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The Hon. the Secretary for Agriculture

Edited by J. F. F. REID

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GENERAL INDEX.

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ANNUAL RATES OF SUBSCRIPTION.

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VOL. XXXVIII. 1 JULY, 1932. PART 1.

Event and Comment.

The Dairying Industry—Its Development and Value.

INVITING His Excellency the Governor (Sir Leslie Wilson) to formally open the annual exhibition of the Queensland Butter and Cheese Factory Managers' and Secretaries' Association, the president (Mr. J. J. Searl) said that the association of factory managers represented an income derived from butter and cheese that amounted approximately to £6,000,000 a year. Over 60 per cent. of this butter and cheese was shipped to a market in London, and much of it was not consumed till four or five months after it had been made. Queensland therefore was called upon to manufacture butter and cheese that had good keeping qualities. For that reason an exhibition was staged annually that would give the factory managers some idea of how the product turned out after it had been stored for some time.

His Excellency said that was the first show he had opened that had anything to do with the primary industries of the State, but he intended to tour Queensland to see these industries for himself. He congratulated those who had organised a show of such great importance. In primary products the first essential was quality—after quality usually came quantity. That the butter produced in Queensland was of the highest standard was proved at the recent Royal Agricultural Show at Islington, where Queensland butter obtained the highest possible award.

He would like to mention one extraordinary fact—in the year 1900 only 9,000,000 lb. of butter was manufactured in Queensland, whereas to-day 100,000,000 lb. was produced, showing the enormous growth and progress of the industry. This

100,000,000 lb. was produced by 24,000 dairy farmers, supplying 117 of the factories throughout Queensland. These factories were as up to date as could be found anywhere in the world, and some of them produced 100 tons of butter a week. An amazing feature was the immense increase in export during the past year. That was entirely satisfactory. He hoped the industry would continue to prosper, and he was sure that an exhibition such as they had seen at Hamilton would help towards that end.

Further Research Work Planned.

AT the same gathering the Minister for Agriculture (Mr. F. W. Bulcock) said that as head of the Department he realised that there were avenues yet to be exploited. Along certain lines the Department should be entirely at the disposal of the people engaged in the primary industries. Attention must be given to the necessity for technical research. It would be his endeavour to make available to those who were creating material wealth facilities for research for the benefit of the dairyman, the butter factory manager, and the cheese producer, and others engaged in the industry.

He gave those assembled the assurance that as far as the Department could help in the solving of problems it would do so. He hoped to proceed with herd testing, with experiments in the top-dressing of pastures, and with problems connected with the incidence of disease. It was his intention to set up an organisation that would inquire more closely into problems concerning dairymen; he also intended to reconstruct the Yeerongpilly Stock Experiment Station as a research laboratory available to the dairymen of Queensland.

Avoidable Losses in Dairying.

AMONG the several important papers read at the June conference of butter and cheese manufacturers was one prepared by Mr. W. S. Hartley, manager of the South Burnett Co-operative Dairy Association. His subject was "Avoidable Losses in the Dairy Industry," in the course of which Mr. Hartley said he wished to draw attention to facts, some of which might prove unpalatable, but nothing was to be gained and much might be lost by an unfounded optimism, which overlooked their existence.

It was heartening to record that steady progress was maintained by dairymen in improving the breed and capacity of Queensland's dairy cattle, he said. A better system of herd-testing would be of service to farmers, and do much to eliminate losses due to milking cows, whose exact productive capacity, stated in monetary terms, was not known.

"If it be true that onlookers see most of the game," he went on, "then I am entitled to say that the future prevention of the huge losses, usually sustained by farm and factory when a man-size drought hits Queensland, will be secured by subdivision of paddocks, pasture improvement, and above and beyond all huge reserves of pit silage and hay. Surplus grass is plentiful at recurrent periods of the year, and pit silos are both cheap and effective for its storage in a palatable and succulent form. To take another point of view, it should not be an impossible task for Government to devise a 'drought insurance scheme,' with proper safeguards in the way of fodder reserves on the farms of component members."

Mr. Hartley covered a wide field, which included losses due to transport, low-test cream, and quality, the reduction in the price of boxes, moisture control, oil reclamation, and dual grading.

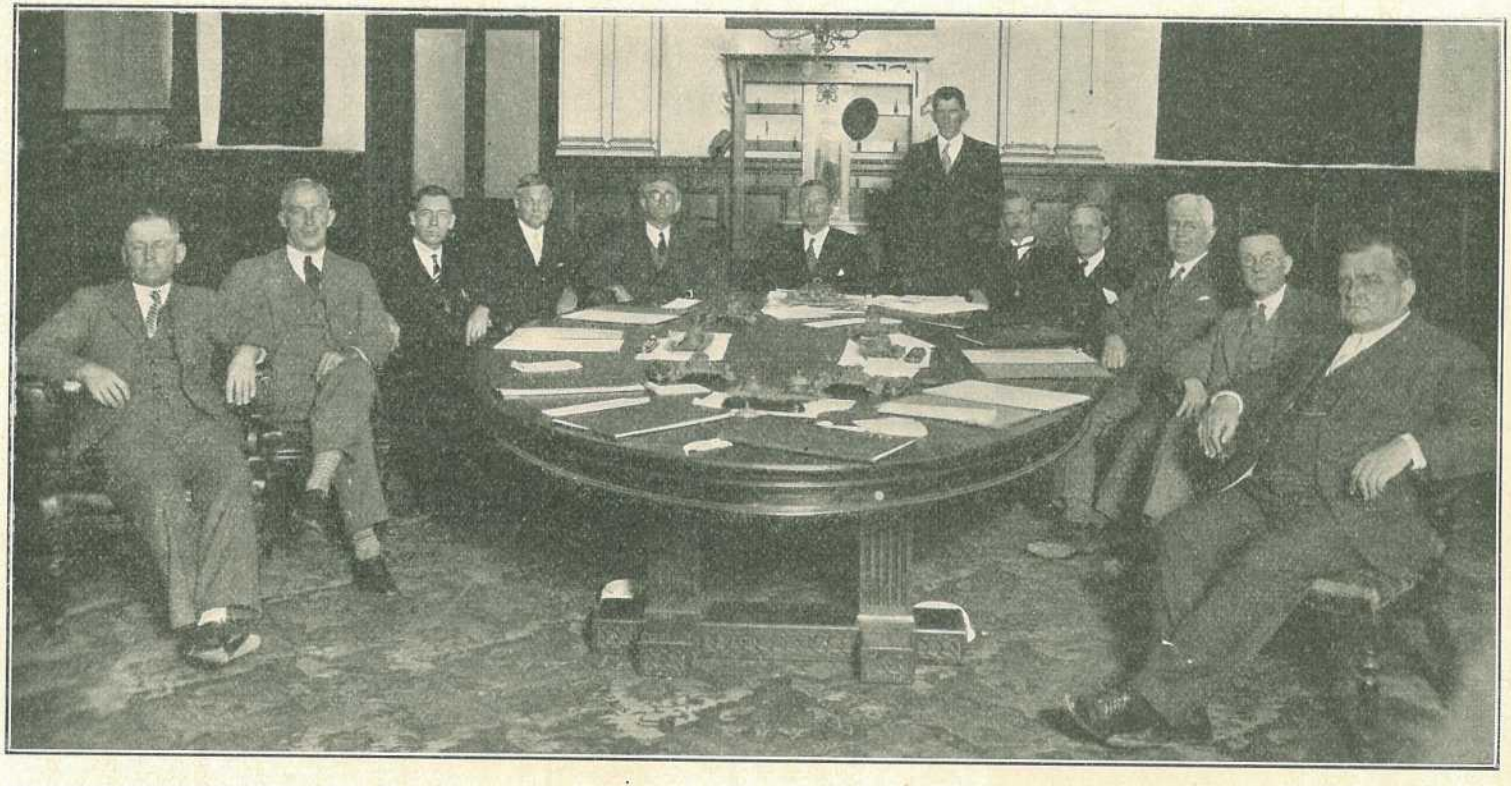
Feeding Value of Dairy By-products.

AT the same assembly Mr. H. J. H. Hines (Agricultural Chemist at the Queensland University), in a paper dealing with the feeding value of dairy by-products, pointed out that in some industries the value of by-products was sufficient to turn certain loss into handsome profit. The main uses to which dairy by-products were put were in the rearing of calves, pigs, and poultry, and in the feeding of fowls for egg production. The poultry industry in Queensland offered a promising field for the extended use of dairy by-products. Considerable changes as the result of experiments were likely to occur in the methods of feeding practised. The commonly used bran, pollard, and grain mixtures provided too little protein in the early stages of bird growth; properly supplemented by protein-rich foods, growing mashes could be designed to give remarkable growth in a short period. Giving details of experiments carried out at the Mount Gravatt experiment station, Mr. Hines said that White Leghorn chicks raised under a specified ration had an average weight in eight weeks of 20½ oz., as against 15½ oz. under another ration. Australorp chicks had a weight of 25½ oz., produced at a cost of 4d., under an approved ration. The young chick required a ration containing in the neighbourhood of 20 per cent. of crude protein. A substantial portion of the protein-rich supplements should consist of dairy by-products, such as skim milk, dried skim milk, or buttermilk. Eggs in their composition compared closely with milk, and milk by-products might therefore safely be held to be valuable aids to egg production. In the ticklish business of the early weaning of calves to save milk, extensive use was now being made both in Great Britain and New Zealand of whey paste—whey evaporated to a semi-solid consistency. Dr. Harding, in the journal of the Ministry of Agriculture in England, was enthusiastic in his praise of this product. Pigs had long been a standby in the disposal of surplus products; the Brisbane abattoir held promise of improvement in storage and transport, and continued attention to the problem of feeding might serve to combat low prices by lowering production costs. A growing demand might reasonably be expected for dairy by-products; a factor militating against their more extensive use was their high cost, which possibly might be reduced as demand grew and processes improved technically.

Advice to Tobacco Growers.

ENTIRE eradication of tobacco plants on completion of harvesting of the leaf and seed is advised by the Minister for Agriculture and Stock (Mr. Frank W. Bulcock). In the course of a recent statement on the subject he said that the harvesting of the 1931-32 tobacco crop had now been practically completed, and it was essential that the plants from which leaf had been gathered should be uprooted at once and wherever practicable destroyed by burning. In the course of the past season the entomological and plant pathological staff of the Department had devoted considerable attention to tobacco pests and diseases, and it was obvious from the information obtained that the incidence of these troubles would be reduced appreciably if the advice given were accepted by the growers and put into immediate practice.

Mr. Bulcock added that the destruction of the remains of the present crop and also of any volunteer plants would reduce to a minimum the material on which the various pests and diseases could continue their existence until the beginning of next season. This meant that the next season's crop would obtain a reasonably clean start, whereas the neglect of the precaution of destroying the residue of the crop would greatly increase the risk of infestation at the outset of the next season.



By Courtesy of the "Daily Mail," Brisbane.]

PLATE 1.—THE NEW QUEENSLAND CABINET.

From left to right: Hon. John Dash (Minister for Transport); Hon. H. A. Bruce (Minister for Works); Hon. E. M. Hanlon (Home Secretary;) Hon. Percy Pease (Minister for Lands); Hon. W. Forgan Smith (Premier, Chief Secretary, and Treasurer); His Excellency the Governor, Sir Leslie Orme Wilson; Hon. John Mullan (Attorney-General); Hon. Frank W. Bulcock (Minister for Agriculture and Stock); Hon. M. P. Hynes (Minister for Labour and Industry); Hon. F. A. Cooper (Minister for Public Instruction); and Hon. James Stopford (Minister for Mines).

Standing: Mr. G. W. Watson (Clerk of the Executive Council).

The Minister's Message.

TO THE FARMERS OF QUEENSLAND.

The services of the Department of Agriculture and Stock are at the disposal of the farmers and stock-owners of Queensland, and a completely successful outcome of departmental effort can only be possible with the continued co-operation of all concerned.

I would like you all to recognise that the Department is your Department, and that its policy is shaped in consonance with your individual requirements and the needs of organised agriculture based on science.

It is realised that the efficiency of methods of crop disposal must rest largely in the producers' own hands, and our desire is to perfect the comprehensive rural policy initiated some years ago for the benefit of Queensland producers.

We all recognise the complexity of modern marketing machinery and that our selling system must fail unless the many problems of distribution are studied and solved. We believe that the need of patient attention to the effectiveness of every link in the chain from the producer to the consumer has, in present world circumstances, vastly increased. We also acknowledge the necessity of a radical improvement in the organisation and distribution of agricultural produce in the interests of the State, no less than in the interests of the individual farmer.

