcock test for milk production—how the use of a simple outfit for determining butter-fat content has helped dairymen to cull out poor cows, and build up herds that, instead of yielding 300 lb. of butter-fat yearly, produce 700 to 1,000 lb.

My colleagues and I here at the Iowa Agricultural Experiment Station (United States of America) have been seeking an equally effective way of finding out how to select the most profitable pigs, just as the dairyman can readily know his best paying cows. I am going to tell you about this most practical discovery, which is so simple that we marvel it has been overlooked so long.

Since 1910 we have studied the productive efficiency of hundreds and hundreds of swine. We observed that the most profitable pigs were those that made the most rapid gains, with very few exceptions. We also found that if we wanted pigs to weigh 200 lb. and more at six months of age, we succeeded better when we selected breeding sows whose brothers, sisters, and sons and daughters, and other near relatives showed rapid gaining abilities. We also noted that if we used boars which came from rapidly-gaining strains, mating these with the rapidly-gaining strain of sows, the offspring weighed much more at six months of age than when we used sires and dams that came from slow-gaining blood lines. So here we have our clue. The rapid gainers were the most efficient for the breeding herd.

Our next step was to study thousands of swine to determine whether or not the feed requirements of the rapidly-gaining animals were less than those which reached marketable age slowly. We studied the records of a multitude of pigs from the time they were weaned at 40 lb. until they went to market at 225 lb. We learned that pigs which gained only ½ lb. per head between sunsets took approximately 486 lb. of feed for each hundredweight of gain. Pigs which gained 1 lb. per head daily took only 430 lb. of feed for the same weight of increase, or 56 lb. less for the 100 lb. of pork yield. That was gratifying.

We proceeded and found that pigs which put on 1.5 lb. daily took even less feed than the 1-lb. gainers, or only 374 lb., thus showing another decrease in feed requirements amounting to 56 lb.

The conclusion is evident; to get efficiency of production, to make a bushel of corn and other feeds yield the most in pork products and by-products, it is necessary to pick out "speedy" pigs which put on weight at a rapid clip. By speeding up the gain from 1 to 2 lb. per head daily, the feed requirement was cut 112 lb. on the hundredweight of gain attained. That is real economy.

In analysing our figures more closely we discovered that for every one-tenth of a pound of extra gain put on by the pigs we saved 11 to 12 lb. of feed per 100 lb. of pork made. And a tenth of a pound extra gain per head daily makes approximately 3 lb. more weight per month, some 18 lb. greater production in six months.

Forty-pound pigs that gain a pound daily take 185 days to reach the handy marketable weight of 225 lb. (as sought after in the United States of America), whereas the more efficient pen-mates which gain 1.1 lb. in the average twenty-four hours take only 168 days to reach the same marketing goal. Here we have a saving in time of seventeen days, and that is another advantage.

Thus by increasing the rapidity of gains we save feed, time, labour, overhead expense, and likewise we save even more by reducing the risk of sickness and death. Then, too, the pigs that reach the market weight the quickest usually sell for better prices, because the earlier markets for spring as well as fall (autumn) pigs are

higher than later ones. With a faster turnover you have money longer in the bank, and not so long in pigs. Hence, everything considered, it is a profitable proposition to produce pork with pigs which put on gains so quickly.

The profit for future years should be the greater when we apply in practice these facts presented herein and use for breeding stock those members of the herd which show the most speed in attaining the mature weight. By mating high-gainers with high-gainers the progeny are more efficient than if we follow the opposite procedure, and the resulting offspring should make more pounds of pork per bushel of corn and other feed fed.

It is profitable to follow the rigid policy of selecting only those individuals which come from rapidly-gaining strains for the breeding herd. If this practice is executed year after year, the swine herd should be placed upon a high plane of efficiency from the production and early marketing standpoints.

Some of my friends have been selecting for market the gilt (sow) pigs which have done the best, put on the most rapid gains. The temptation to do this is strong, because such pigs are usually ready to sell before the market prices begin to drop in the fall or late spring. Such procedure, however, takes from the herd the best individuals, thus handicapping future breeding progress.

It is common practice on the part of a great many to separate selected breeding gilts from the growing and fattening herd when they are four or five months old. If one does this, but finds later that the brothers and sisters of any selected gilts do not make acceptable gains in the market-fed group, it is wise to discard that particular gilt from the breeding-yards. We judge the future breeding efficiency of the gilt, not only by her performance but also by the development of her closest relatives. It is certainly true that "blood tells."

We are anxiously awaiting the day when thousands of our progressive swine-breeders will be producing 200-lb. pigs for market in four to five months.

THE EMPIRE PIG BUSINESS.

THE BRITISH MARKET.

The twelfth report of the Imperial Economic Committee, just issued, deals with pigs and pig products. It emphasises the great hold obtained on the main bacon market in the United Kingdom by foreign competitors who have concentrated on the production of a standardised type of pig and organised the trade in bacon on a national basis. Taste in pig products varies in different parts of Great Britain, but the report states that:—

"A general change is in progress in the prevailing taste. . . . A liking for smaller and leaner cuts in place of fat heavy joints was becoming apparent in England in the latter half of the last century. The lean type of bacon and ham, and the small cut of pork, are now firmly established as the predominent requirements throughout the South of England. In the Midlands the demand is for a somewhat fatter product and for sausages, pork pies, and "processed" meats, whilst further north still fatter products find a ready market."

In spite of these local differences the general preference for the lean type of bacon is growing. Danish farmers and bacon factories have concentrated on supplying this type.

Ninety years ago Great Britain was an exporter of pig meat, but to-day is dependent on imports for two-thirds of its supply. Nearly half the total imports, which altogether are valued at £55,000,000 a year, consists of bacon from Denmark, in which practically only one type of pig—evolved largely from the large White Yorkshire strain—is maintained. Payments are based on weight and quality grades, and all exports are subject to constant and strict inspection. The vast majority of pigs give dead-weight carcasses between 132 and 158 lb., lower prices being paid for carcasses outside this narrow range. Bacon so produced is marked in England as "Danish," and not under factory brands. It is all of the mild-cured type, and a very regular supply is maintained.

Dominion Supplies.

At present the whole of the overseas Empire contributes less than one-seventh of the total imports of pig products into the United Kingdom. Canada and the Irish Free State are the chief suppliers. Since the war New Zealand has been developing a very useful trade in frozen pork, both for sale as pork and for curing into bacon.

The consumption of pig products in the United Kingdom, though below those of Canada and the United States, has increased since the war by about 50 per cent. in weight and 100 per cent. in value, due almost wholly to larger imports of lard, bacon, and frozen pork. Foreign countries have received almost the whole benefit of this expansion.

Conditions of Competition.

The report emphasises the necessity for meeting consumers' tastes and of maintaining a regular supply. It contains a statement by representatives of both the bacon and pork trades of the characters to which the products should conform to meet the main market and of the breeds which yield carcasses of the requisite types. The report points out the great possibilities which exist within the Empire. It expresses the definite opinion that these possibilities are unlikely to be realised without organisation amongst the producers and the adoption by them and the curing industry of a joint common policy.

Research.

The report advocates that entry into the herd books should be dependent upon commercial performance and not only on show points. It advocates further research into the problems of nutrition generally, but states that—

> "from the point of view of the substitution of Empire products for those of foreign countries, perhaps the most fruitful line of research lies in the effort to make possible the carriage, without detriment, of mild-cured bacon from the Southern Dominions."

Preliminary experiments conducted at Cambridge on the freezing and cold storage of bacon are full of promise. They indicate that with certain modifications of present practice the problems of transport of mild-cured bacon from the Southern Dominions should be possible. The report strongly advocates that those experiments should be continued and developed with a view to testing their results in commercial practice.

Competitors Comparatively Few.

In spite of the large size of the import trade into Great Britain, supplies are drawn from comparatively few countries, the chief being Denmark, United States, Sweden, and Holland. The trade from the United States consists mainly in lard and hams, and it is possible that countries in the Empire producing large crops of maize might compete in that trade. The portions of the Empire in which the possibilities at present are most promising are the Irish Free State, Canada, Australia, New Zealand, and South Africa.

The report emphasises that regularity of supply is essential for a steady trade. "The idea that the top of the market can easily be caught by an 'in-and-out' policy is an illusion."

The committee envisaged "a great problem—nothing less than the replacement of the foreigner by the Empire farmer in the main supply of the standard article to the British market." For this standards of size and quality, adequate quantity, regular supply, and competitive prices are essential.

"The general effect of our report may be summed up in the words—the mobilisation of the producer. The benefits to the small farmer of a successful pig industry are so obvious as to justify, in our opinion, a great co-operative effort involving the farmers and traders of the Empire and, indeed, the Governments."

Answers to Correspondents.

PIG RAISING.

Replies selected from the outward mail of the Senior Instructor in Pig Raising, Mr. E. J. Shelton, H.D.A.:—

Rice Meal for Pigs—Cotton Seed.