It is my belief that the progress and prosperity of Queensland are bound up with the primary industries, so every effort will be made to promote their welfare.

I am fully aware of the difficulties in the way of the fulfilment of the desire to make an effective contribution towards the solution of the very grave problems confronting the farmers and stock-raisers of Queensland and, in extending sincere greetings to you all, I ask for your earnest and hearty co-operation in the performance of the task that lies before me.

Frank. W. Bulcock

Bureau of Sugar Experiment Stations.

HINTS TO CANEGROWERS.

The Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby, has received the following Entomological Notes for July, from the Northern Entomologist (Mr. E. Jarvis), Meringa:—

IMPORTANT NOTES ON GRUB FUMIGATION.

It is encouraging to record that during the cane beetle season just passed (December, 1931, to May, 1932) many of our growers have shown practical interest in the work of fumigating grub-infested cane land; which for the most part has been carried out in accordance with our directions as to the correct procedure for this method of grub control, the results obtained having again amply demonstrated the value of such treatment. In a few instances, however, farmers have met with disappointment, owing probably to the injecting having been undertaken too early in the year, before termination of the period occupied by emergences of these cockchafers.

When scouting for grubs and chancing to find a number of small ones under each stool examined, a grower would naturally become alarmed, and in his desire to destroy the pest without delay, be apt to overlook the fact that grubs of the first instar of growth do not materially damage the cane until about four weeks later, after they have moulted into the second stage of development.

During this interval any eggs deposited by secondary emergences of greybacks will have had time to hatch out, and these resultant grubs can be finally destroyed when fumigating the cane against those of the secand and third instars.

CUT THE FOLLOWING TABLE FROM YOUR JOURNAL AND KEEP FOR FUTURE REFERENCE.

EARLY STAGES OF CANE BEETLE; WHEN TO FUMIGATE THE STOOLS.

		Days.
19 Nov. ..	Assumed date of emergence of beetles.	
20 Nov. ..	Beetles, after copulation fly to the feeding-trees; remaining on same for about two weeks	14
3 Dec. ..	Egg-laden beetles invade cane land to oviposit under stools.	
15 Dec. ..	Grubs of the first instar or stage of growth are hatched out and commence feeding	12
	Period of first stage grub lasts about 30 days. Width across head of grub $\frac{1}{8}$ in. Length of body (doubled up state) from $\frac{1}{4}$ to $\frac{1}{2}$ in.	30
14 Jan. ..	Appearance of grubs of second instar, which lasts about 38 days. Width across head of grub is $\frac{1}{4}$ in. Length of body (doubled up state) $\frac{5}{8}$ in. to $1\frac{1}{8}$ in. About two weeks later these grubs of second stage, when numerous under the stools, do damage to the roots. Scouting of grub-infested fields can now be undertaken and fumigation work may be carried out at any convenient time between the dates of 28th January to about middle of March	38
21 Feb. ..	Appearance of grubs of the third stage of development. The duration of this instar lasts approximately 16 weeks (21st Feb. to 11th June). Width of head of grub $\frac{3}{8}$ in. Length of body (doubled up form) $1\frac{1}{4}$ to $1\frac{1}{2}$ in.	112
		206

A period of about seventy days should elapse from laying of the eggs until starting fumigation work, but in the event of there being a secondary emergence of beetles this period would need to be extended to about 100 days, in order to catch the grubs from both emergences.

Duration underground of the egg and larval conditions of this beetle (*Lepidoderma albohirtum* Waterh.) occupies a period of about 206 days.

The complete life-cycle of a greyback cockchafer (from egg to adult beetle) is completed in one year.

Note.—The figures shown below refer to years in which *single emergences* take place. This generally happens when dry weather conditions prevent flighting of the beetles until the end of November or middle of December.

WHEN TO FUMIGATE GRUB-INFESTED CANE LAND.

Beetles Emerge.	Time to Fumigate.	Beetles Emerge.	Time to Fumigate.	Beetles Emerge.	Time to Fumigate.
20 Nov.	29 Jan.	5 Dec.	13 Feb.	19 Dec.	27 Feb.
21 Nov.	30 Jan.	6 Dec.	14 Feb.	20 Dec.	28 Feb.
22 Nov.	31 Jan.	7 Dec.	15 Feb.	21 Dec.	1 Mar.
23 Nov.	1 Feb.	8 Dec.	16 Feb.	22 Dec.	2 Mar.
24 Nov.	2 Feb.	9 Dec.	17 Feb.	23 Dec.	3 Mar.
25 Nov.	3 Feb.	10 Dec.	18 Feb.	24 Dec.	4 Mar.
26 Nov.	4 Feb.	11 Dec.	19 Feb.	25 Dec.	5 Mar.
27 Nov.	5 Feb.	12 Dec.	20 Feb.	26 Dec.	6 Mar.
28 Nov.	6 Feb.	13 Dec.	21 Feb.	27 Dec.	7 Mar.
29 Nov.	7 Feb.	14 Dec.	22 Feb.	28 Dec.	8 Mar.
30 Nov.	8 Feb.	15 Dec.	23 Feb.	29 Dec.	9 Mar.
1 Dec.	9 Feb.	16 Dec.	24 Feb.	30 Dec.	10 Mar.
2 Dec.	10 Feb.	17 Dec.	25 Feb.	31 Dec.	11 Mar.
3 Dec.	11 Feb.	18 Dec.	26 Feb.		
4 Dec.	12 Feb.				

How Canegrowers Should Act.

In the first place all farmers purchasing soil fumigants should get into touch with the Entomologist at Meringa. When commencing fumigation work, remember that a 'phone call will bring an officer to the field to be treated, to demonstrate how to manipulate the pump and keep it in good working order, and to supply any information needed regarding the amount of the dose required for the crop in question, and what depths and distances from stools it should be placed.

Cane farmers would also find it advantageous to record in a note book or diary the dates on which primary and secondary emergences of greyback beetles were first observed to be on the wing. The purchase of insecticides is a wise step for any farmer to take; but at the same time, by being too hasty to apply same, it is possible to suffer the loss of both cane and fumigant.

CANE CROP PROSPECTS.

The Director of Sugar Experiment Stations, Mr. H. T. Easterby, states that the preliminary estimate furnished by the Queensland sugar mills, of the cane to be harvested during the 1932 crushing season, shows that 3,667,568 tons are likely to be crushed. This would give a yield of 94 net titre sugar in the region of 524,000 tons, which will be about 57,000 tons less than manufactured last year. The principal falling off is in the districts from Bundaberg south.

TO NEW SUBSCRIBERS.

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

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

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

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

THE QUEENSLAND SUGAR INDUSTRY.

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

PART XXVIII.

Field Machinery—(B) Cane Harvesters.

MANY attempts have been made in Australia to invent and perfect a machine that would successfully cut cane. Although I have been unable to find any reference to cane harvesters in the early literature connected with sugar-growing, yet probably attention was given to this subject even in the early days of cane cultivation. I have been connected with the industry for upwards of thirty-four years and during the whole of that time I have seen or heard of many machines devised for cane cutting, from automatic air-driven chisels and gigantic scissors operated by hand, to the powerful machine known as the Falkiner Cane Harvester, now stated to be working in Cuba, but which was invented in Australia. The cost of canecutting is so high, and the manual labour involved in hand cutting is so great, that the subject has always had a fascination for many persons with a mechanical turn of mind.

It is only during recent years, however, that there has been any promise of success, and we do now appear to be getting closer to the desired achievement of cutting cane by machinery.

The earliest reference I have found to a mechanical cane cutter appears in the Report of a Royal Commission on the Sugar Industry in 1889. It is there said:—

> "T. A. Silverwood presented a model of a practical apparatus for cutting standing cane. The *modus operandi* of the cane cutter were fully explained. The members of the Planters' Association (at Bundaberg) were so favourably impressed that they promised the inventor monetary assistance to enable him to have a full size working machine made."

Nothing further appeared in connection with the machine that I have been able to trace and, like the majority of its followers, it sank into obscurity.

In 1892 a prize of twenty shillings was offered by the Agricultural and Pastoral Society at Bundaberg for a cane harvester to be locally made. A writer then remarked that if the Association had made the prize £50 it would not be claimed, but if it were, Bundaberg would have nursed into existence the most valuable invention yet discovered in connection with the sugar industry. He went on to say:—

> ". . . Several inventive men in this district are cudgelling their brains over this difficult piece of machinery. At least six different designs are being worked out. At the Bundaberg foundry there are several models, and at the same place there is one complete machine, the invention of Mr. Rowland, proprietor of the "Star" and Mayor of the town. It seems to me that every design seems to fail at the point of cutting. A Brisbane engineer some years ago made a machine that would very nearly work. If a few small alterations had been made, success would probably have attended his efforts. He was a designer and not a workshop man, and I heard he went home to Scotland to remedy his deficiencies. That a harvester, able to work on level ground, will be invented is almost a certainty."

The next reference to cane cutting by machinery is in 1893, where the "Mackay Sugar Journal" states:—

> "Mr. Joseph Fletcher, F.C.S., forwards us plans of his proposed cane-cutting machine recently patented in Queensland.
>
> "The machine is an adaptation of the principles of the ordinary reaping machine to the cutting of sugar-cane, with such modifications as fitted for that purpose. The motion is derived from a driving wheel in contact with the ground revolving as drawn by a team of horses, oxen, or in the larger machines by a steam engine. . . . This cutter is of peculiar construction, being a saw made of small pieces, jointed, or loosely riveted together in such a way that the cutting edge is always presented to the standing cane whilst it revolves round spindles at a very rapid rate. The construction of this saw-cutter permits of very easy repairs.
>
> "The simple machine, consisting of framework, driving wheel, and cutter, could be constructed for a small sum and would be sufficient for farmers growing a few acres of cane; a pair of horses would be enough to work it, and the amount of cane cut would be large. A larger and more ambitious machine provides that when the cane is cut by a similar means it should fall on an arrangement of light wire ropes having at intervals teeth or prongs which collect and elevate the canes and the guides to another platform, at one end of which is a system of revolving knives by which the tops of the canes are cut off to fall behind the machine, this cane being delivered at the side in rows or on to a wagon which may accompany the machine. This arrangement of knives is capable of adjustment (within moderate limits) to the average length of the cane in the field, but short canes must fall out uncut, to be topped by a man following the machine.
>
> "With a stationary steam engine, wire-cables, &c., a very large quantity of cane should be harvested in a day, and the saving of labour should be considerable. The cost of such a machine, if it were successful, would be amply repaid by one season's working."

This machine which promised so much has certain points of resemblance to some of the later cane cutters recently tried out, but it too was no more heard of.

The subject again crops up in the "Mackay Sugar Journal" later in the same year, when it is said:—

> "We are in receipt of a letter from a gentleman in Sydney who is anxious to dispose of his interests in a machine to cut cane. It is worked by two horses and one man and moves at the rate of 2½ miles per hour, will cut 20 acres of cane a day at a cost of less than one penny per ton."

Where was this machine in some cane cutters' strike? The sugar-growers could all have been "sugar barons" if they had a machine to cut 20 acres a day at a penny per ton!

In 1894 we read that the Queensland Registrar of Patents had accepted an application for letters patent for a "sugar-cane cutter."

In the same year Mr. C. W. Bock, of Bundaberg, patented a machine to be used in the fields for canecutting. By a system of cogs, movement

was given to a horizontal cross-saw. Another action shot the untopped canes over the roof of the machine, leaving same lying in rows upon the ground behind. Persons interested in the sugar industry expressed the general opinion that for practical purposes the invention was superior to any yet tested. This cutter was improved during the following year.

An improved machine for canecutting was patented and tried in the Bundaberg district by Mr. Corten also in 1894. A report stated that it seemed to come nearer to what is required, but funds were wanted to build the machine and test its capability.

Stepping out of Australia, in 1894 we learn that a new cane cutter had been invented in Louisiana by a Mr. A. le Blanc, which presented some new points that promised success in the direction whereon most machines had failed so far.