D.B. (Ceratodus, Upper Burnett)—

1. Care must be exercised in using any meal or food to which pigs are not accustomed, and we think, in your initial practice in using rice meal, that if you add just sufficient salt to give the food a slight flavour, or molasses to sweeten the mixture slightly, you will soon accustom the stock to the rice meal. If you do not do this you will probably find the pigs refuse the food awhile before they become more accustomed to it. Where used judiciously in conjunction with green foods and foods carrying a high percentage of protein (pea meal, made from cowpeas or field peas, &c.) or green lucerne or even lucerne hay or lucerne chaff, good results may be looked for, though the general opinion of pig feeders is that the pollard is more palatable to pigs than rice meal.
2. Generally speaking, we consider cotton seed meal a risky food to use for pig feeding purposes, though this is not because it is not a good food as pig foods go, but solely because it needs to be used judiciously and with very much greater care than is ordinarily observed in the feeding of this class of stock. The pamphlet dealing with stock foods—a copy of which has been sent to you with several other pamphlets—deals with the use of this food for all classes of stock. The Supervisor of Dairying and the Poultry Instructor will advise on the use of cotton seed for calves and poultry respectively, and the pamphlets available on poultry and turkey raising have been forwarded. If you use cotton seed meal as a food for pigs it will need to be used in small quantities, not more than 10 per cent. for a start, and it should be soaked in and mixed in with other meals and with milk, for it is a comparatively expensive food that needs very careful handling.

Pneumonia in Pigs.

W.E.M. (Boyne Valley Line)—

It seems to us from your account that you have had some trouble with a form of contagious pneumonia among your pigs, a trouble all too common among young stock, and one that is extremely difficult to handle. Isolation of all sickly stock must be the first move in any condition indicating ill-health, after which special care and attention to the wants of these "off-colour sorts" must claim part of your time. Falling back on the good old castor oil will be effective in freshening up the sickly pigs, after which we believe tablespoonful doses of cod liver oil and some phosphates, bonemeal, and other mineral mixtures in the food must follow, the cod liver oil being given as a drench if this is possible or in a small quantity of warm food and a pinch of salt early in the morning. We believe a good oiling of the skin, using petroleum jelly or some other similar mixture, is just as good as internal medicine, for it seems that unless we can freshen up the "off-colour" stock and put them into better heart it is a difficult task getting them back on the right track.

It is difficult, even dangerous, to attempt drenching of a pig suffering from pneumonia, hence if the breathing is at all laboured or short and jerky, it is better to depend on using the oil in a form of a bran mash than as a drench, and, in all cases, a pinch of salt to take away the flavour of the oil and increase the thirst will be effective. Give ample supplies of clean drinking water and as much green food as is possible. Doubtless you have treated them for intestinal worms, for if worms are present in any number they cause distress and laboured breathing plus some pain. We note you have tried Nema capsules, and will await your further advice on results with interest. Flies are no doubt responsible for much of the trouble to which live stock are subject. Mosquitoes, too, cause trouble, and these, with intestinal parasites, give weak young stock a very bad spin. The symptoms you describe might be taken to indicate general ill-health, indigestion, and bowel disorders, plus a tendency to lung troubles. Why not open one up and let us have results of your post-mortem? Be careful

to incise all the glands, search for lung and intestinal worms and for kidney worms, and be especially careful to note if there is any inflammation of the stomach, intestines, and lungs. We cannot advise more than this without inspection, for it's no good spending money on the purchase of drugs if the seat of trouble is local or parasitic.

Ground Pumpkin Seed as Pig Feed.

R.C.L. (Proston, via Murgon)—

1. Ground pumpkin seed has the reputation of being particularly useful in the treatment of pigs suffering from intestinal worms, some breeders considering this product even more beneficial than turpentine or other drugs when used as a vermifuge (worm-expellent). We would not recommend ground pumpkin seed as a food for pigs unless mixed with other foods, and the Poultry Instructor (Mr. Rumball) informs us that he would not recommend them as a food for poultry at all, as poultry appear to be very susceptible to the poison these seeds contain. No doubt both pigs and poultry consume a proportion of seed when being fed on raw or cooked pumpkin from which the seed has not previously been extracted without ill-effect, but it would certainly be inadvisable to feed such seed unless with considerable caution, as an excess of highly concentrated seed matter might be responsible for derangement of the digestive system and for other ailments. If they are being used they should be mixed up with a liberal supply of other less-concentrated foods and be fed (with caution) in that form.

   Henry and Morrison in their book, "Feeds and Feeding," state that as pumpkin seeds contain much nutriment they should not be removed before feeding. They estimate that 1 ton of pumpkins, including seed, equals in feeding value for dairy cows about 333 to 400 lb. mixed hay or 800 lb. of corn silage. Though often cooked for pigs, trials show equally satisfactory results with raw pumpkins.

   Rommel, summarising the findings of three experiment stations, reports that 273 lb. of grain together with 376 lb. of raw pumpkins gave 100 lb. of gain with fattening pigs. When cooked it required 1,150 lb. of pumpkins and 222 lb. of grain for 100 lb. of gain. They also add that feeding an undue allowance of seeds would tend to cause digestive disturbances on account of their richness.

2. *Best class of pig for market.*—Extensive reference has been made to this subject in the pamphlet dealing with "Economic Phases of Pig Raising," of which a copy has been sent to you. From that publication and from others forwarded you will note that the principal demand in this State is for prime quality bacon pigs weighing from 95 to 120 lb. dressed weight (approximately 140 to 170 lb. live weight). The factories do not specify any particular breed or cross, but the pigs must be in prime condition, not too fat, and must be firm and able to stand up to the journey by train or other conveyance to the factory. A type similar to that produced from the Tamworth-Berkshire cross has given satisfaction, but pigs of other breeding give equally satisfactory results if they are well grown and developed and properly fed and handled.

To Rid Pigs of Lice—Hair Growth on Pigs.

H.H. (Kingston)—

1. To rid pigs of lice and other external parasites, prepare a mixture composed of ½ pint of benzine, ½ pint of kerosene, and 7 pints of fish or other cheap oil. Mix together thoroughly, store in a clean tin or jar, and apply per hand or per soft cloth or brush after the animals have been freed from accumulations of mud and dirt by washing. Repeat the application in three days' time, and then occasionally when it is noticed lice are about again. This will effectively deal with the lice and keep the skin soft and clean.

2. For encouraging the growth of hair on bare patches we recommend coconut oil, which may be purchased in bulk tins of 1 to 14 lb. at wholesale druggists. This oil is quite soft during summer months, but may require heating to soften during the winter time. It is a reliable preparation for encouraging rapid growth, and keeps the skin soft, free from scurf, and in mellow condition. Petroleum jelly may also be used in a similar way, and is also quite a good preparation.

General Notes.

New Sanctuaries for Native Fauna.

The State Forest Reserve (R. 452), portion 255, East Barron (Atherton), and the Reserve for Water and Gravel (R. 536), parish of Kalkie (Bundaberg), have been proclaimed sanctuaries under the Animals and Birds Acts. It shall be unlawful for any person to take or kill any animal or bird in these areas.

Standard Fruit Case.

The Fruit and Vegetable Grading and Packing Regulations of 1928, made under "*The Fruit and Vegetables Act of* 1927," have been amended by altering the dimensions of the Canadian standard case. The dimensions of that case now read—"Eighteen inches long by eleven and one-half inches wide by ten and one-half inches deep."

Queensland's Bread Needs.

"I find that the consumption of wheat in Queensland in the matter of the bread requirements of the people may be taken at approximately 5,000,000 bushels, exclusive of requirements for seed, poultry feed, and such like. Over a period of eleven years we have produced on the average barely half these requirements. A doubling of the wheat production of the State would mean an increase in the income of the State of close upon £750,000 per annum."—Hon. H. F. Walker, Minister for Agriculture.

An English View of Emigration.

"We transport criminals no longer; we emigrate the poor instead. Carelessness in choosing emigrants and in fostering their welfare when once they have left our shores has created in the public mind the firm conviction that what was once a punishment for crime has become a punishment for poverty. The spread of education no less than the increase in security at home, represented by the development of schemes of social insurance, has made men more and more reluctant to emigrate. Despite the unparalleled unemployment experienced since the war, the passing of the Empire Settlement Act of 1922, and the activities of the Overseas Settlement Committee, the number of emigrants has declined steadily since 1913. In the years 1911-13 240,000 workers on the average sought fame and fortune in the self-governing Dominions. In the years 1925-27 the average fell to 107,000. 'Training and After-care' must become the motto of the emigration authorities. They must offer emigrants the opportunity to equip themselves for the tasks of pioneering. They must offer emigrants sound prospects of winning a decent livelihood and of building up a decent home life; and one way to do that is to induce the Empire Government to protect their people by legislation in the same way as citizens are protected in the Home Country."—"Co-operative News."

Staff Changes and Appointments.

Messrs. G. Bell, R. C. Gilmour, J. I. Lomas, J. C. Schnitzerling, A. Clowes, and F. J. Kingsford, of the Warwick district, have been appointed Honorary Rangers under the Animals and Birds Acts for the sanctuary at Connolly Dam, Warwick.

The Police Magistrate at Blackall has been reappointed Government Representative on the Barcoo Dingo Board.

Sergeant C. J. Perrin, of Gladstone, has been appointed an Inspector of Slaughter-houses as from the 16th November, 1929.