> "The new machine was to be propelled by mule power from behind and to cut the cane at or slightly below ground level. The cane thus cut falls on a carrier and passes over a drum, cut end foremost. As the cane drops from the drum a rapidly revolving knife cuts off the top of each cane stick just as it drops. Thus the short and long canes are all properly topped, as the topping is only done when the cane passes off the carrier and the top end falls across the topping knife. It has seemed that human discretion was esential to determine when to cut off the cane at the top. Now we have a rapidly revolving knife that will top any cane that falls across it, but while short canes may fall across the knife when the carrier carries them, 4 feet or 5 feet long cane cannot fall across the knife until the carrier has carried them their full length, when they, too, fall across the knife and are properly topped."

The year 1894 seemed a rather fruitful one for different machines. In 1895 the only reference I find is the following:—

> "Some months ago, it will be remembered, an account appeared in the columns of the "Bundaberg Mail" of a cane cutter designed and patented by Mr. C. Bock, sen., of Burnett street. Before any practical use was made of the invention, a topper was added, and it was found necessary to make material alterations to the original cutter with the view of enabling it to work closer to the ground. In fact, the whole construction was so altered as to practically constitute an entirely new machine. Application was then made, through Mr. H. N. Thorburn, for letters patent, which were received upon Saturday last, when a representative of this paper waited upon the inventor and obtained the following particulars.
>
> "The salient features of both cutter and topper are that they are automatical in movement and so designed as to be capable of being drawn by one or two horses from either end. The cutter consists of a large wooden framework fixed between two bulky wheels to the connecting shaft to which is attached the various portions of the machinery. The framework is divided into two parts, one of which is for dealing with the cane, and the other contains the cog-wheel gear. The former is flanked by high iron sides to prevent the cane, when cut, interfering with the gear. Projecting from the frame, fore and aft, are sets

of two gatherers so placed as to be capable of picking up any fallen sticks; and below there is a lacerated knife, which, working sideways, cuts the stools close to the ground. The forward motion of the machine makes the cane fall back upon a platform on which are two revolving drums. These shoot the cane along until it is in position against the swing board of the topper. The cog-wheel or driving gear consists of a shaft on which is a cog-wheel driving a smaller one 'keyed' to a crank shaft with two eccentric rods. These drive a pulley shaft which connects by belting with the lacerated knife. The topper, a separate piece of machinery, is placed at the end of the cane platform. When the cane has been driven by the rotary motion of the drums on to the swing board of the topper, a cam or eccentric driven by the topper's shaft tilts the swing board up. As the swing board is tilted a gauge board rises to prevent the cane from dropping too far. This board can be regulated from 14 inches to 2 feet, so as to cut off the whole or only part of the tops. When the latter are severed the guillotine rises and the gauge board drops again, thus allowing the cane to slide from the swing board to the ground. The cutter and topper together, it is calculated, will not weigh more than 12 cwt. They are to be exhibited at the forthcoming show, and, meantime, Mr. Bock will be glad to show them to anyone calling at his residence."

Nothing further appears in the "Mackay Sugar Journal" till July, 1897, when a leading article deals with the matter asking whether it was not possible to find a light portable motive power which, operating along flexible shafts, would enable several men to cut and top cane without the necessity of striking a blow themselves.

(The writer must have had in mind the mechanical sheep shearing, but he does not explain how the motive power and flexible shafting are to be moved from place to place in the field.)

The writer adds the need is urgent, but regrets that the bare idea of finding any machine which would operate with almost human intelligence in the cutting of cane was always the signal for derision, laughter, and scorn.

In the year 1900 a description is given of a new cane cutting machine invented in Louisiana. This presented some novel ideas.

The machine resembled the usual two-wheeled vehicle drawn by three mules, except that no middle mule was used in the shafts—

"but the machine is guided by the two mules outside of the shafts. This leaves the space usually occupied by the middle mule for the standing cane just before being cut. In other words, one mule and one cart wheel goes on one side of the cane row, and the other mule and cart wheel goes on the opposite side of the cane row. There are also two other mules that push the cart from behind. The axletree is curved up in the middle, to allow the canes to pass under just as they are cut and fall forward. The cutting of the canes is accomplished by two steel discs placed underneath the axletree of the machine. These discs revolve horizontally, and are attached to the journals, which are adjusted at the desired height. The discs below the axletree above and the two sides of the frame, form a rectangular opening, or throat, through which the canes pass, root ends backwards, as the machine advances forward. It is proposed to make future machines with each disc 3 feet in diameter. The edges of the discs lap 2 inches.

> This would leave some 30 inches space between the journals of the discs. It is considered that this 30-inch space, or throat, will be wide enough to allow a heavy growth of cane to pass through just as it is cut and is falling forward to the ground. The discs are partly in the ground, at the roots of the cane, and I did not observe that any canes were cut in two near the middle by falling forward on to the ground before the discs had passed on out of the way. The lower ends of the cane just cut are steadied by some soil clinging to the roots, and the tops of such canes fall forward against standing canes just to be cut."

These are all the references to cane cutters in the "Mackay Sugar Journal" from 1892 to 1900. No doubt many other devices were patented which never saw the light or got outside the "plan and specification" stage.

In the Annual Report of the Bureau of Sugar Experiment Stations for 1903, reference is made to a cane cutting machine in the following terms:—

> "The invention of a mechanical means of cutting cane, as a substitute for hand cutting, has engaged the attention of several inventors for some time.
>
> "A cane cutting apparatus has been made by Mr. Herbert Paul and a public trial was made with the machine on 17th October of this year at the Mackay Sugar Experiment Station. . . . . This mechanically is a partial substitute for hand labour. The question of the relative economy of the device has yet to be determined. This will be done during next season by comparative tests of cost of cutting by machine and by hand."

From what I remember of this machine it was in the form of a sharp automatic chisel strapped to the cutter's arm and operated by compressed air, making a series of rapid blows when applied to the cane and cutting through the stick. From memory I think it did not work as quickly as a good cane cutter did in the same block. Anyhow, it was never more heard of.

On a previous page it was mentioned that Mr. Rowland, of the "Star" newspaper in Bundaberg, invented a cane cutter. It is rather a curious coincidence that about ten years later Mr. T. D. Chataway, proprietor of the "Mackay Mercury" and also Mayor of Mackay, designed a cane cutter, but I do not think it ever got beyond the "plan" stage.

Another remarkable invention was that of a Mr. Alfred Cantle, at Yandina, in 1909. This was a machine which he asserted would solve the problem of the cheap and rapid cutting of the cane crop. It was a hand machine operated and propelled by one man, and weighed about 28 lb. It had at the foot a triangular knife similar in shape to the cutting tooth of the ordinary scarifier. This was carried on a light iron frame supported at the rear by a pair of light iron wheels, and it slides along the ground on the under surface of the knife. It was propelled by means of handles like a wheel barrow. When the knife had been brought in contact with a cane stool the operator lifts a cross-handled lever which raises a swinging hammer. The latter, on being released, strikes violently against the projecting shaft of the cutter and drives it through the object to be cut. This movement is intensified by the action of a spring in contact with the handle. It was claimed that the blow can be so delivered as to cut through many sticks of cane at a stroke,

and that one man with the machine could do as much work as three without it. Another feature of the machine was that the tapping could be very simply done by resting the handles on the ground so that the knife was elevated to a convenient height for the operator who, seizing the cane stalks severs the top by simply striking them against the sharp blade of the knife. These ideas also perished.

During the first few years of the present century we did not hear very much about cane harvesters. After the one mentioned in 1903 no further reference is made in the Annual Reports of the Bureau of Sugar Experiment Stations till 1925. There were, however, some attempts made to cut cane by machinery between the years mentioned, and in addition a number of inquiries were made by inventors. It was rather a curious thing that nearly every one seeking information as to the prospects of success of a cane cutter were imbued with the erroneous idea that there was a huge reward offered by the Queensland Government for a successful cane cutter, the sums of £10,000 to £100,000 being generally mentioned.

A machine known as the Hurrey Cane Harvester was being experimented with about 1910. The inventor devoted much time and money to the work and it was this machine, afterwards taken over by Mr. Falkiner, that became the basis of what is now known as the Falkiner Cane Harvester of which reports have recently come from Florida and Cuba.

In August, 1921, a demonstration sponsored by the Australian Sugar Producers' Association took place at Sarina (Plane Creek), when the son of the inventor who had previously died was in charge of the machine. He stated that the machine then being tried was built on very different lines to the original machine. Mr. Hurrey said it was designed to do all the work with one man, but the mechanism had not operated as it should, the topping gear would have to be altered and the guillotine strengthened. The machine could now cut 3 acres daily, but would cut 4 acres when properly geared. The defects would be remedied, and by the end of the season he was sure he would have a satisfactory cane cutting machine.

The Luce Cane Harvester.

This machine came into a great deal of prominence from 1914 to 1929, but recently nothing has been heard of it. It was pictured very freely in the current Sugar Journals of the time, and a moving picture film of the machine cutting cane was sent to the Australian Sugar Producers' Association and exhibited at one of their conferences a few years ago. This machine, I understand, was a Louisiana invention, but it was also tried in Cuba. The Commonwealth Government was invited to send an Australian sugar planter to inspect the machine working, but this was not done. The Luce Cane Harvester Company said in their letter to the Secretary of the Prime Minister, that their idea was to ultimately arrange for the manufacture of their harvester in Australia, but before doing that it would be necessary to try out an imported machine under Australian conditions and so create the demand necessary to justify the erection of a local factory, but the great expense that would be incurred rather put that out of the question for the time being.

Good reports of the work done by the harvester in Cuba and Louisiana were received from time to time, and it is difficult to understand why no further reference to it have appeared lately. The plates following show the Luce Cane Harvester.

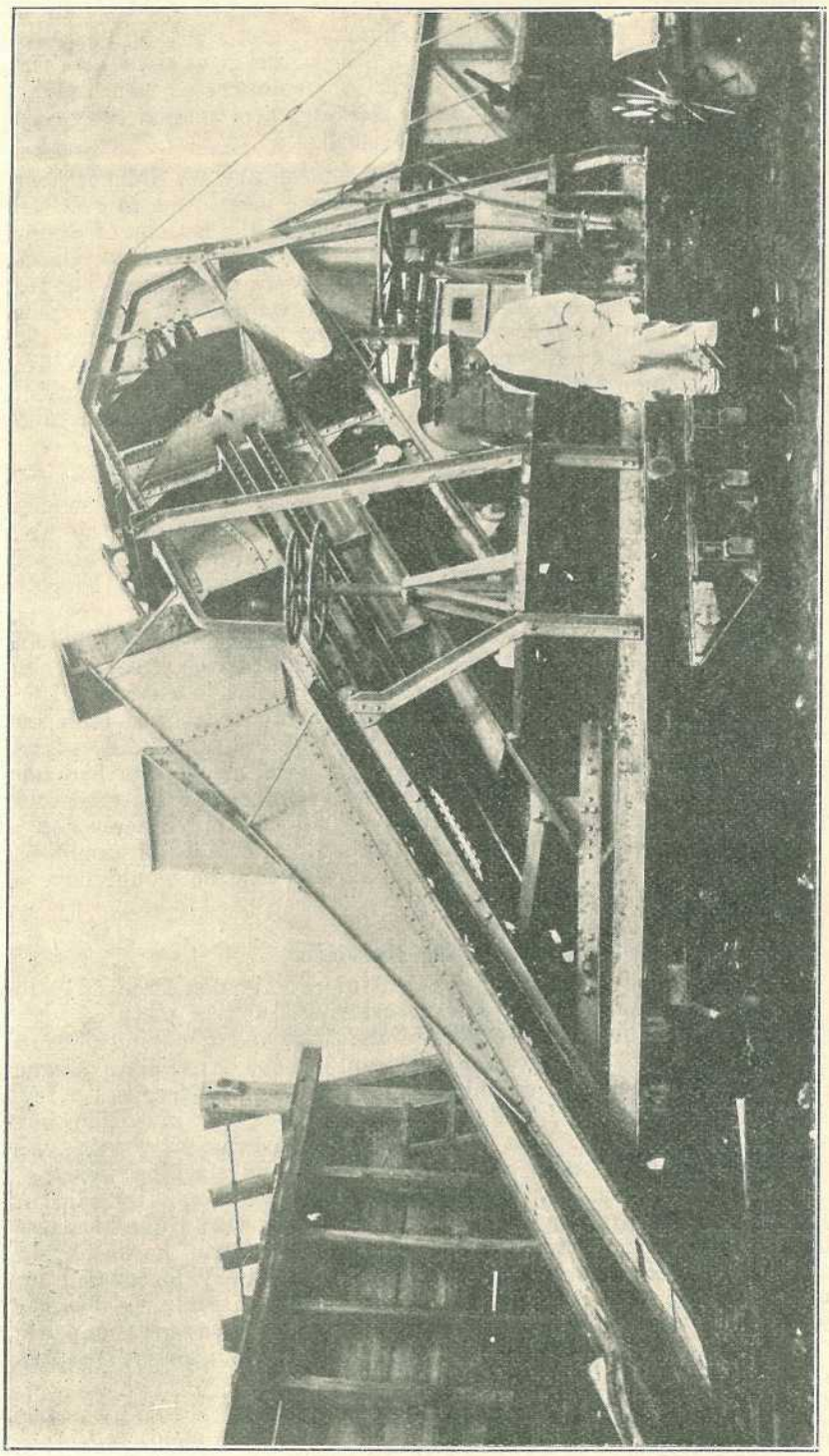


PLATE 2.—SHOWING THE CONSTRUCTION OF THE LUCE SUGAR CANE HARVESTER.

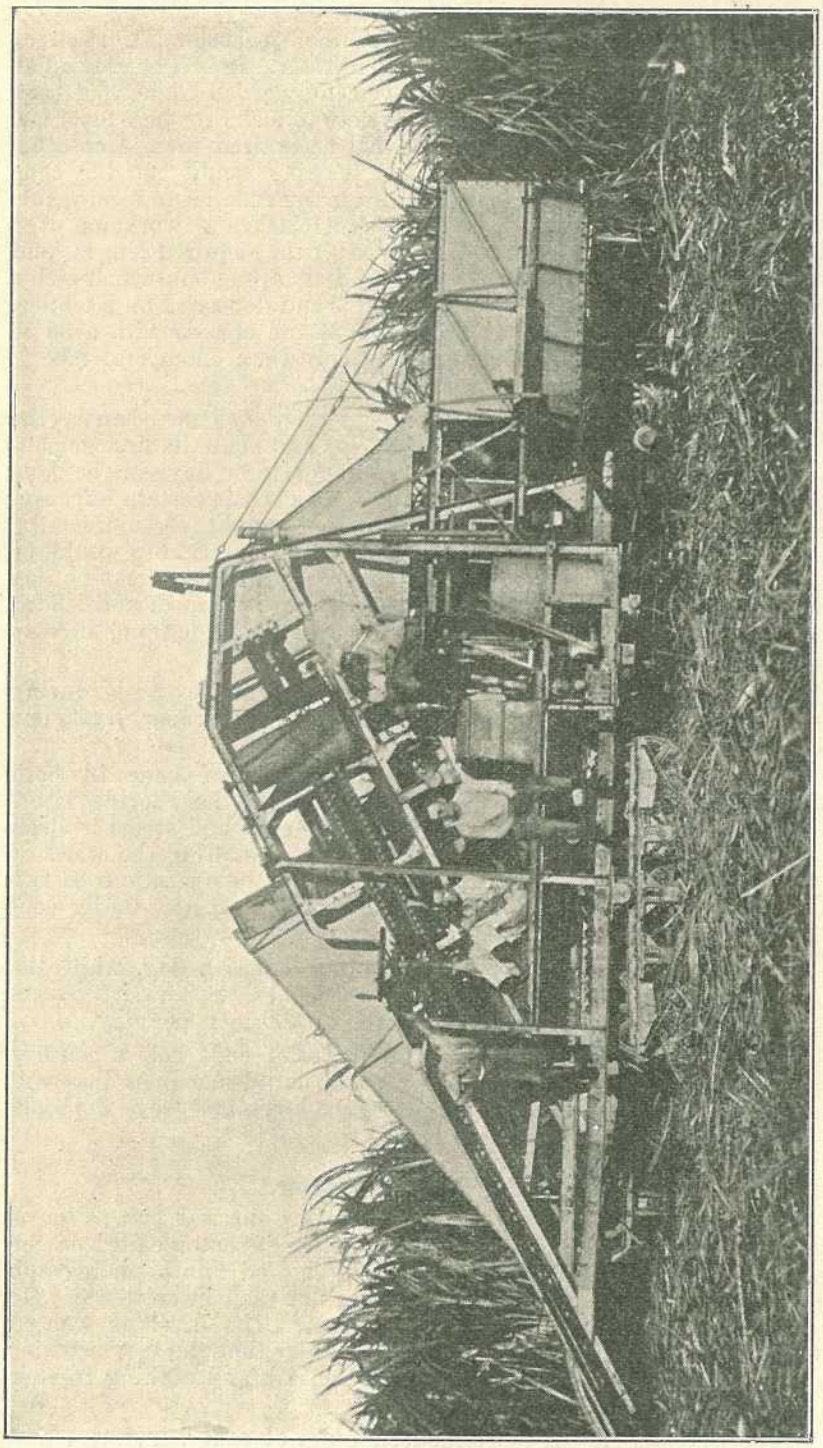


PLATE 3.—ANOTHER PICTURE SHOWING THE CONSTRUCTION OF THE LUCE SUGAR CANE HARVESTER.

Haorgt's Cane Harvester.

In 1923 Mr. W. G. Haorgt informed the Queensland Council of Agriculture that he had invented a cane harvester. It had been tried at Beenleigh, but there were several improvements needed which had been overcome and the patterns were now all ready to make the new machine. Extra capital was required to build it, and he desired the aid of cane-growers and Government support. His machine would cut the cane ½ to ¾ inches below the ground, then it threw the cane on to a moveable carrier which carried it up a working platform to a workman who guided the sticks to the knives to be topped at the required length, and then it was carried by a rotary carrier into a stripping-box which strips it and leaves it ready for carting to the rollers and deposited on a trailer. It is designed so that it can be built on a 3½ ton chassis with a 30 to 35 h.p. engine, and such power would be more than enough to take it through any fields.

In 1928 a cane harvester called the Fisher was mentioned (the result of eight years' investigation and trials) and made its first demonstration in America. The machine operated for forty days in the cane fields and was tested severely in every way. As a result certain improvements were to be introduced tending to reduce weight, strengthen the structure, and add to its mobility. The completed machine would be operated by three men and should handle 300 to 500 tons of cane a day at an estimated cost of 2½d. per ton of topped, cut, stripped, and loaded cane. This, I suppose, was also too good to be true, as nothing further has come to light.

Another American invention was mentioned in the press during 1930; this was a cane cutter invented by Carl G. Muench, of New Orleans. It is thus described:—

> "Ripping its way through tall fields of cane in both Louisiana and the new sugar plantations in the Florida Everglades, the sugar-cane harvester cuts the cane and strips it clean of leaves at the rate of 20 tons an hour, equalling the work of 159 skilled field hands. So successful were the operations of two of these machines this year that four more are now under construction and will be ready for next year's harvesting.
>
> "Because it will work twenty-four hours a day, while the field hand cannot work more than ten hours, the new harvesters actually more than replace the work of 300 men per day.
>
> "The perfection of the cane harvester ends half a century of failures on the part of sugarmen to build machines that will cut the tough cane stalk, strip off the foliage, and leave the stalk ready for the sugar grinding mill."

Howcroft's Cane Harvester.

This was a Queensland invention built before the war, but as far as I can gather it was never operated. In 1923 the inventor called on the Director of Sugar Experiment Stations and showed him a photograph of the original machine which he stated was not then in existence. He had made or thought of many improvements. The inventor wanted the Government to make him an advance in order that the new machine could be built. The Government declined the risk and nothing further was heard of the machine.

In the next article the more modern types of cane harvesters that are now in course of trial will be dealt with.

[TO BE CONTINUED.]

SOILS AND SUGAR CANE CULTURE.—I.

FORMATION AND COMPOSITION.

By H. W. KERR.*

IN its broad meaning soil is that friable upper layer of the earth composed for the most part of mineral matter resulting from the breaking up and decay of rocks. It is thus the product of rock weathering, brought about by the action of the destructive forces of nature. These forces include the stresses set up in the rock mass due to alternate heating and cooling and the action of running water as an abrasive agent, assisted by the sand and gravel which it carries along. In cooler regions the water which enters the cracks of the rock may become frozen, and the force exerted in this way tends further to open up the cracks and hasten the break-down of the rock. Under humid tropical conditions the rock decay is effected chiefly by the chemical action of water, aided by gases such as oxygen and carbonic acid which it carries in solution. The products of decay of vegetation are frequently acid substances which also exert a solvent influence.

As a result of this complex, slow action, the solid rock mass is eventually reduced to small particles, and the minerals of the rock undergo a greater or lesser change in the process. The quartz particles are merely broken down to smaller sand grains, but other minerals may completely lose their identity in the process. An outstanding example of rock weathering is the decomposition of the hard, dark, compact volcanic rock or basalt which occurs at numerous points along the coastal area of Queensland. It yields a deep, rich red or chocolate loam such as is found at Bundaberg, Childers, Innisfail, and Atherton. In many cases the rock has been changed to soil to a depth of 100 feet or more. The weathering processes do not cease when the soil is formed, but continue to act indefinitely upon the soil itself. As we shall see later, this is most important, for the process provides a supply of materials most valuable to our crops.

In many localities, we may trace the changes from the mature surface soil, through the partially decomposed rock, to the solid, unchanged material. Such a soil is known as a residual soil, and is directly related to the underlying rock. The red volcanic loams provide an example of this type. However, the excessive rainfall which drains from the land surface during the wet season, carries with it a greater or lesser amount of fine soil material which may find its way into creeks and rivers. In times of flood these streams frequently overflow their banks. The rate of flow of the water is thus checked, and the load of sediment is deposited as a layer over the flooded land surface. In this way soils are built up which have no relationship to the underlying rock. These are known as transported soils, and are represented by our river alluvials, which constitute some of the most important sugar soils of the State. The sources of the sediments are mainly the uplands drained by our coastal streams; these are frequently areas of deficient rainfall, so that the sediment has not been subjected to excessive leaching; and as a consequence it confers upon the alluvial soils a high degree of fertility, which is maintained in some measure by the renewed deposits during successive flood seasons. The rich alluvial soils of the Burdekin delta are an excellent example of transported soils of this character.

The term "soil" is also employed in a more restricted sense to designate that portion of the ground which is tilled, or which can be

* In a series of radio lectures from 4QG.

readily identified from the underlying stratum or "subsoil" by a definite colour change. The distinct transition from soil to subsoil may be traced very clearly in most of our forest soils, but with scrub soils there is often no sudden change, but a gradual transition extends over a depth of several feet. There is usually a definite relationship between the depth of surface soil and the fertility of the land, and it is for this reason that the deep scrub soils are preferred to the comparatively shallow forest lands.

A detailed study of the soil shows that it consists of a mixture of mineral particles of widely varying size. Let us add a portion of soil to water contained in a glass vessel, shake the suspension very thoroughly, and then allow it to stand. We would find, in general, that the coarser particles settle rapidly, and then follow the finer and finer grains, while certain of the extremely finely-divided material remains suspended almost indefinitely. The coarser particles are known as sand, while the finest material is known as clay. The grains of intermediate size are called silt. All soils contain these three grades in varying proportions, and the relative amount of each present has a most important bearing on the physical properties and the tilling qualities of the particular soil. One rich in sand is known as a sandy soil, while a soil rich in clay particles is known as a clay. Intermediate to these extremes we have the loams, which do not contain a preponderance of particles of any of these three grades.

The individual soil particles do not exist as a casual mixture in which every particle remains separate from every other particle. The finest soil material or clay exerts a cementing action which binds the soil into compound particles or granules, thus developing what is known as a "crumby" or "granular" structure. This characteristic is an essential feature of a soil in a condition of good tilth; but frequently the land loses this characteristic, so that the soil becomes loose and dusty when dry, and runs together to form a hard compact mass after wetting. This soil condition is most undesirable, and methods for correcting the difficulty will be discussed in some detail at a later stage.

So far we have considered the soil as a conglomerate lifeless mass of mineral particles. Such a mixture would be quite incapable of crop production, and we have now to recognise that the soil contains, in addition, a greater or lesser amount of material not of mineral but of organic origin. As the plant and animal inhabitants of the soil perish, their remains decompose in the soil; and the residues from this decomposition constitute that important material—the soil humus. The process of decomposition or decay which these organic remains undergo, is effected by a complex population of myriads of minute organisms known as bacteria and fungi. When we speak of bacteria and fungi, the popular mind conjures up visions of certain of these organisms in their relationship to diseases of both animals and plants; but it is well to remember that there are but few of these organisms which are actually our enemies; and, from the farmer's point of view, we must consider this great army of little workers as a never-tiring band of willing helpers who, given suitable conditions, bring about most important changes in the soil for the benefit of both farmer and crop. The plant and animal remains which are added to the soil constitute the food of these "microbes," as they are popularly called, and the by-products of their life processes are, firstly, the plant food materials which we shall consider shortly; and secondly, the undecomposed residue which remains

to confer its important properties to the soil. This material—the soil humus—is a black, waxy substance, which exists as a fine coating surrounding the mineral grains, and assists the clay particles in binding the individual grains into that crumby or granular structure so desirable in our agricultural lands. It also has an important bearing on the water-holding capacity of the land, and contributes in a large measure to its fertility.