Mr. T. E. Dwyer, Clerk of Petty Sessions, Mackay, has been appointed chairman of the Cattle Creek, North Eton, and Racecourse Local Sugar Cane Prices Boards for the 1929 sugar season, vice Mr. J. J. Scheibein, resigned.

Messrs. G. R. Passmore, A. B. Greer, and James Grindle, of Wacol, have been appointed Officers under the Animals and Birds Acts to prevent the shooting of native animals and birds in the Wacol district.

Mr. C. D. Hogan, Senior Clerk, Government Workshops, Ipswich road, Department of Public Works, has been seconded for duty as Senior Clerk (Accounts), Agricultural Bank, for a period of three months.

An Order in Council has been passed proclaiming the Goodna Recreation Reserve No. 359, county of Stanley, parish of Goodna, to be a Sanctuary for the protection and preservation of native animals and birds.

Foods that Taint Pork.

Recent inquiries indicate that the use of fish meal, fish oil, and whale oil as supplements in the feeding of pigs is to be strongly discouraged after the pigs reach the age at which they are usually penned up or otherwise prepared for the final fattening stages of development. Experiments are in progress in New Zealand and elsewhere aiming at determining up to what period before killing, fish meal, fish oils, &c., can be fed without tainting the carcass. That there is a certain amount of risk with all these oily foods, and with peanuts and soya beans, when fed to pigs in the fattening stages—*i.e.*, two months before slaughter—is well known to all authorities on pig feeding, though many farmers appear to be unaware of the risks involved. The matter is one that needs further investigation, and is a subject that might well be discussed at meetings of the pig industry committees and other bodies specially interested in the production and marketing of pork products.

Australian Beef Wins.

A cable message from London, 3rd December.—The result of the secret ballot on beef exhibits at Australia House, at which Mr. T. Trumble (Official Secretary at Australia House) presided, was as follows:—Australian beef, 364; Scottish, 354; Argentine, chilled, 348.

The guests each had a slice of each kind of beef, not knowing from which class it had been cut. The highest points went to beef cut from an Australian two-year-old Hereford.

Colonel Dunlop-Young, the City of London's chief veterinary surgeon, revealed that he had placed Australian beef first, saying that it was Scottish opinion of English-bred, but grown in Australia.

Resident Entomologist for Nambour.

Mr. H. F. Walker, Secretary for Agriculture and Stock, has announced that Mr. W. A. T. Summerville, Assistant Entomologist at the Head Office of the Department of Agriculture and Stock, will, in future, have his headquarters at Nambour. Mr. Walker states that this action is part of the policy of decentralisation to ensure as far as possible that certain technical officers of the Department shall be stationed in the centre of the districts in which their work will primarily lie.

Mr. Summerville entered the Public Service as a learner in the Entomological Section of the Department in 1922. In his spare time he studied at the Queensland University and secured his B.Sc. degree last April. Mr. Summerville has specialised in the diseases of citrus fruits, and it is chiefly for this reason that Nambour has been selected as his headquarters. There will be associated with him in the Blackall Range Mr. R. L. Prest, Instructor in Fruit Culture, whose speciality is also citrus fruits.

Both Mr. Prest and Mr. Summerville have a sound knowledge of horticulture and entomology respectively, and both are capable of advising fruitgrowers on cultural and plant disease matters generally.

Tourist Bureau—Opening of New Premises.

Recently the control of the Government Tourist Bureau was handed over to the Commissioner for Railways (Mr. J. W. Davidson) with a view to a more satisfactory handling of the tourist business, with which the railways are so closely identified.

Mr. Davidson decided upon a scheme of reorganisation, involving the bringing together of the tourist activities and the principal city railway booking office. He made certain rearrangements of the disposition of his staff which allowed of the major portion of the floor area of the Commissioner's Office in George street being converted into a tourist bureau and city booking office. Show windows for the display of photographs and publicity matter have been installed on the street frontage, and considerable interior alteration has been made to suit requirements.

The new booking office is open to the public for the purchase of tickets and reservation of seats and sleeping berths on interstate and Queensland mail trains, as well as for the sale of tickets for the South Coast line (Southport and beyond) from 9 a.m. to 5.30 p.m., Monday to Friday inclusive, and from 9 a.m. to noon on Saturday; outside the hours named bookings will be conducted at the ticket office on No. 1 platform, Central Station, but the issue of post-dated tickets and reservations from that office will be restricted to one week ahead, whereas booking will be made at the city office for twenty-eight days ahead as heretofore.

Tickets for special trips, including accommodation or meals, will be sold at the bureau booking office counter in the Tourist Bureau, which will be quite distinct from the railway booking office situated in the same building near Queen street.

Australian Wheat a Winner.

Thus a Press message from Chicago, 2nd December:—J. W. Eade, of Euchareena, New South Wales, won first place with White Spring wheat at the International Live Stock Exposition on Monday.

Running a Family.

Either to let the children grow as they will and do anything they please, or else to establish a benevolent but firm autocracy, is a simple way to run a family. Both these types of household, however, for purposes of training children, are as cheap as they are easy. The youths who are best fitted to be good citizens in the new generation come out of democratic homes. A child from the beginning ought to be called into the family's counsels and consulted on the family's affairs. A little child, if well handled, is the most loyal of creatures and would far rather than not be devoted to his group and co-operative in its interests..—Dr. Fosdick in "World To-day."

Prevention of Swine Fever.

The most recent literature dealing with diseases of the pig and kindred subjects indicates that to avert the risk of swine fever preventive measures are necessary. Following is a summary of the measures recommended:—

(1) Prohibition of the importation of pork or other pig products from any country except those that are declared free from swine fever, and the prohibition of the use of ship's garbage as pig feed.

(2) Prompt notification by each State of the occurrence of outbreaks of swine fever or suspected swine fever.

(3) Slaughter of all pigs on any holding on which swine fever occurs, and the destruction of carcasses of such pigs.

(4) Thorough boiling of all household refuse and garbage on the premises on which the pigs are being kept before such refuse or garbage is fed to the pigs.

(5) The introduction of a system of pig branding which would enable pigs to be more definitely traced within the State.

It has been noted further in regard to the spread of swine fever that next to the living infected animal the feeding of pork scraps in garbage is the most important means by which disease is spread.—From reports of an address by Mr. Max Henry, Chief Veterinary Surgeon of the Department of Agriculture of New South Wales, at a meeting of the Pig Industry Committee of New South Wales.

Levy on Stanthorpe Fruit and Vegetables.

Regulations have been issued under the Fruit Marketing Organisation Acts renewing for a further twelve months the levy on Stanthorpe fruit and vegetables.

This levy consists of 10d. per ton on all fruit and vegetables railed from all railway stations between Wallangarra and Dalveen (including all stations on the Amiens-Pikedale Branch). Where more than one grower contributes fruit or vegetables to any one consignment, the total amount of the levy payable will be paid in proportion by the different growers, there being a minimum of 1d. payable in respect of any one consignment by any grower who, in his name or otherwise, contributes any fruit or vegetables to such a consignment.

The extension of the levy has been made at the request of the Deciduous Sectional Group Committee, and has been endorsed by the Committee of Direction. The manner of making the levy is as follows:—

A resolution shall be passed by the Committee of Direction that the levy be made, and thereupon the Committee gives notice prior to the 7th December, 1929, by public advertisement of the levy, and upon such publication the levy shall be deemed to have been duly made.

The growers liable to pay the levy shall pay the same to the Commissioner for Railways on behalf of the Committee of Direction at the time they are consigning their fruit or vegetables. The levy will be expended in the payment of any expenses attaching to the collection of the levy, and the balance shall form part of the general funds for administrative purposes, and shall be utilised by the Deciduous Sectional Group Committee. The levy will operate for twelve months as from the 7th December, 1929.

The levy for the coming year will be 10d. per ton as against 5d. per ton last year.

Are there Too Many Shopkeepers?

"More than a century has elapsed since Napoleon stigmatised Britain as a nation of shopkeepers, but even to-day the taunt contains a certain element of truth. A visitor to the ordinary small country town will find that, apart from a few local industries, the main business of the town consists of shopkeeping, so much so, that he may well be pardoned for wondering whether all the shopkeepers in the town are trying to make a living by selling their wares to each other. This question as to whether the number and variety of retail shops in this country is redundant to its needs is one of considerable economic importance. Too many shops with too much competition can be as great an evil as too few. An excessive number of shops means that each one has too small a turnover out of which to earn its fixed charges, and so means that retail prices rule higher than they would under an ideal number. If four competing tradesmen are making each morning the round of a street which one man could easily cover, that is a clear example of wasteful effort for which the consumer in the long run has to pay."—"The Economist."

Practical Education.

"There is a widely prevalent notion that university extension is a kind of watered-down version of the education that is given in the university itself," said Principal L. P. Jacks in a recent speech, "and I am afraid it is true that a good deal of it has hitherto been precisely that. But of late years our eyes have been gradually opened to the fact that a course of university and water appeals only to a very limited section of the adult population. There are other ways of educating adults which do appeal to men and which yield far better results. It has been found both here and in America that multitudes of adults to whom the offer of book learning through classes and lectures makes no appeal are quickly attracted by the offer of any kind of practical skill, and that those who begin in this way by learning to do something significant for themselves are easily led on to an interest in the literature which tells of the great doings of others and to an interest in the things of the spirit in general."

A Doubtful Ideal.

"We are hearing a great deal at present of the desirability of brightening 'rural areas' (by which phrase newspapers now refer to the country), the brightening up to be done, of course, by townsmen by means of wireless sets, libraries, picture-houses, and all the things from which the townsman wishes to escape when he goes to the country. If there is one thing which the country has and which the town has not it is peace, even if only in the form of silence, and if there is one thing which the town has which the country has not it is commotion, even if only in the form of noise. No doubt the countryman sometimes wishes that the peace of the country-side was not so peaceful, and the townsman on occasions thinks that he would find life more agreeable if there was not such a ceaseless coming and going in the streets; but when the countryman feels that he really must have a little more excitement he can go to the town, and when the townsman begins to desire above everything surcease from strife he can pay a visit to the country. But to introduce an artificial commotion into the country and an artificial calm into the town would make it impossible for the countryman to escape from the country and for the townsman to get away for awhole from the town."—Mr. Hubert O'Toole, in the "Cornhill Magazine."

Spare that Tree!

This might well be applied to Queensland:—

"It's a fine day; let's go out and cut down something," might be put forward as a New Zealand version of an old gibe against the Englishman's liking for destruction. Certainly the history of New Zealand is tragically rich in contrast between the glorious natural endowment of forest and the indifference so many New Zealanders show towards the fate of trees. Public conscience is being strengthened in this direction, but there is still so much to do that one welcomes every victory over the forces of destruction. Traffic is not everything, otherwise the praise of the American motorist for a certain prairie State would be wisdom. This man was ecstatic about roads that ran without a bend for many miles, on which a motorist could 'do fifty' and go to sleep at the wheel. Among the tree-lovers of Palmerston North were a number of women who had sufficient enterprise to hold a meeting, with the result that the cutting of trees in the street has been suspended, and probably they will be saved. This is an interesting blow struck for beauty as opposed to utility, and should encourage others to be active in the same good cause.—Auckland "Star."

Soil Research.

"Soil research, not from the point of view of agriculture only, but of the world's population, which depends on the products of the soil for its existence, is a cardinal factor in the advancement of civilisation. The time, although still far distant, can yet be envisaged when mankind will be so numerous that the earth will have difficulty in finding sustenance for the teeming multitudes," says the "Aberdeen Free Press" referring to the Institute of Soil Research, so recently generously endowed by Mr. T. B. Macaulay, president of the Sun Life Assurance Company, of Canada. "That nation is to be envied the productivity of whose soil is sufficient to meet its own needs in food. The agriculturally self-supporting State is, from the point of view of economics and of certain factors in man-power, the ideal country. We in Britain are so reduced in agricultural resources that five-sixths of our food has to be imported, entailing a tremendous drain upon our communal wealth. Our soil is old and weary after countless generations of cultivation."

A World's Champion—Three Lactation Periods.

Queen Bessie Pietertje Ormsby, a pedigree Friesian cow belonging to Elwood Farms, Deerfield, Illinois, recently completed an official production record of 28,122.7 lb. milk and 1,128.4 lb. fat, with an average test of 4.01 per cent. She now holds the world's record for production for any three lactation periods. Her records now are:—Two years, 985.06 lb. fat; four years, 1,095.26 lb. fat; five years, 1,172.75 lb. fat; seven years, 1,128.40 lb. fat. This makes an average for the three last periods of 1,073 lb. fat.

The only cow to beat her for four lactation periods is Springbank Snow Countess, a Canadian Friesian cow, with records as follows:—Two years, 749 lb. fat; three years, 979 lb. fat; mature, 1,125 lb. fat; mature, 1,122 lb. fat; mature, 1,113 lb. fat.

The paternal grandsire of this cow is Sir Pietertje Ormsby Mercedes, who is the paternal great grandsire of Pioneer Snow Ormsby, the imported bull belonging to the Oakview Stud Farms, Auckland.

Fertilisers—Prices Reduced.

Mr. E. H. Lindsey, secretary, Board of Trade (Price Fixing), announces that reductions have been made in the unit values of nitrogen as ammonium sulphate, of water soluble phosphoric acid in super.; also a slight reduction in the unit values of potash in both sulphate and chloride (muriate).

In the case of ammonium sulphate with a nitrogen content of 20.5 per cent., present maximum price for this percentage will now be £17 18s. 9d. per ton, as against the previous price of £20 10s.

In the case of super. with a water soluble phosphoric acid content of 20.5 per cent., present maximum price £7 8s. 7d., against £8 4s. previously.

Potash in the form of sulphate will now be £16 4s. per ton, as against £16 16s.

Muriate of potash (chloride) with a potash content of 50 per cent.—the maximum price will now be £14 7s. 6d. per ton, previous price £15.

In the case of phosphoric acid derived from bone, the unit value has been increased by 6d.

Church on Wheels—New Uses for Motor Car.

Two uncommon motor vehicles have just been completed to special order by British manufacturers. They are a travelling bathroom, ordered by an Indian prince, and a motor church, built to the specification of a Christian missionary society.

The mobile bathroom is built on a 30 cwt. chassis, and the interior includes a porcelain-lined bath, wash-hand basin, divan, and dressing table, all of which are cleverly designed to fit into the relatively small space available.

An ingenious apparatus, controlled by a thermostat, transfers the waste heat from the engine to the bath-water system, ensuring a constant supply of hot water. Special springs and Dunlop pneumatic tyres are fitted to the vehicle to ensure smooth running over rough jungle tracks. The car is to be used in the prince's hunting expeditions, and is fitted with a special glass which permits a clear view from the interior without the occupant being visible from the outside.

The motor "church" is mounted upon a lorry chassis fitted with Dunlop tyres, and it is equipped with an altar and reredos. The body is built so that it can be used as a pulpit, and the vehicle was consecrated before it was put into service.

The Richest Things in Life.

The whole edifice of modern civilisation would fall to the ground without a foundation of sound moral principle. The character of a people is the only security that can be relied upon for their making a proper use of the material advantages around them; all scientific inventions may come to nought, or even bring about evil, without moral guidance and inspiration (writes Mr. Charles Wicksteed in "Bygone Days and Now, a plea for Co-operation between Labour, Brains, and Capital"). The richest things in life are those that no wealth can give, and no poverty, short of destitution, can take away. An agricultural labourer who, with the aid of a thrifty wife, has a sufficiency, returning home after a hard day's work to the enjoyment of his frugal supper, with love in his heart for his wife and children, has the greatest joy that a man can have, and one which no millionaire can take away. A man may be rich, but no money will give him the joy he loses if he has no heart.

The First Veterinary Writers.

The veterinary art dates from that far-away time when man first bent the horse to his will. The earliest extant works on the diseases and injuries of horses belong to the fourth century of our era, and were written by army veterinarians of the Byzantine or Eastern Roman Empire, the chief of whom was one Apsyrtus, veterinarian in the army of Constantine the Great. The fourth century was not, however, the real starting-point of veterinary knowledge; there is ample evidence to show that there were skilled men in the times of ancient Greece. Xenophon wrote on the care and management of cavalry horses 800 years earlier than the time of Apsyrtus, and we know that his views are as true to-day as when written 2,400 years ago.

Aristotle, who lived 150 years later than Xenophon, devoted the eighth book of his history of animals to a consideration of veterinary medicine; he wrote, of course, as a layman. The Romans, on the other hand, were not skilled in medicine or surgery; in fact, for five centuries the medical art was unknown in Rome. Later they borrowed from Greece. If this was the condition of human practice it is easy to understand the position of veterinary medicine. Varro, a soldier who flourished in 36 B.C., and appears to have explored every branch of human activity, refers to the ancient Greek veterinarians as "Hippiatroi." He was evidently familiar with their work, of which, unfortunately, nothing remains. He himself wrote on the diseases of animals, and it is doubtless to such men that the Roman Army, even as early as the second century of our era, possessed an infirmary for sick animals, known as a "veterinarium." But Columella spoke of the "veterinarius," or animal physician, in 42 B.C. The irritating word "veterinary" is therefore extremely old; it disappeared with the final collapse of the Western Roman Empire, and was not met with again until the year 1528, though it did not appear in England until the closing days of the eighteenth century.

Vegetius' "Veterinary Art."—Among the contemporaries of Apsyrtus was one Chiron, a man whose work on veterinary medicine has only come to light in recent years. Shortly after Apsyrtus there lived a lawyer and gifted veterinarian, by name Hierocles, fragments of whose letters survive. It was from inspirations obtained from those gifted men that Vegetius, the Western Roman general, who flourished about the middle of the fifth century, wrote his remarkable treatise on "The Veterinary Art." He was not only a soldier, but a man of letters. Vegetius stands out in bold relief in the Western Roman Empire; he deplored the low state of the veterinary art in Italy, and tells us that the study of animal diseases is regarded as a mean and contemptible occupation. Though 1,500 years have passed since that was written, public opinion on this question has undergone very little change. The work of Vegetius may be read with interest to-day; he is very modern in some of his views, such, for instance, as the absurdity of regarding outbreaks of disease as being evidence of Divine wrath; he urges the public in these cases to place their faith in medical aid rather than in incantations and charms.