The proportion of humus which is found in soils varies widely. In certain of the black earths of the Canadian prairies, famed for their prolific wheat productivity, as high as 20 per cent. of the weight of the soil is humus. Unfortunately, the humid tropical conditions of our coast are such as favour the rapid decomposition of the valuable soil organic matter, and it is seldom that we find more than 5 per cent. of humus in the best of our soils. The excessive leaching to which most of the sugar lands are subjected also results in a rapid loss of humus. Under intensive cultivation, the rate of loss due to these causes is intensified, and unless strenuous efforts are made to keep up the supply, by the ploughing under of all available crop residues, the soil suffers seriously from the point of view both of fertility and the ease with which it can be maintained in a condition of good tilth.

We must visualise our soil, then, as a body of lifeless, decomposed rock minerals, through which is infused the organic remains of plant and animal origin, carrying with it a busy population of microscopic life.

We have next to consider the importance of this complex mass of decayed rock and humus in its relationship to plant nutrition and crop growth.

FUNCTIONS OF THE SOIL IN PLANT NUTRITION.

Earlier students of agriculture were completely mystified by the process of crop production. That the soil was essential to plant growth was quite obvious, but of the nature of the substances which it absorbed in the process they were completely ignorant. As recently as three centuries ago it was thought that a plant was nothing more than water that had undergone a mysterious change in the soil; other workers contended that the plant roots actually fed on the solid soil particles, and the explanation of the value of cultivation was, that it helped to reduce the soil to the finest condition and thus assisted in the process of digestion by the plant. In fact, it is only during the past 100 years that the science of agricultural chemistry has given us a clear understanding of the principles of crop growth, and the true function of the soil in this regard.

Scientific studies have shown that the plant leaf is a marvellous factory in which the raw materials, carbonic acid gas and water, are manufactured into sugars, through the agency of the green colouring matter of the leaf. This substance—known as *chlorophyll*—has the power of absorbing the energy of the sun's rays, and utilising this energy to effect a combination of the raw materials. The water utilised in this process is absorbed from the soil through the roots of the plant. The carbonic acid gas, or carbon dioxide, is absorbed from the atmosphere by the inner surfaces of the plant leaves. Microscopic examination of a leaf shows that its surface is pitted with numerous small pores, through which air may enter and leave, and in this way a continuous supply of carbonic acid is maintained to the "leaf factory."

From the sugars manufactured in this way, more complex plant substances are built up. These include starches, fibre, proteins, and fats, which are essential to the economy and life processes of the plant. Our cane crop is particularly interesting in that it preserves large quantities of sugars in the storage cells of the stick, and these sugars confer upon the crop its economic value.

In addition to these organic compounds of the plant it contains, also, a certain proportion of mineral matter. This is clearly evident from the fact that when we burn the dried plant, a certain amount of ashy material remains. Analysis of the ash from a variety of plants shows that certain simple substances or elements as they are called, are always present, and it has been demonstrated that these are absolutely essential to plant growth. These essential elements, six in number, are phosphorus, potassium, calcium, magnesium, iron, and sulphur. They are usually called soil nutrients or plant foods, and if any one of these is entirely lacking in a soil, plant growth is quite impossible; yet in total quantity they may constitute no more than 1 per cent. of the entire weight of our plant. The mineral matter of the soil is the source from which these substances are derived, and they enter the plant through the roots, dissolved in the soil water which is absorbed at the same time. It is in this respect that the weathering action in the soil is so important; it maintains the decay processes which provide these nutrients in a form available to our crops. The nutrients bound up in the undecomposed soil particles are not available for plant feeding, as was once supposed, but are utilised only when the weathering processes release them in a soluble or available condition.

There is still one essential nutrient, nitrogen, which does not arise from mineral decay, but which is entirely associated with the soil humus. It has already been stated that a mass of decomposed mineral matter will not support crop growth, for the reason that it is not capable of supplying the essential plant food, nitrogen. Further, soil nitrogen becomes available to the plant only as rapidly as the humus decays; that is, conditions in the soil must be suitable for the feeding of the soil microbes on the soil organic matter, so that they in turn may release the available nitrogen as a waste product of their feeding. At the same time certain mineral nutrients which were contained in the original plant residues, when they were returned to the soil, become available once more in the process.

The nett effect of mineral and organic decay in the soil is, then, to provide a supply of plant foods to the crop. It is also reasonable to suppose that certain soils may not be capable of supplying these plant foods in quantities adequate for the crop needs, and in this event we might expect crop growth to be handicapped as a consequence. This is, indeed, quite true, and the problem of maintaining the nutrient supply introduces the question of fertilizers and their use.

Fertilizers are used largely in Queensland, particularly by cane-growers; but there are still many farmers who have deep-rooted objections to them, which they consider as plant stimulants, the use of which will eventually ruin the land. Nothing could be further from the truth; for these substances are nothing more or less than concentrated supplies of essential plant foods. Let us look into this question a little more closely. It has already been stated that before plant growth is possible, a supply of the seven named soil nutrients is essential. Most agricultural lands contain at least four of the nutrients named; but it

frequently happens that there is a marked deficiency in the supply of nitrogen, phosphorus, and potash, and that is the reason why artificial fertilizers contain only these three nutrients.

In preparing commercial fertilizer, it is possible to mix together a variety of proportions of the constituents which supply the individual plant foods. It will be quite obvious that, if fertilizer is to be used to the best advantage, the mixture employed should be so constituted that it supplies the three plant foods in the exact proportions in which they are lacking in the soil. In other words, we may determine that our crop requires nitrogen, phosphoric acid, and potash, in certain proportions. Sugar-cane, for example, shows something like the following:—One ton of cane contains 2 lb. nitrogen, 1 lb. phosphoric acid, and 4 lb. potash. A 30-ton crop of cane will then require thirty times these amounts or 60 lb. nitrogen, 30 lb. phosphoric acid, and 120 lb. potash.

If we could only determine the capacity of the soil to yield these three nutrients, it would be an easy matter to calculate, by simple arithmetic, the weights of each plant food to be added to the soil. Unfortunately, the problem is not quite so simple as that; but the essential point is, that in seeking the most suitable fertilizer mixture, we have to keep in mind firstly, the needs of the crop, and secondly, the nature of the soil supply. The latter factor involves a knowledge of the soil itself, and it is a well-established fact that soils vary widely in their ability to supply these nutrients. In this connection take our well-known red volcanic loams. These soils are derived from a rock which is notably deficient in potash, and, as we might expect, the soil very frequently yields a deficient supply of this plant food to the crop. The use of fertilizer mixtures rich in potash on such soils is therefore attended by good success. On the other hand, the alluvial loams of the Johnstone River area are derived largely from granitic rocks, which are notably rich in potash, but deficient in phosphoric acid. On these soils our experiments show that large increases in crop yields follow the use of fertilizers rich in phosphates, while little response is shown to applications of potash. Each particular soil type, then, exhibits its own peculiar characteristics with respect to its fertilizer needs.

With regard to the nitrogen supply, it has already been pointed out that this is closely associated with the humus content of the soil; and the soils of coastal Queensland are notably deficient in their content of this important soil substance. We might expect, therefore, that these soils will frequently be found to give good results following the use of fertilizers containing this plant food. This is, indeed, a well appreciated fact; and the use of sulphate of ammonia (which supplies only the plant food, nitrogen) is a well-established practice, particularly with ratoon crops. This fact also explains in a large measure why the ploughing under of a green manure crop such as cowpea or Mauritius bean prior to planting the cane, is attended by uniformly good results. Peas and beans (which belong to the family of legumes) possess the special characteristic that they act as hosts for an interesting group of soil microbes which enter their roots, and live in a state of perfect harmony with their host. The legume supplies the sugars which constitute the food of these tiny organisms, and as they develop and multiply, they give rise to those well known nodules which are generally associated with the roots of peas and beans. In exchange for their food supply these bacteria build up a wealth of nitrogenous food of immense importance to our legume. The nitrogen utilized in the process they gather in the gaseous

condition from the atmosphere, manufacture it into compounds which nourish their host; and when the green crop is finally ploughed under, the soil receives a nett gain of valuable nitrogen compounds which, when decomposed, provide an abundant supply for the succeeding cane crop. As high as 200 lb. per acre of nitrogen may be accumulated in this way; to supply this quantity in the form of artificial manure would necessitate the addition of almost half a ton of sulphate of ammonia per acre.

The absolute necessity for the application of heavy dressings of artificial fertilizer cannot be over-emphasised if the fertility of the land is to be maintained. The weights of plant foods removed by a ton of cane are apparently quite low; yet, when it is considered that over a period of even twenty-five years, 400 tons of cane may be removed from an acre of land, we find that it would require almost 5 tons of high-grade artificial fertilizer to supply the plant food which is lost from the land in this way. Coupling this with the fact that the best of the soils of our coastal area, even in their virgin state, are not over-well supplied with plant food, due to the excessive leaching to which they are exposed, we can readily appreciate how rapidly the fertility of the land will run down when fertilizers are not employed. For a farmer to admit that a good agricultural soil becomes worn out after only fifty years of cultivation, is to make the candid confession that he has failed in his capacity as an agriculturist.

[TO BE CONTINUED.]

REPORT OF MAIZE DIPLODIA EXPERIMENTS 1930-31.

By R. B. MORWOOD, M.Sc., Assistant Plant Pathologist.

A SERIES of experiments was designed to compare planting of clean seed with that lightly infected with Diplodia and to test the effect of treating the latter seed with Tillantin R. Experimental plots were laid down at Kairi State Farm, on Messrs. Sims and Bailey's farm at Atherton, and at Yeerongpilly. We are indebted to Messrs. Sims and Bailey and to officers of the Agricultural Branch for co-operation in carrying out the major part of the work involved, and to the officers of the Yeerongpilly Stock Experiment Station for the provision of facilities there.

Each unit of the experiment consisted of thirty-two rows 2 chains long and 4 feet apart, plus guard rows. The seed was planted singly 1 foot apart and counted to calculate the percentage germination in each row. Each row constituted a plot, there being eight randomised replications of the four following treatments:—

A. Seed with light natural infection of Diplodia.

B. Seed with light natural infection of Diplodia and treated with Tillantin R.

C. Seed from cobs carefully selected for freedom from moulds.

D. Seed from cobs tested on germinator and found free from moulds.

The results were disappointing as the crops were a failure in all except one locality, owing to exceptionally dry conditions. Figures are given for the germination in three of the trials and the yields in the one which bore a successful crop.

GERMINATON.

—		Number of Plants per Row.								
		I.	II.	III.	IV.	V.	VI.	VII.	VIII.	Average.
Unit at Bailey's Atherton	A	69	74	47	58	65	51	58	46	58·5
	B	84	70	55	85	59	50	54	38	61·9
	C	69	81	70	50	74	69	60	72	68·1
	D	90	79	64	69	62	50	61	64	67·4
Unit at Sim's, Atherton	A	91	56	40	80	88	55	56	32	62·2
	B	90	65	69	86	83	55	44	55	68·4
	C	82	89	97	80	79	85	80	87	84·9
	D	79	95	83	80	83	86	85	89	85
			*					*	*	
First Unit at Yeerongpilly	A	109	..	77	113	116	81	..	..	99·2
	B	115	..	107	118	97	72	..	..	101·8
	C	110	..	114	116	96	117	..	..	111·5
	D	110	..	117	125	113	98	..	..	112·6
			*							
Second Unit at Yeerongpilly	A	109	..	84	115	115	105	106	73	101
	B	100	..	73	107	80	86	107	45	85·3
	C	121	..	117	101	111	118	113	106	112·4
	D	113	..	103	118	117	86	125	118	112·9

* Surface irregularities interfered with results.

YIELD.