It is fortunate amid the disruptive influence of 1,000 years that the work of Vegetius has been spared and was amongst the earliest books printed in Europe, being published in 1528. Two years later what was left of the manuscripts of the Byzantine veterinary writers—i.e., Apsyrtus, Hierocles, and their many correspondents —was published in Paris under the orders of Francis I., the title then given to the collection being "The Hippiatrica." How these manuscripts got to Paris is unknown; probably, with many others, they were brought back from Constantinople by the Crusaders. It is interesting to note that a copy of the fragmentary manuscripts of these early Byzantine veterinary authorities is regarded as one of the literary treasures of the world.—"Live Stock Journal" (Eng.).

School Training.

It is quite true, as many persons might hasten to tell us, that great men have been developed without the benefits of University training; it is quite true that unusual genius will bring the man of special gifts to the front. But neither school nor University devotes itself to the development of the superman; the principal attention is devoted to that great mass of boys and girls who must have adequate opportunities, who must be strengthened and guided and taught. At no time in our history were we confronted with greater problems than those of to-day; never was there greater demand for the administrative and the operative ability of our citizens. Brains and character will be the first line of our national defence in the future. Can we afford to deny all reasonable facilities? That is for the people themselves to answer, because upon their answer depends the interest of Governments. —The "Brisbane Courier."

A Whitewash Formula.

Obtain, if possible, large pieces of fresh lump lime, place them in a very large bucket or other suitable container, and into this pour hot water. Cold water will do, but hot water is better as it hastens the slaking. The lime will start to boil and break up. Keep it covered all the time with about half an inch of water. This is important, for if whilst the lime is slaking it is allowed to rise up above the water in a dry powder it will "curdle," a condition tolerated only by inexperienced and indifferent workmen. Before the lime commences to boil fiercely, add tallow or common fat in the proportion of about 1 or 2 lb. to 7 lb. of lump lime. This makes a good binder which will prevent the wash from rubbing off.

If desired, a little yellow ochre may also be added, which will give a cream or buff tint according to the quantity used. When the lime is thoroughly slaked it should be stirred and sufficient water added to make it a little heavier than, say, milk, after which it should be strained, and, if desired, may be applied whilst hot.

Girdling the Earth.

"I'll put a girdle round about the earth in forty minutes," said Shakespeare through the mouth of Puck some 340 years ago. That was fantasy, for Magellan, who was the first to circumnavigate the earth, took three years only three-quarters of a century earlier. But who is to say that Puck's boast will not yet cease to be a boast? In the 16th century modern speeds were not dreamt of. During the last fifth-three years the time it has taken to "put a girdle round the earth" has been reduced from 117 days to twenty-one days. In 1876 Captain W. D. Seymour took 117 days in 1889, Miss Nellie Bly encircled the globe in 72 days 6 hours 11 minutes 14 seconds; since when the following times have been recorded:—Geo. Francis Train (1889), 67, 12, 3; Captain Fitzmorris (1901), 60, 13, 29 42⅝; Henry Frederick (1903), 54, 7, 20; Colonel Burnley Campbell (1907), 40, 19, 30; A. Jaegar-Schmidt (1911), 39, 19, 42, 37⅘; J. H. Mears (1913), who used a hydro-aeroplane to cross Paget Sound, 35, 21, 35, 0⅘; E. C. Evans and L. O. Wells (1926), 28, 14, 36, 51; J. H. Mears and Captain Chas. Collyer (1928), who took their own aeroplane and used it for eight flying days, 23, 15, 8; the Graf Zeppelin (1929), 21, 7, 32. All these people, except the travellers in the Graf Zeppelin, spent practically the whole of the time in actually travelling, whereas the Zeppelin was in flight only 11 days 23 hours 33 minutes.—"Brisbane Courier."

The Future of Cotton.

Discussing the outlook of the cotton industry in Lancashire, a writer in the "Fortnightly Review" suggests that probably too much attention is being devoted to the discovery of means for reviving the trade in coarse grey cloths, which other countries are able to produce themselves, and will continue to do so, even if they have to raise high tariffs against Lancashire. "Even if we do not recover any of that which has been lost, our cotton trade remains a very large one," he continues. "To say that the whole trade is doomed is ridiculous. To talk in generalities at all about the cotton trade is ridiculous. It is far too varied. There are plenty of units who have succeeded in doing well all through the bad years. We are still the largest exporting country of cotton textiles, and the home trade alone is not inconsiderable. All this will be stimulated by a cheapening of the cost of production. The same applies to the trade in new styles which we hope to see developed by ingenuity and craftsmanship. Ingenuity has not been lacking in the past, and one feels that it must still be present in plenty, unless it is being concentrated upon the newer industries of Great Britain. It has, however, been a peculiar feature of British mentality

that a stimulus of impending disaster is required before really the latent ingenuity of the people can reveal itself. Witness the many rapid improvisations brought out by the war. Possibly the cotton trade is not yet sufficiently near to the abyss to awaken such inventive powers. Howbeit, upon ingenuity the future must largely rest, and upon the elimination of the inefficient producers."

Rubber Tyre Wear and its Cause.

Interesting data about tyre wear and its causes is supplied by Mr. L. J. Lambourn, M.Sc., A. Inst. P., A.I.R.I. (Sc.), of the Fort Dunlop Research Laboratory, from which it is learnt that there is considerable difficulty in obtaining definite data about tyre wear if the research is confined to tyre service on the road. In comparing one tyre with another, speed, the type of driving, the type of car, the kind of road surface, the weather, the air temperature, all vary so much that it is not easy to get accurate results. In order to wipe out all these variables, a special machine has been developed and patented in which conditions representative of rough roads, wet roads, roads covered with dust, quick acceleration, wheel spin, high temperature, can all be reproduced and controlled. The relation between abrasion, or wear of tyres, and slip, which, of course, is always taking place when tyres are running, can be quite accurately determined. Approximately, the rate of wear increases not in direct ratio to the slip, but rather as the square of it up to values of about 25 per cent. Above that value, the relation is approximately linear. As showing the accuracy with which the machine and road results can be compared, samples of the actual treads of the machine and road results can be compared, samples of the actual treads of tyres were made into test wheels while the real tyres were run under average conditions, and the rate of wear of the tyre on the road and on the machine was compared. The value of a hundred being taken to represent the standard tread compound, the following results were obtained:—

RELATIVE WEAR.

On the Road.	On Machine.
100	100
130	139
142	150
225	200
93	95
117	117
92	92

Other tests, on the road, showed that one tyre on a car ran 8,400 miles during December to March while another, used during April, May, and June, ran only 6,000 miles. Another test, in which two exactly similar tyres were run at the same period on the rear wheels of two cars of the same type, showed that the rate of wear on the one run on rough roads was twice that of the other, run on tarmac. Two tyres were again run on the rear wheels of a touring car and a sports car respectively. The tyre on the touring car ran for 5,000 miles under average conditions, but the other tyre was worn to this same extent after running only 335 miles at an average of 90 miles per hour on a racing track. Considering fast touring speeds, the rate of tread wear on tyres which average 50 miles per hour was found to be about 0.17 m.m. per 1,000 miles and this is about twice the rate of wear of tyres run at an average speed of 30 miles per hour. Above 65 miles per hour the increase in wear is very rapid. Excessive toe-in has a very bad effect and it has been found that a toe-in of an $\frac{1}{8}$ of an inch should not be exceeded, otherwise the tyre will not last its full life. A tyre run with a toe-in of $\frac{1}{2}$ inch was nearly worn out after 3,700 miles. Another with a toe-in of 1/16 inch has run 9,000 miles and is not yet nearly worn out.

Tests made for wheel slip with a motor cycle combination showed that on a cross country run at normal speeds there was a total slip of only $1\frac{1}{2}$ per cent., but on a rough road a short run at 62 miles per hour gave a slip of $4\frac{1}{2}$ per cent. By fiercely engaging the clutch for rapid acceleration a slip of 16 per cent. was obtained. In a similar "getaway," measuring the slip on the first 33 yards only, it amounted to the very high figure of 48 per cent. If the slip be doubled, four times the amount of tread rubber will be worn away.

It is of interest to note how the wear of tyres varies according to the season of the year, partly due to the temperature and partly due to the wetness or dryness. For instance, the rate of wear of a large quantity of tyres in July of three successive years was 9/10 m.m. per thousand miles, while in January of the corresponding years, it was only 6/10 m.m. per thousand miles.

The Home and the Garden.

OUR BABIES.

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

THE HOT WEATHER BOGEY.

Baby enjoys the hot weather. There is nothing that pleases him better than to exercise his limbs freely in the most scanty attire, or in nothing at all, unless it is to splash about in a tub of tepid water. He is released from the burden of clothing, which oppressed him in the cold season, and cramped his movements.

Hot weather is healthy. The three coolest States of Australia have the highest infantile mortality. Last year Queensland had the lowest. That hot weather is dangerous to infant life is just a silly bogey.