—		Pounds per Row.								
		I.	II.	III.	IV.	V.	VI.	VII.	VIII.	—
Unit at Bailey's, Atherton	A	53	50	40	46	43	40	46	34	†44
	B	66	54	48	60	53	45	50	35	51·4
	C	59	60	65	38	58	54	33	60	53·4
	D	61	65	49	45	54	42	50	62	52·2

† Comparing the yields of pairs of A and B by the Student method gives a probability of 700 to 1 that B outyields A.

The following conclusions are considered warranted:—

The infected seed was poor in germination in comparison with that from selected cobs. Careful selection of cobs on their appearance gave seed of good viability and no further advantage was gained in subjecting the cobs to the individual cob germination test for the presence of mould organisms. The treatment of infected seed with Tillantin R. did not significantly increase its germination but did increase the yield. This conclusion is based on the only unit which gave sufficiently good yields to justify a consideration of the figures. Each of the eight treated rows outyielded its untreated neighbour. This result is not considered conclusive owing to the small size of the plots, but is sufficiently suggestive to warrant particular attention to this point in the coming season. No reason for the increase can be advanced at this stage.

Careful note was taken of barren stalks and presence of cob rots in each row, but the figures show no consistent differences between the various treatments.

THE BANANA WEEVIL BORER.

BRIEF NOTES ON *Plaesius javanus* Er., THE HISTERID PREDATOR.

By J. A. WEDDELL, Entomological Branch.

AS has already been recorded, Mr. J. L. Froggatt[1] visited Java during 1928 for the purpose of making a collection of living insects predatory on the banana weevil borer, *Cosmopolites sordida* Chev.—an experiment in the biological control of that notorious pest. In December, 1928, a total of 3,066 beetles of *Plæsius javanus* Er. (Plate 4) was liberated in a banana plantation in the Cooran district of the near North Coast which was suitably infested with the banana weevil borer, a supply of food for the predators being thus ensured. A colony of the Leptid fly, *Chrysopila ferruginosa* Wied. (Plate 4), was also introduced and liberated, but no further trace of this insect has been found. These notes deal solely with the beetle predator.

Prior to the liberation it had been necessary for quarantine reasons to retain the insects in captivity, and both during this period and afterwards by occasional visits to the area of liberation, the writer was able to make a few life history notes on the insect which partly corroborate and partly supplement those previously on record.[2]

Egg-laying in Captivity.

The beetles were stored in Brisbane in flat tins 9 x 5½ x 2 inches, about thirty beetles being placed in each tin together with about 1 inch of fine soil. The soil was sifted occasionally at first and later every day. Altogether ten eggs were found loose in the soil by this means, but it was more than probable that many eggs were found and devoured by the carnivorous beetles between observations.

Egg-laying in the Plantation.

Eggs have been found from time to time out in the open plantation, and the fact that this has been possible indicates that a considerable amount of breeding has taken place, for while the egg is relatively large, being nearly 5 millimetres long, the quantity of rubbish and trash about a banana plantation makes the task of searching apparently hopeless. All of the eggs that have been found were lying in the half-rotting pseudostem material of old plants from which the bunch had been cut. They were always well into the interior and they lay in the intercellular spaces as shown in Plate 5. The eggs are generally found singly, except in the one instance when three eggs were found very close together as shown.

Development of the Larva.

Larvæ from various sources were kept under observation from time to time, but the number was necessarily small as every insect was needed so as to give the field colony the best possible chance of survival. However, two larvæ were sent from Java, a small number were hatched from the egg, and one was collected from Cooran and brought to Brisbane. In no case, however, was it possible to carry an individual completely through the larval stage under observation.

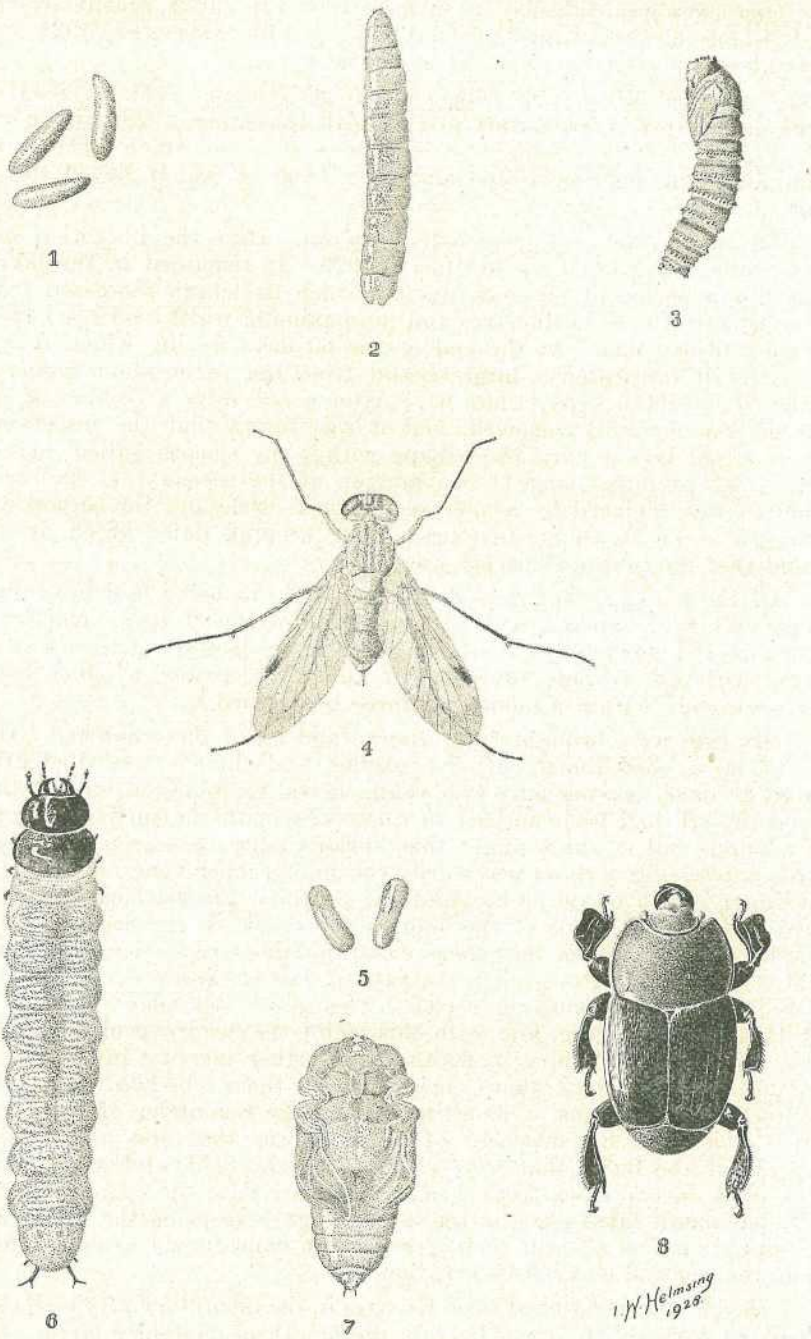


PLATE 4.

Figs. 1-4. Eggs, larva, pupa, and adult of *Chrysopila ferruginosa* Wied.
Figs. 5-8. Eggs, larva, pupa, and adult of *Plæsius javanus* Er.

One larva was collected in Java on 10th July, 1928, and it arrived in Brisbane on 3rd August; it pupated on 13th November, 1928, 126 days after its collection as a well-grown larva.

The other larva was collected on 26th July, 1928, arrived in Brisbane on 16th August, and died on 17th December, 1928, still in the larval stage after 142 days confinement, during which, firstly by compulsion during the voyage and later from choice, it fasted for at least 90 days.

The larva that was collected in Cooran, after the liberation had been made, was picked up in March, 1929. It remained in the larval stage for a period of 60 days, during which its length increased from 35 millimetres to 40 millimetres and its maximum width increased from 5·0 mm. to 6·0 mm. At the end of the 60 days during which it was fed daily it fabricated a large cocoon from the pseudostem tissue in which it had been kept (Plate 6). After a few days a portion of the cocoon was carefully removed, and it was found that the insect was lying curled into a horse-shoe shape within the smooth-walled cocoon, still in its prepupal stage. The portion of the cocoon that had been removed was replaced by a microscope cover circle and the cocoon was wrapped in moist pseudostem tissue. By keeping daily watch, it was found that the prepupal period was 33 days.

Of the ten eggs that were mentioned above as being laid in confinement, only four hatched, with an egg period of 8 to 9 days. One larva died almost immediately; the other three larvæ moulted after 14 to 19 days, with an average duration of the first instar of 16·3 days. Unfortunately within a month all three larvæ died.

Six eggs were brought from Cooran and all of these hatched. One of the larvæ died shortly after emerging, and three others died after 18 to 20 days, leaving only two young larvæ for observation. Rather rapid growth had been noticed in connection with the earlier attempts at rearing, and it was thought that various daily measurements might prove interesting without necessarily consuming much time. The length, maximum width of the larvæ, and the width of the head capsule were measured. The records of the lengths are shown in the accompanying graph. It will be seen that there was rapid increase in length for the first 9 to 12 days, after which the rate of growth lessened, and growth ceased for the pre-moulting period. The moult took place from 18 to 22 days after hatching, and with this moult the head capsule increased from 1·5 mm. to 3·0 mm. in width. No further increase in the size of the head capsule took place, neither were there observed any fresh exuviæ or other signs of moulting during the remainder of the larval life. This later measurement of 3·0 mm. was that also of the head capsule of the larvæ that were collected in the field, and as pupation took place in two cases from them, one is forced to the conclusion that only one moult takes place in the larval stage (excepting the moult into the pupa), unless a moult took place almost immediately after hatching from the egg and escaped observation.

The larvæ that hatched from the eggs in the laboratory attained when about 40 days old to approximately the length of the older larvæ when collected. From then on, as can readily be seen from the graph, very little increase in size took place although they lived several months. Unfortunately one of the larvæ died on 25th August, 1929, after 158 days in the larval stage, and the other one died, still in the larval stage, after a larval life of 190 days.

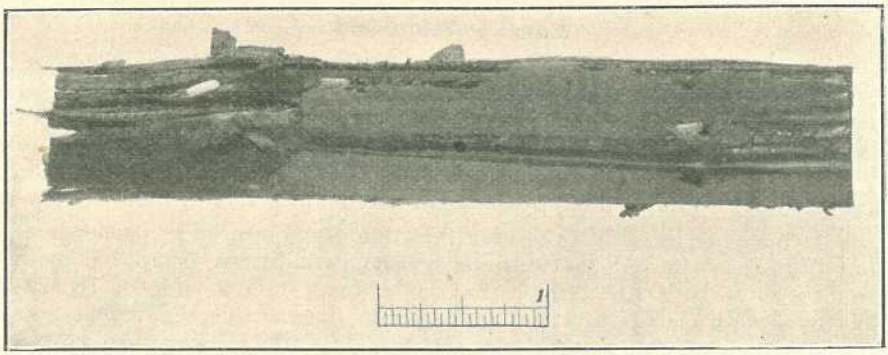


PLATE 5.
Eggs of *Plæsius javanus* Er. laid in banana pseudostem tissue.