Of course, special care is needed during the hot season in some respects. If you overclothe baby he will suffer from prickly heat. This is caused by excessive sweating when the sweat is not allowed to evaporate freely. Dress him in cool singlets—not in heavy woollens. Outside the singlet he should wear only the coolest of airy garments, and these should be taken off when he is indoors. Do not torment him with flannel binders. Prickly heat is worst on his back, because he lies on that, and the perspiration cannot dry off quickly. Let him lie on cool sheets, or better still, on cool vegetable mats. Turn him over sometimes, when he is asleep, and train him to lie on his side.

He does not now need so much heat-forming food. Give him rather less solid food, rather less sugar and fat (clinic emulsion for instance). But he needs more fluid, so let him drink as much boiled water as he likes between his meals. Do not forget that this is necessary for babies who are on the breast.

Boil Baby's Milk.

During warm weather all kinds of bacteria grow very rapidly, and so food does not keep, but undergoes changes, which make it unwholesome, and sometimes even dangerous. Especially is this true of milk. You know how quickly it goes sour. Unfortunately, it changes in other ways, which are more harmful than sourness. Therefore, be careful to boil your milk as soon as you get it; then keep it in a cool place carefully protected from flies. Pasteurised milk delivered in bottles does not need to be boiled. It will keep good for twenty-four hours on ice; but otherwise, if you have only one delivery, you will need to boil it within twelve hours if it is to be kept till next morning. Should your milk be stale or dirty before it is boiled, it will cause loose motions. When good, fresh milk cannot be had, you may use dried milk (Glaxo or Lactogen).

Diarrhoea.

Loose motions or diarrhœa is common in warm weather, and needs careful watchfulness. Should your baby suffer from this, you must at once stop giving him milk or any kind of food except very thin barley-water slightly sweetened. Let him drink as much as he wants; he will be thirsty, but not hungry. It may be even necessary to take him off the breast for one or two days. You may also give him one teaspoonful of castor oil to clear out any undigested food. Within twenty-four or forty-eight hours he should be much better, and probably a little hungry. A little breast milk may then be given, or you may then give him whey made with junket tablets, but the whey must first be brought to the boil. If he is over nine months, you may also give him some arrowroot, cornflour, or sago boiled with water without milk, or a finger of bread baked hard and crisp. Do not give him milk foods until his motions become natural, and give the milk at first in very small quantity, increasing it gradually.

By this treatment attacks of simple diarrhœa are usually easily cured. But it is very different with diarrhœa caused by infectious bacteria. Of these the most dangerous is dysentery. We told you last month how to guard against this epidemic, which attacks us every year in the early summer during the fly season—not, be it observed in the hottest time of the year, when the epidemic usually subsides.

Babies Killed by Ignorance.

We hope that our advice will be carefully observed, and that it will save many lives. The cause of the increased sickness and more frequent deaths among our infants during the summer is not the hot weather; it is the prevalence of dysentery and other bowel infections during this season. This infection occurs so frequently because mothers do not know how the dysentery bacilli get into their babies. Babies have died from want of knowledge.

THE PREMATURE BABY.

Most people know that when a baby is premature—that is, born before its time—it needs special care and treatment, but many have little knowledge of the special points which require immediate attention, if the child is to have a reasonable chance of survival.

If even half of the premature babies who are born each year in Queensland could live, there would be a marked lowering of the infantile death rate. Of all the deaths that take place in children under one year, about half occur during the first month of life. A large number of these children are either premature, or feeble, weakly infants, who should receive the same care as those who are premature. Such cases should always be under the care of a doctor.

If a baby is under 5 lb. when born, it is better to treat it as premature, to get satisfactory results. Those under 2½ or 3 lb. in weight rarely survive, though cases are on record where infants of less than 2 lb. have lived and developed into healthy children.

In appearance, the premature baby differs from the normal baby in more than size. The little body is very soft and limp; the skin wrinkled and downy, and because it is thinner than usual, it looks redder. All the muscles are weak, and the infant is often too feeble to suck. The cry is feeble and suggestive of the mewing of a young kitten. Often the baby cannot cry at all. Such cases need special care from the moment of birth.

FOUR IMPORTANT POINTS.

There are four points which should receive attention. They are prevention of chilling of the baby (that is most important and must come first): careful feeding, on mothers milk; careful avoidance of risk of infection; and avoidance of all unnecessary handling.

Prevention of Chilling.

Because the baby has come too soon into the world, the power of the body to manufacture and regulate its heat is not yet properly developed, and the temperature can quickly fall to a dangerously low level. A premature baby who is allowed to become thoroughly chilled soon after birth rarely lives. When we know that an infant is to be born prematurely, special preparation should always be made to prevent this chilling. A cot should be prepared and thoroughly warmed for its reception. Baby must not be bathed, nor yet even oiled, but as soon as it is born, wrapped in warmed cotton wool or soft flannel, and placed in the cot. At the end of six or eight hours it can be oiled over with warm olive oil and cotton-wool swabs, taking care to do it as quickly as possible and with as little handling of the child as possible. Very frail babies should be oiled without being removed from their cots, and the cot should be placed in a warm, sheltered place, and protected from all draughts by screens while this is being done. In hospitals, special cots are kept for premature babies. These are not always available in private homes, but a very useful and comfortable cot can be quickly improvised. A dress basket does admirably; failing this, the family clothes basket can be used, or a drawer out of a chest of drawers can be made to serve, though this last is not deep enough to be as suitable as the two previously mentioned. To prepare the improvised cot: if the weather is cold, first line it with paper—newspaper does quite well—then throw a blanket over it, covering it completely. Next, in the bottom of the basket and over the blanket, place a pillow to serve as a mattress. A pillow-slip or flannelette napkin serves as a sheet, and a small, folded, soft napkin as a pillow. On this the baby,

wrapped in cotton wool and its soft woollen shawl, is placed with a baby blanket over it. The enveloping blanket is now drawn from each side across the cot, but this is not enough warmth for the premature baby. Hot water bags or bottles will be required. Rubber bags are best, but any bottles can be made to serve. In cold weather three are required, in warm weather two will probably be enough. One bag is placed under the mattress at the foot of the bed, and the others at the sides, not close to baby's body but lying on edge, tucked down between the enveloping blanket and the mattress. For the bottle at the foot of the bed use two-thirds boiling water and one-third cold water; for the side bottles use equal parts cold and boiling water. The bags must be refilled in rotation, one every hour in cold weather, less often in summer. Give baby plenty of fresh air—keep him in a well-ventilated room. In our Queensland climate, the air even in winter is not cold enough to hurt the premature baby, provided his bed is kept properly warm. Guard against over-heating. It is wise to have a dairy thermometer in the bed, and this should register between 85 and 95 deg. Fahr.; never more, or it will do baby harm. Gradually decrease the artificial heat as baby's condition improves. Oil baby every second day, taking the same precautions as for the first oiling. Do not put him in the bath until he weighs 5 lb. As he improves, commence with sponging, at first only hands and face, and gradually increase until he is being fully sponged, and later, bathed.

Careful Feeding.

For our premature baby, mother's milk is practically essential. Few survive without it. If circumstances make it impossible for the mother to feed her own baby, endeavour to get milk from another healthy mother. A relative can sometimes be found who has a baby of her own, and so is able to supply some breast milk. It does not matter at all if the foster-mother's milk baby is six or even more months old. It will not hurt the premature baby, but it may sometimes be necessary at first to dilute the milk with equal parts of water. If the foster-mother is a stranger, or there is any doubt about her health, boil the milk before giving it to baby. Nothing but plain, boiled water should be given to the premature baby for the first twenty-four or thirty-six hours. After that it must have food. It is impossible to say exactly how much the child should have or how frequently it should be fed. Some strong premature babies can suck the breast and get all they need. Others are quite unable to suck, and at first almost unable to swallow. Such cases must be fed with a pipette or eye dropper, and the milk must be expressed from the mother's breasts and fed to the child. If baby can take very little, say only one or two teaspoonsful at a time, he must be fed every two hours, with one night interval of three hours. With a feeble baby, it may take twenty minutes or even more to take even this small quantity. Increase the interval between feeds by a quarter of an hour at a time, to three hours, with one longer night interval, as soon as baby can take a larger quantity at a feed. Also substitute a small feeding-bottle for the eye dropper as soon as the child shows signs of sucking.

If mother's milk is unprocurable, whey may be tried, at first diluted to half strength, until advice can be obtained from a doctor or welfare nurse. A rough estimate of the amount of food that a premature baby should take, is 3 oz. for each pound of body weight. So if baby weighs 3 lb., try to give him 9 oz. of fluid daily. He may take much less at first.

Prevention of Infection.

As a result of being undeveloped and weak, baby is very susceptible to infection. Because he is so tiny, he is generally an object of interest and curiosity to neighbours and friends who come to visit him. In his interest this should not be allowed. Even a common cold in an attendant or visitor can easily lead to a fatal pneumonia in a premature baby. For this reason isolate him as far as possible. Have no unnecessary visitors and as few attendants as can be. If mother or nurse develops a cold, she should tie a piece of gauze over her nose and mouth while attending to the child.

Avoidance of Handling.

Handling is very harmful to the feeble premature baby. Until he shows signs of increasing strength, do not remove him from his cot while feeding or oiling him. Handle as little and as gently as possible while changing him; but change of position is necessary; turn him from one side to the other every four hours. The care of a frail, premature baby entails not only much care and trouble, but a high degree of skill. The successful rearing of such an infant is justly a source of pride to mother or nurse.

FOR THE COUNTRY GIRL—SOME OPPORTUNITIES.

"What superior opportunities girls in the cities have!" sighs the country girl. "In what line?" you ask. "Opportunities for education, money-making, fun." It is true that salaried positions are more numerous in the city than in the country, but the country girl has many more ways of earning odd shillings. For, primarily, she has space—a necessity for growing anything, vegetable or animal, and the products of the farm are in never-ceasing demand. Butter, eggs, honey, preserves and jellies, chickens and vegetables are always marketable. Ingenuity will make the marketing exceedingly profitable.

Develop Originality.

Develop your originality. It is originality which makes one potent or impotent, and originality will grow if stimulated. Do not say: "But I am too far from a market to raise pigeons," or "there are no rare butterflies in our neighbourhood," but think out your own environment; study your own ability; imagine and create an opportunity for yourself.

Of course, in higher and specialised lines, the city girl may become educated more easily than her country cousin. But even when it is impossible for you to leave the farm, you can accomplish much in any desired line.

All Universities are giving more and more attention to extension work, and you can go far towards a degree without ever seeing the college buildings. And all their help you are entitled to. The State University is your University; your taxes support it.

Courses will be laid out for you, reading suggested, and books loaned.

Aid and inspiration may be had for the asking from the city and travelling libraries. Outline courses will be sent you which contain the ability of experts. And there are correspondence schools whose text-books are often by masters in their lines.

One girl I know has obtained very fine instruction in music by organising a class for a teacher from a nearby town. The teacher comes to her home one day in the week, and there gives lessons to all of the pupils. The girl who organised the class pays nothing for her own lessons, but gives the teacher the use of her home, and furnishes her luncheon.

Many teachers of drawing, music, and dancing take long annual vacations. Perhaps an advertisement in some city paper that board on the farm during the summer would be given in exchange for one lesson a day, would get a response. In such a case, you could probably "sub-sell" three of the lessons each week and take three yourself.

But you will say that you want sometimes to get away from the country; to be in the city; to see its plays and to be part of its merry gaiety.

Of course you do, just as your city friends long ardently for the country. So let us consider ways of earning money for trips to the city, and delightful tastes of its pulsing life.

As a modification of the summer boarder idea, a girl might make a fancy little sum by boarding and caring for the children of people who wish to travel in summer. Children are so enthusiastic over farm life that they practically entertain themselves. And, being clad with extreme simplicity, they are very little trouble.

If your home has an attractive site, especially if it offers boating or fishing, arrange and advertise a camping ground. You may either charge a small fee for renting privileges, or omit the fee to secure an easy and profitable market for milk, butter, eggs, vegetables, preserves, home-made bread, and pies.

Home Industry.

Pickles, jellies, and candied fruits, when of superior quality, command high prices and show a large percentage of profit when the fruit is home grown. To save a great proportion of the work during the summer months, defer the jelly and jam making until the autumn. That is, cook the berries and other fruit sufficiently, and can them without sugar. Later make them into jellies, jams, and so on as indicated by the demand. The freshly made jams and jellies have a certain charm of flavour that is lacking in those that have stood very long. The deferring of part of the labour is a great help to the farm girl, for summer is a busy season on the land, and, at that time, outside help seems to be non-existent.

I have an idea, however, that an advertisement in a city paper would bring answers from girls who are not otherwise domestic helps, who would be willing to work several hours each day in exchange for board. Two such girls would be a decided help, and might be pleasurable friends as well.

Roadside Tea-houses.

Many a profitable tea and luncheon place has been developed from very small beginnings by country lasses. In these days of the far-going auto, there is increasing demand for such places. Here, naturally, environment should determine the choice of food offered, but in no case should an effort be made to compete with the city. Simplicity should dominate. Near the beach fish and oysters may be profitably served, and many little oddities of weed and shell life sold. On the inland farm the dairy products and vegetable salads are suitable, and a good trade may often be built up in hampers of fresh vegetables, thus eliminating the middleman bugaboo . . .

The gathering of medicinal herbs, the raising of cats and dogs, of rabbits, of mushrooms, pigeons, of poultry, and of bees, all offer suitable pursuits for the country girls and her small brothers. And, should she make a great success in any line of endeavour, she can add a little to her store of pin-money by detailing that success in simple and effective language for the farm papers, which are always in the market for accounts of actual and practical money-making experiences.

All these merely by way of suggestion. If none of them fits your case or abilities exactly, vary them, make them fit, or invent other opportunities—find them rather, for opportunities in one shape or another generally abound, if one has the eyes to see. It is largely a matter of gumption, and the girl who lacks that, could not succeed at anything, even though the whole plan were "cut and dried for her." "God helps those who help themselves."—ELIZABETH WHITFORD in the "California Cultivator" (adapted).

Farm Notes for February.

Reference was made in last month's Notes to the necessity for early preparation of the soil for winter cereals, and to the adoption of a system of thorough cultivation in order to retain moisture in the subsoil for the use of crops intended to be raised during the season. The importance of the subject, and its bearing in relation to prospective crop yields, is made the excuse for this reiteration.

Special attention should be given to increasing the area under lucerne (broadleaf Hunter River), wherever this valuable crop will grow. Its permanent nature warrants the preparation of a thorough tilth and seed bed, and the cleansing of the land, prior to sowing the seed, of all foreign growths likely to interfere with the establishment and progress of the crop. Late in March or early in April is a seasonable period to make the first sowing providing all things are favourable to a good germination of seed.

Dairymen would be well advised to practise the raising of a continuity of fodder crops to meet the natural periods of grass shortage, and to keep up supplies of succulent fodder to maintain their milch cows in a state of production.

Many summer and autumn growing crops can still be planted for fodder and ensilage purposes. February also marks an important period as far as winter fodder crops are concerned, as the first sowings of both skinless and cape barley may be made at the latter end of the month in cool districts. Quick-growing crops of the former description, suitable for coastal districts and localities where early frosts are not expected, are Soudan grass, Japanese and French millet, white panicum, liberty millet, and similar kinds belonging to the Setaria family. Catch crops of Japanese and liberty millet may also be sown early in the month in cooler parts of the State, but the risk of early frosts has to be taken.

Maize and sorghums can still be planted as fodder and ensilage crops in coastal districts. In both coastal and inland areas, where dependence is placed largely on a bulky crop for cutting and feeding to milch cows in May and June, attention should be given to Planters' Friend (so-called Imphee) and to Orange cane. These crops require well-worked and manured land; the practice of broadcasting seed for sowing at this particular season encourages not only a fine stalk but a density of growth, which in itself is sufficient to counteract to some extent the effect of frost.

In most agricultural districts where two distinct planting seasons prevail, the present month is an excellent time for putting in potatoes. This crop responds to

good treatment, and best results are obtainable on soils which have been previously well prepared. The selection of good "seed" and its treatment against the possible presence of spores of fungoid diseases is imperative. For this purpose a solution of 1 pint of formalin (40 per cent. strength) to 24 gallons of water should be made up, and the potatoes immersed for one hour immediately prior to planting the tubers. Bags and containers of all kinds should also be treated, as an additional precaution. "Irish Blight" has wrought havoc at times in some districts, and can only be checked by adopting preventive measures and spraying the crops soon after the plants appear above the ground. Full particulars on the preparation of suitable mixtures for this purpose are obtainable on application to the Department of Agriculture, Brisbane.

Weeds of all kinds, which started into life under the recent favourable growing conditions, should be kept in check amongst growing crops; otherwise yields are likely to be seriously discounted. The younger the weeds the easier they are to destroy. Maize and other "hoed" crops will benefit by systematic cultivation. Where they are advanced, and the root system well developed, the cultivation should be as shallow as possible consistent with the work of weed destruction.

First sowings may now be made of swede and other field turnips. Drilling is preferable to broadcasting, so as to admit of horse-hoe cultivation between the drills, and the thinning out of the plants to suitable distances to allow for unrestricted development. Turnips respond to the application of superphosphate; 2 cwt. per acre is a fair average quantity to use when applied direct to the drills.

Where pig raising is practised, land should be well manured and put into good tilth in anticipation of sowing rape, swedes, mangels, field cabbage, and field peas during March, April, and May.

Orchard Notes for February.

THE COASTAL DISTRICTS.

February in coastal Queensland is frequently a wet month, and, as the air is often heavy with moisture and very oppressive, plant growth of all kinds is rampant, and orchards and plantations are apt to get somewhat out of hand, as it is not always possible to keep weed growth in check by means of cultivation. At the same time, the excessive growth provides a large quantity of organic matter which, when it rots, tends to keep up the supply of humus in the soil, so that, although the property looks unkempt, the fruit-producing trees and plants are not suffering, and the land is eventually benefited. When the weed growth is excessive and there is a danger of the weeds seeding, it is a good plan to cut down the growth with a fern hook or brush scythe and allow it to remain on the ground and rot as it will thereby prevent the soil from washing, and when the land is worked by horse power or chipped by hand it will be turned into the soil. This is about the most satisfactory way of dealing with excessive weed growth, especially in banana plantations, many of which are worked entirely by hand.