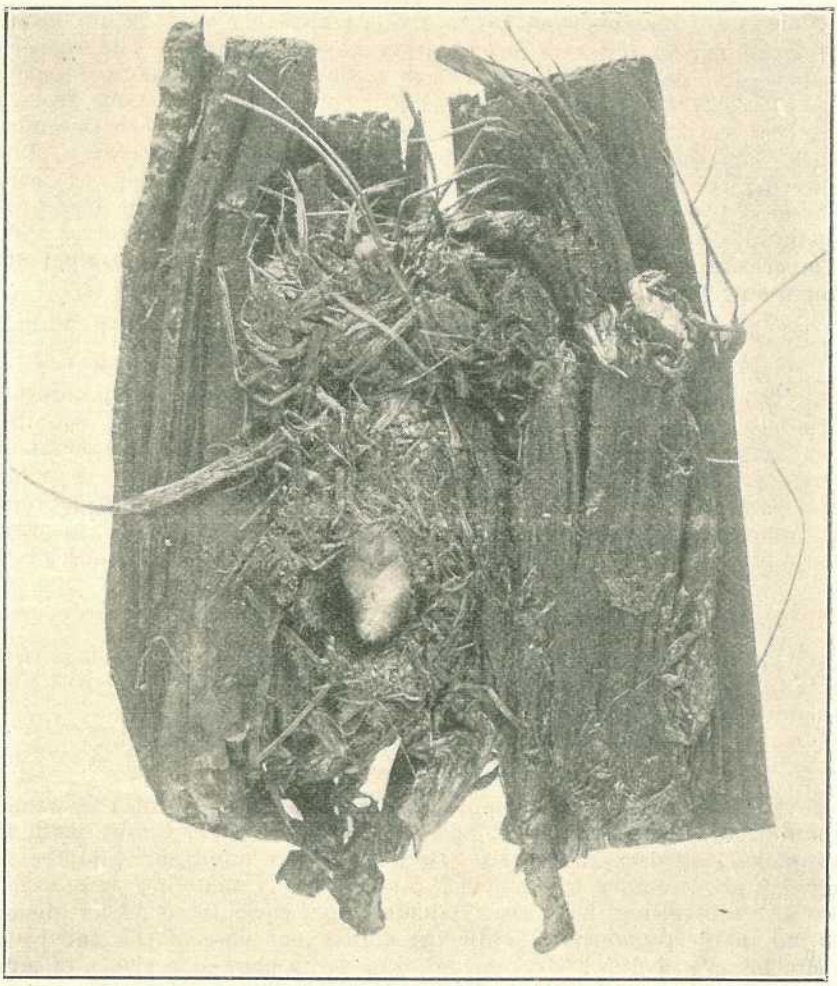


PLATE 6.
Pupa of *Plæsius javanus* Er., slightly enlarged, lying in cocoon woven from banana pseudostem tissue.

Pupal Development.

The pupa that was under observation was pale cream in colour, but gradually the appendages darkened until they were distinctly brown. At the end of 48 days the adult beetle broke through the very delicate pupal investing membrane. The beetle was creamy with brown appendages on its emergence. It remained inactive in the pupal chamber for 15 days, during which the colour deepened to black.

It is rather interesting to note that this insect, reared in Queensland partly in the field and partly under artificial conditions, compared more than favourably in size with the native Javanese insects. Jepson records 11 to 13 millimetres as the length, while insects selected from those brought by Froggatt ranged from 10·8 to 17·1 mm. The insect reared here measured 17·5 mm.

Life Cycle Period in Queensland.

It is not possible even yet to give a reasonably exact figure for the life cycle period, but an approximation may be obtained. The egg stage lasted 8 to 9 days. Larvæ lived from 158 to 190 days without pupating. On the other hand, the large specimen mentioned above came from an egg that was laid in the plantation after the liberation on 11th December, 1928. As the larva entered the prepupal stage on 12th May, 1929, allowing for the egg period, the active larval stage in that case could not have exceeded 143 days. As previously mentioned, the insect was in the prepupal stage 33 days and the pupal period was 48 days. The temperature records made in the laboratory during the prepupal and pupal stages may be summarised as follows:

Minimum daily temperatures varied from 58 to 67 deg. Fahr.

Maximum daily temperatures varied from 62 to 72 deg. Fahr.

The total life cycle from oviposition to emergence of the adult in this case cannot have exceeded 8 plus 143 plus 33 plus 48, equalling 232 days. At the same time, it is obvious that the life cycle could not have occupied much less than this period. As the life cycle is so long and each individual insect thus must always experience a wide range of climatic conditions, it is unlikely that the time of year in which oviposition occurs will have very much effect on the total length of the life cycle.

Longevity of Adults.

Three beetles that were part of the consignment from Java were retained in Brisbane, and these remained alive 13 to 14 months after their collection as adults in Java.

Habits of the Insect.

Both the adult and the larva have been found in the banana plantation, frequenting the half-rotting pseudostem tissue and the tunnelled and decaying corms. Both stages are admirably adapted for moving about among this material, and it is here that they can do good work in controlling the borer. Banana weevil borer larvæ are frequently found in the pseudostem, while the adults make use of the half-rotted material as a shelter. Broken and apparently chewed portions of adult borers have been found in fairly close association with the Plæsius beetles.

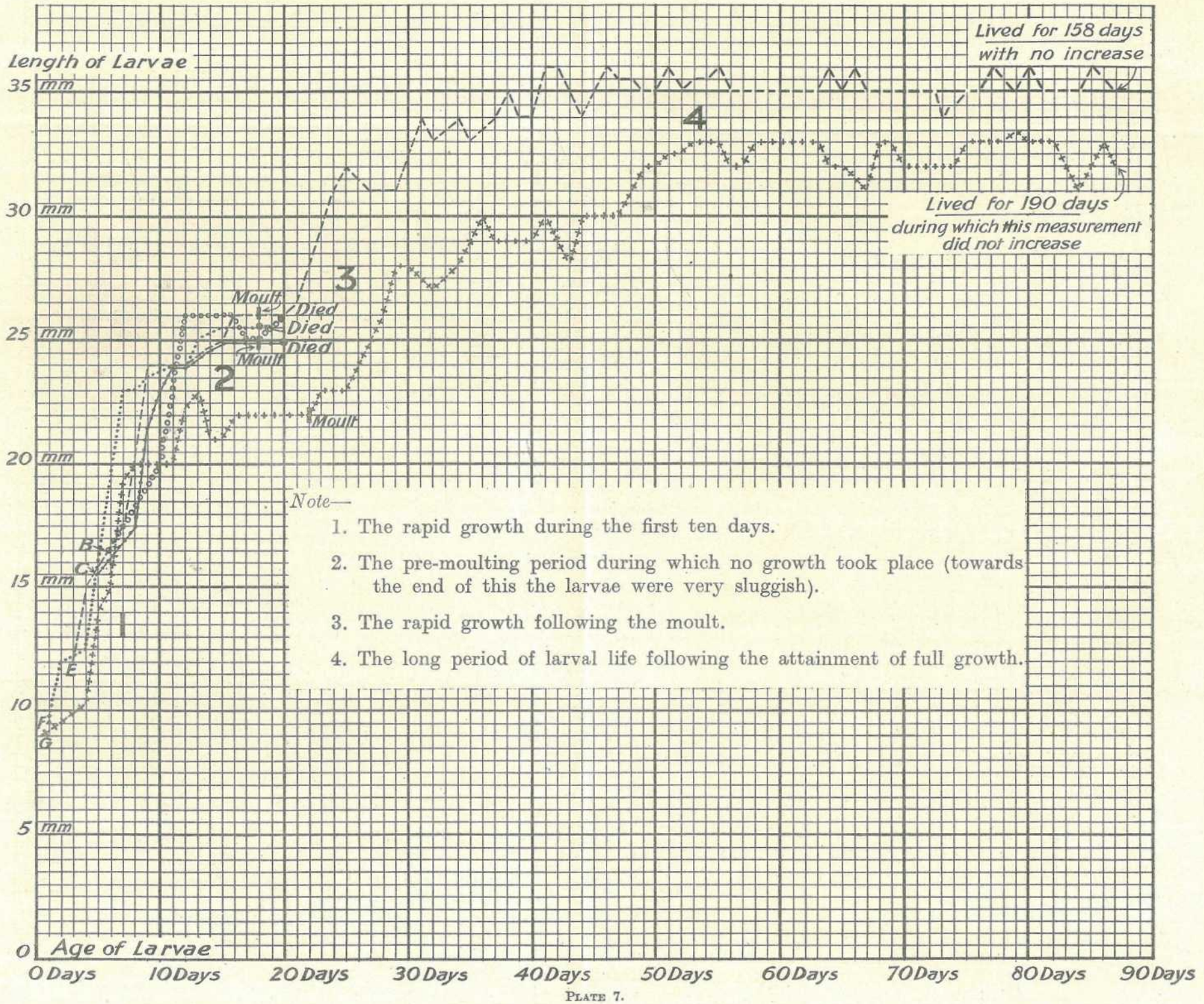


PLATE 7.

Graph showing the daily records of length of the larvae of *Plaesius javanus* Er. (The minor fluctations are due to the fact that the larvae were fairly active.)

It is interesting to note that the predatory beetles are capable of strong flight and that they will readily take wing in the bright sunlight. This fact is of importance when natural spread of the insect is being considered. Unfortunately this ability of the insect to move readily makes it impossible in any way to gauge the population of the colony, and chance will be the only method of proving spread until such time as the colony is strongly entrenched. It may be noted that there are numbers of contiguous banana plantations in the area without boundaries or barriers of any kind, so that the insect is quite able to move away from the original area.

Since the original liberation occasional visits have been made to the locality. The insect has not been found in sufficient numbers to indicate any immediate possibility of its collection and distribution to other centres. There are two possibilities regarding it—one that the climatic or other conditions in Southern Queensland do not permit of the insect developing a large population, or, two, that a gradual increase is actually taking place coincident with a spread of the insect as yet unrecorded.

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2. Jepson, F. P.—A Mission to Java in Quest of Natural Enemies for a Coleopterous Pest of Bananas (*Cosmopolites sordida* Chev.), Bull. No. 7, Dept. Agric., Fiji, Suva, 1914.

RAT CONTROL.

Mr. John L. Anderson, of Barline, near Baddow, via Maryborough, writes:—I noticed in the "Queensland Agricultural Journal," last issue, "Rat Control in Sugar-cane Fields," by Dr. H. W. Kerr. Here is one method that I contend is better than any I have seen published. I have tried this out with good results, as it does not injure bird life and is one of the best in fowl-houses infested with rats. Curlews, magpies, peewits, wild turkeys, and butcher-birds are all good grub and other insect killers, and they will all eat the baits that are published. To destroy these birds means an increase in grub and other insects. The one I have tried is harmless to all bird life, but death to all animals. Here it is; and I hope that you will give it your consideration:—

Rat Poison for Fowl-Houses and Cane Fields.

To make biscuits, ingredients are the same as in barium biscuits. You add glass finely ground in place of barium carbonate, strychnine, or arsenic. It is also mixed in equal parts of pollard and flour and ground glass, slightly damp, and made into pills about the size of a marble. It also can be given in dry form of pollard and glass. I would say that the pills are the best.

SQUIRTER IN BANANAS.

CAUSES INVESTIGATED.

By NORMAN J. KING, Agricultural Chemical Laboratory.

THE physiological condition known as "squirter" in bananas has manifested itself since the earliest years of commercial banana production in the immediate North Coast. As far back as 1920 growers in the Cooroy district were troubled with this so-called disease, and in later years growers in all parts of the commercial areas from Gympie to Nerang who case fruit for the Southern market have had reported to them the development of this condition in their bananas during transport and ripening. Such areas as Dayboro, Samford, and Redland Bay, which supply all their fruit in the bunch form to the Brisbane market, have never been affected by this trouble; nor likewise have the Currumbin growers been apprised of such condition in their fruit, the bunches in this latter case being shipped direct from Murwillumbah to Sydney.

Early investigators discussed the possibility of the disease being due to a pathological organism. Professor Goddard, in a memorandum dated December, 1925, stated as follows:—

"With respect to the actual causal agent being a pathological organism, the work which has been done so far does not support this; it may be stated that this idea has not received support from the work of Mr. MacKinnon and Professor Goddard. It was the opinion of the latter at a very early stage that possibly a species of *Glœosporium* was responsible. This opinion, however, was of a purely preliminary nature, and was based on the action of species of Glœosporium in respect of ripening fruits, and further, the common occurrence of Glœosporium on ripening bananas. The general evidence, however, soon invalidated this opinion. It may be stated that although certain of these fungi are commonly found associated with the disease, not one of them is constant. The same statement would apply to bacterial forms."

The major difficulty encountered therefore in squirter control is the lact of knowledge as to the primary cause of the disease. If squirter were known to be the direct result of fungoid or bacterial infection, or that it were caused by the depredations of insects, suitable measures could be adopted for its control. As mentioned above, no positive results have so far been obtained from pathological investigations, and the condition developing in the fruit is assumed to be a physiological breakdown depending directly on factors obtaining on the plantation or during transport or ripening.

The bananas when packed in cases on the plantation for transport to Southern markets are separated from the hands and packed as "singles." Although by this method every banana is handled separately, the grower has no means of segregating unhealthy fruit, as they exhibit no indication of their potentiality for squirter development. If broken across in the green state, the cross section of the banana shows no abnormality whatever, the fruit in this green stage having all the characteristics of a perfectly healthy specimen. Certain growers, particularly in the Cooran-Cooroy section, maintain that they are able to detect squirter in the green fruit by its angular, unfilled appearance,

and the lack of development in the flower end of the fruit. When broken across these bananas show a red or reddish-brown discolouration about a quarter of an inch in diameter around the core of the fruit, which is usually of a rather gummy consistency. This condition is not squirter, but is gumming disease of bananas—a totally different type of disease.