The main crop of smooth leaf pineapples will be ready for canning, and great care must be taken to see that the fruit is sent from the plantation to the cannery with the least possible delay and in the best possible condition. The only way in which the canners can build up a reputation for Queensland canned pineapples is for them to turn out nothing but a high-class article. To do this they must have good fruit, fresh, and in the best of condition.

The fruit should be about half-coloured, the flesh yellowish, not white, of good flavour, and the juice high in sugar content. Over-ripe fruit and under-ripe fruit are unfit for canning, as the former has lost its flavour and has become "winey," while the latter is deficient in colour, flavour, and sugar content.

For the 30 or 32 oz. can, fruit of not less than 5 in. in diameter is required, in order that the slices will fit the can; but smaller fruit, that must not be less than 4 in. or, better still, 4¼ in. in diameter, and cylindrical, not tapering, can be used for the 20-22 oz. can.

Bananas for shipment to the Southern States should on no account be allowed to become over-ripe before the bunches are cut; at the same time, the individual fruit should be well filled and not partly developed. If the fruit is over-ripe it will not carry well, and is apt to reach its destination in an unsaleable condition.

Citrus orchards require careful attention, as there is frequently a heavy growth of water shoots, especially in trees that have recently been thinned out, and these

must be removed. Where there are facilities for cyanidings, this is a good time to carry out the work, as fruit treated now will keep clean and free from scales till it is ready to market. Citrus trees can be planted now where the land has been properly prepared, and it is also a good time to plant most kinds of tropical fruit trees, as they transplant well at this period of the year.

A few late grapes and mangoes will ripen during the month, and, in respect to the latter, it is very important to see that no fly-infested fruit is allowed to lie on the ground but that it is gathered regularly and destroyed. Unless this is done, there is every probability of the early citrus fruits being attacked by flies bred out from the infested mangoes.

Strawberries may be planted towards the end of the month, and, if early ripening fruit is desired, care must be taken to select the first runners from the parent plants, as these will fruit quicker than those formed later. The land for strawberries should be brought into a state of thorough tilth by being well and deeply worked. If available, a good dressing of well-rotted farmyard manure should be given, as well as a complete commercial fertiliser, as strawberries require plenty of food and pay well for extra care and attention.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

The marketing of later varieties of peaches and plums, and of mid-season varieties of apples and pears, as well as of table grapes, will fully occupy the attention of fruitgrowers in the Granite Belt, and the advice given in these notes for the two previous months, with regard to handling, grading, packing, and marketing is again emphasised, as it is very bad policy to go to all the trouble of growing fruit and then, when it is ready to market, not to put it up in a way that will attract buyers.

Extra trouble taken with fruit pays every time. Good fruit, evenly graded and honestly packed, will sell when ungraded and badly packed fruit is a drug on the market. Expenses connected with the marketing of fruit are now so high, owing to the increased cost of cases, freight, and selling charges, that it is folly to attempt to market rubbish.

During the early part of the month it will be necessary to keep a careful watch on the crop of late apples in order to see that they are not attacked by codlin moths. If there is the slightest indication of danger, a further spraying with arsenate of lead will be necessary, as the fruit that has previously escaped injury is usually that which suffers the most.

Fruit fly must also be systematically fought wherever and whenever found, and no infested fruit must be allowed to lie about on the ground.

Grapes will be ready for market, and in the case of this fruit the greatest care in handling and packing is necessary. The fruit should never be packed wet, and, if possible, it is an excellent plan to let the stems wilt for a day at least before packing. This tends to tighten the hold of the individual berries on the stem and thus prevent their falling off.

In the western districts winemaking will be in progress. Here again care is necessary, as the better the condition in which the fruit can be brought to the press the better the prospect of producing a high-class wine.

Where necessary and possible citrus trees should be given a good irrigation, as this will carry on the fruit till maturity, provided it is followed up by systematic cultivation so as to retain a sufficient supply of moisture in the soil.

Readers are reminded that a cross in the prescribed square on the first page of this "Journal" is an indication that their Subscription —one shilling—for the current year is now due. The "Journal" is free to farmers and the shilling is merely to cover the cost of postage for twelve months. If your copy is marked with a cross please renew your registration now. Fill in the order form on another page of this issue and mail it immediately, with postage stamps or postal note for one shilling, to the Under Secretary, Department of Agriculture and Stock, Brisbane.

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.

	December, 1929.		January, 1930.		MOONRISE Dec., 1929.	Jan., 1930.
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	a.m.
1	4.50	6 32	5.2	6.48	4.24	5.35
2	4.50	6 32	5 2	6.48	5.9	6.28
3	4.50	6.33	5 3	6.48	5.57	7.23
4	4.50	6 34	5 4	6.49	6.48	8 19
5	4.50	6 35	5 4	6.49	7.42	9.14
6	4.50	6 35	5.5	6.49	8.37	10.9
7	4.50	6.36	5 6	6.50	9.31	11 2
8	4 51	6 37	5.7	6.50	10.26	11.57
						p.m.
9	4.51	6.37	5.8	6.50	11.20	12.55
					p.m.	
10	4 52	6 38	5 9	6.50	12 16	1.56
11	4 52	6.38	5.10	6.50	1.11	3.2
12	4.53	6 39	5 11	6.50	2.9	4.11
13	4.53	6 39	5 12	6.50	3.10	5.19
14	4.54	6.40	5 13	6.50	4.17	6 27
15	4.54	6.40	5.14	6.50	5.27	7.29
16	4.55	6.41	5.15	6.49	6.36	8.22
17	4.55	6.41	5.15	6.49	7.46	9.5
18	4.55	6.42	5.16	6.49	8.50	9.41
19	4.56	6.43	5.17	6.48	9.47	10.14
20	4.56	6.44	5.18	6.48	10.30	10.46
21	4.56	6.44	5.19	6.48	11.9	11.18
22	4 57	6.45	5.20	6.47	11.43	11.50
23	4 57	6.45	5.21	6 47	...	...
					a.m.	a.m.
24	4.58	6.46	5.21	6.47	12.15	12.26
25	4.58	6.46	5.22	6.46	12.46	1.5
26	4 59	6.46	5 23	6.46	1.18	1.50
27	4 59	6.47	5.24	6 46	1.51	2.39
28	5 0	6-47	5.24	6.46	2.27	3.31
29	5.0	6.47	5.25	6.45	3.6	4.24
30	5.1	6.48	5.25	6.45	3.52	5.19
31	5.2	6.48	5.26	6.45	4.43	6.14

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

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

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

Phases of the Moon, Occultations, &c.

8 Jan.	☾ First Quarter	1	11 p.m.
15 „	○ Full Moon	8	21 a.m.
22 „	☽ Last Quarter	2	7 a.m.
30 „	● New Moon	5	7 a.m.

Apogee, 2nd January, at 1·48 a.m.
Perigee, 15th January, at 10·24 a.m.
Apogee, 29th January, at 2·12 a.m.

On the 3rd the earth will make her nearest approach to the Sun from which its distance will be 91,300,000 miles.

The planets Venus, Mars, and Saturn will be apparently close to one another on the morning of the 3rd: but as they will rise only about one half-hour before the Sun they will be lost in the coming daylight.

On the 6th Mercury will be at its greatest distance, 19 degrees on the east side of the Sun.

The occultation of Tota Geminorum by the Moon, on the 14th instant, which will take place about 11 p.m., will not be visible north of Mackay, where the star will appear very near the northern edge of the Moon. Through binoculars or telescope it will be interesting to watch the star apparently skirting the northern limb of the full Moon. In the southern half of Queensland the star will disappear behind the Moon sooner further south and its reappearance will be proportionately retarded.

On the evening of the 27th the Moon will be passing from the west to the east side of Saturn, but 5 degrees further south. Although this will occur near midday the Moon will be visible in the north-west and Saturn can be brought into view with binoculars.

The Moon will be in the constellation Capricornus from the 1st to the 4th; in Aquarius from the 4th to the 6th; in Pisces and Cetus from the 6th to the 9th; in Aries from the 9th to the 11th; in Taurus and Auriga from the 11th to the 14th; in Gemini from the 14th to the 15th; in Cancer from the 15th to the 17th; in Leo from the 17th to the 18th; in Virgo from the 18th to the 22nd; in Libra from the 22nd to the 24th; in Scorpio and Orphincus from 24th to the 26th; in Sagittarius from the 26th to the 27th—New Moon on the 30th.

As the Southern Cross will be at the lowest part of its daily circle, about 6 p.m. in the beginning of the month and will not reach its most eastern position (ix.) till midnight, it will barely be coming into view in the south-east at 9 p.m. with its head slanting downwards to the left. Reaching these positions 4 minutes earlier each evening 2 hours will be gained by the end of the month.