The first indication the producer receives is a notification from the market agents that a certain percentage of his consignment was received in the condition described as squirter. This change takes place during transport to Southern States and the ripening processes applied there. These bananas reported as being affected by squirter are found to have developed a prematurely soft condition in the middle of the fruit; this portion of the banana turns to a soft watery mass, which squirts out of the end of the fruit when pressed. In more advanced stages the softening extends right out towards the skin, the latter exhibiting black blotches as in the case of very over-ripe fruit.

Investigations prior to this date have concentrated on studying conditions obtaining during transport and ripening processes, the theory most favoured being that this physiological breakdown developed during the transport by rail through the highlands of New South Wales in trucks wherein adequate protection from sudden changes in temperature was not assured. Considerable work was carried out investigating this phase of the problem, but in respect of this work it may be stated here that, although consignments of South Queensland bananas developed squirter on this route, it was never reported that North Queensland fruit had done so. Special consignments of North Queensland bananas, packed similarly to the Southern ones, were railed in the same trucks and under the same conditions to the same market, and yet failed to contract any symptoms of the trouble. In recent years control precautions have been taken in respect to covering of the truck consignments with tarpaulins, and it was reported that the percentage of squirter was not so high as before. It appears therefore that although the temperature conditions during transport may be, and probably are, a contributory factor in the chemical and physical changes which obviously occur, yet the cause of the breakdown is more fundamental and belongs to an earlier stage in the development of the fruit.

If the cause lay entirely in (*a*) temperature conditions during transport, (*b*) packing methods, or (*c*) ripening control, then no logical reason is possible to explain why the North Queensland fruit was not similarly affected. The only apparent difference in the life of these bananas is that the Northern fruit were grown under more equable climatic conditions. It would have been expected that if the origin of the trouble were closely related to transport, these latter fruit would be more susceptible, having been transported 1,000 miles further than the South Queensland fruit.

These facts, combined with previous field observations on the part of Departmental officers, fostered the theory that the primary cause was related to climatic or other conditions on the plantation. In April, 1926, the Secretary of the Institute for Science and Industry, commenting on the proposed plan of work for squirter investigation in Queensland, wrote as follows:—

"Under possible physiological causes, soil factors are omitted. Excess or deficiency of certain elements or compounds or certain physical or chemical or biological factors might be operating in the production of

the squirter condition. A critical examination of affected plantations will very greatly help in drawing up a scheme of experiments."
This was the first suggestion that squirter may possibly be correlated with soil conditions.

It was not until this year, however, that Professor Bagster, of the Queensland University, who is engaged on squirter investigation work, suggested to this Department that the question of soil relationship was an avenue of investigation worthy of exploitation. As a result of this, the writer, accompanied by Mr. W. J. Ross, Chief Inspector of the Banana Board, carried out an exhaustive field examination of the plantations from which bananas had developed squirter during transport to the South.

The area traversed was from Gympie to Nerang, no squirter ever having been reported north of the Gympie district. Soil samples were taken from selected locations on the plantations and detailed observations made with regard to aspect, slope, drainage, origin of soil (geological formation), nature of original vegetation, condition of plantation and of stools and bunches; details were usually obtained from the occupier as to incidence of frosts, coldest portions of the plantations, period elapsing between cutting of bunches and packing, and other relative matters.

It became a matter of difficulty in some areas to locate a plantation on which squirter had not developed, so that check soil samples could be taken. Soil sampling was also complicated by the fact that where a plantation had been affected by squirter only a very small percentage of the fruit had been reported as so affected. The grower whose method of picking is to take the most mature bunches from all over his block for any given consignment is usually unable to state from which portion of the block the squirter bananas were picked. In a small number of cases, however, where the grower was able to locate accurately where a certain affected consignment had originated, the area was always a low-lying section of the plantation fringing a gully and either exposed to cold draughts or known to be a place where cold air settled. This evidence seemed to indicate with some degree of reliance that the squirter development was in some way related to these cold conditions on the plantation, and if the soil were at all a contributory factor in its development, then it was in those locations that sampling should be carried out. The practice adopted, therefore, was to sample from the lower portions of the hill slopes on which the major proportion of the plantations of South Queensland are located, particularly along the sides of any gullies which ran up the slopes. Accumulations of alluvial wash from the hills were avoided, as were also any other interfering factors such as residues of the burn-off which preceded planting, &c. The soil was sampled with a 4-inch post-hole digger to a depth of 12 inches. Altogether 104 soil samples were taken, of which number twenty-seven were check samples from plantations on which no squirter had ever been reported by the market agents.

Geological Notes.

As a means of determining soil origin, field notes were taken on each plantation regarding the geology of the area under examination. The rocks from which the soils originated, although of great variety in type, did not vary widely in geological age. In the Gympie area the

majority of the plantations were located on the Gympie schists of Permo-Carboniferous age. The soils of the Goomboorian section of this district were developed from phyllites; some of the Glastonbury soils had their origin in augite lamprophyres, while those on Wolvi Mountain were developed on plagioclase basalts.

The Cooran and Pomona districts were located on Gympie schists, while the Cooroy-Eumundi section was divided between Devonian schists and basic igneous rocks.

Nambour and Landsborough districts stretched in each case from the coastal Ipswich series across the basalts of the Blackall Range to the Devonian shales and schists of Conondale and the Obi Obi Valley.

The soils of the Woodford-Kilcoy section were developed principally on schists, phyllites, and conglomerates of Silurian-Devonian age, with the exception of two areas in Woodford, which were of basaltic origin.

The Beenleigh district soils were overlying schists and quartzites of the Silurian-Devonian (Brisbane) series, the soils of the Nerang-Callagrabah-Mudgeeraba section being of similar origin. Burleigh Heads soils were basaltic.

Some 75 per cent. of the plantations had originally supported what is locally known as scrub growth, but which is defined botanically as rain forest of the Papuan-Malayan type. The remainder of the area had been, in its virgin condition, either open or sclerophyllous forest.

Investigations into the chemical composition of the South Queensland banana soils, particularly with respect to available plant nutrients and acidity, resulted in the figures which are tabulated in Table I. in this report. Grouped broadly, the results of analysis of those soils on which bananas develop squirter compare well with the analysis of those from squirter-free areas; the latter are given in the second portion of the table.

As mentioned previously in this report, particular attention was directed in the field to noting plantation conditions, among which factors soil type received a great deal of attention. Although the district traversed represents a strip of country some 150 miles in length following the ranges in a direction more or less parallel to the coast, the soil type remains remarkably uniform. Reference to Table I. shows that the soil description varies between very narrow limits from loam to clay loam. Very few soils of texture sufficiently light to justify the classification of sandy loam were encountered. Colour variations were common, but these were nearly always intimately related to the geological origin of the soils.

Before discussing in detail the results of the analyses, it may be of interest for comparative purposes to mention the analytical methods adopted for soil work in this laboratory. Many different ways have been proposed for the determination of that portion of the soil's mineral plant food supply which, by natural agencies, will be made available during the growing season of a crop. Of these, however, none have withstood the years of criticism and repetition on different soil types with the success of the 1 per cent. citric acid method proposed in 1894 by Dyer. As with all similar empirical procedures, the minimum limits below which fertilization with either phosphoric acid or potash may be expected to give results will vary, depending upon soil formation and

soil type. Dyer's original minimum limits as given for English soils were 0·01 per cent. for either phosphoric acid or potash, but it may be possible that these figures need some slight variation when applied to soils of a sub-tropical country. It should be understood that any method for the determination of available plant food is of necessity empirical, and unless other data are at hand can never be expected to give more than an indication as to probable limiting factors.

The nitrates in the soils were determined by a modification of the phenoldisulphonic acid method, which was first suggested by Grandval and Lajoux.[3]

Chlorides and other interfering ions are eliminated in this method. The availability of soil nitrogen is measured by the rate at which a soil, by means of its own bacteria, can produce nitrates from its insoluble organic nitrogen.[2] The figures are given as parts per million of nitrate nitrogen in the soil to a depth of 12 inches. Experiments have shown that, due chiefly to lack of air, very little nitrification takes place below this depth.

Lime requirement figures were obtained by the methods of Jones and Hopkins where the qualitative Truog test gave a strong reaction. These methods also are empirical, one giving a measure of the amount of the acidity and the other of the intensity of acidity present. The value of the resulting lime requirement figures depends to a large extent on the texture of the soil under examination, and where the soil type varies only between narrow limits, as in these soils, the lime requirement figures have their maximum comparative value.

Hydrogen ion concentration measurements to determine the pH of the soils were carried out by whichever method was found applicable to the particular soil. Where possible the quinhydrone electrode was utilised both in aqueous and normal potassium chloride suspensions. The large proportion of manganiferous soils, however, necessitated the use of the antimony electrode in aqueous and the hydrogen electrode in potassium chloride suspensions respectively.

The determination of chloride was carried out electrolytically by the silver chloride electrode.

Discussion of Analytical Results.

In discussing these tables, the soils of each district will be briefly reviewed and then the squirter-affected areas will be compared critically with the areas free from this disease.

The Gympie district, which is the largest banana-producing area affected by squirter, is, as mentioned previously, located on soils of varying geological origin. In some cases this origin is reflected in the plant food content of the overlying soils. As can be seen by referring to Table I. the soils of the Gympie district vary from section to section, soils in contiguous farms showing fair correlation, but wider variations exhibiting themselves when sections are compared. The Eel Creek and Scrubby Creek districts are universally low in available phosphoric acid and nitrates, potash is from fair to low, while lime is in most cases fair to good. The pH in water suspension varies from 5·38 to 7·84, the average figure being well above 6·0 pH. Hopkins lime requirement is high only in one case, and this soil has a very low lime content. A check

sample from Scrubby Creek has fair potash and very low phosphoric acid. Available lime is good, but nitrification power only fair.

Goomboorian soils are below average in all plant foods both in squirter affected and free areas.

Widgee and Wolvi Mountain soils are high in available potash, and the Widgee soils are also well supplied with lime. One of the Wolvi soils has very good phosphoric acid, but it is so far above the other soils of the same district that fertilization is suspected.

The Glastonbury soils have poor phosphoric acid, good lime, and fair potash content, but in no way vary significantly from a non-squirter sample in the same district except in potash content. The high potash of the check, however, is a result of the soil being developed from an augite lamprophyre of high potash content, and as the occurrence of this rock is very local, the freedom of contiguous plantations from squirter cannot be due to potash nutrition.

In the Cooran-Cooroy district phosphoric acid was very low both in affected and non-affected plantations; lime was also below average, and potash was from very low to very fair in each case. Three soils from Kin Kin are among the non-affected samples, but as these were all possibly fertilized their rather higher potash figures cannot be compared with others of the same district.

Soils from the Landsborough division are on the whole higher in phosphoric acid than the average soils, and this refers both to squirter and to check samples. The potash varies from poor to good in the squirter samples, but is low in the checks. Lime is fair to good.

The Woodford-Kilcoy line soils are all low in available nutrients. The soils of this district are nearly all poor. The vegetation is mainly open forest, and the entire region is too far inland to secure the incidence of rainfall which ensures banana production on the coastal belt. Seven samples from squirter-affected plantations and seven check samples do not show any significant variation to justify the application of a soil deficiency theory to squirter occurrence.

In the Beenleigh district the squirter-affected soils have, on the average, appreciably higher potash and slightly higher phosphoric acid than the check samples. Lime in each case is about the same, whereas in the soils of the Nerang division the phosphoric acid is slightly higher in the squirter samples and the potash appreciably higher in the non-affected areas.

This short discussion of the available plant foods, though unsatisfactory in many ways, shows clearly enough that nutritional deficiencies are not among the factors to be considered when inquiring into the causes of squirter development in bananas. Nor do physical properties of the soils in the field throw any more light on the matter.

The total nitrogen content of the soil, though no criterion of the availability, remains a fairly constant factor when considering such a large number of soils. The figures range usually from 0·2 to 0·3 per cent., and the average figures in squirter and check soils are 0·274 and 0·280 per cent. respectively.

Nitrates.

Examination of the figures indicating the nitrate content of the soils shows what is apparently a very wide variation both in initial nitrate and in the amount developed after an incubation period of four weeks. In the initial determinations the soils from squirter-affected areas exhibit a nitrate content varying between 1·3 and 61·3 parts per million, while the check samples range from 1·9 to 20·9 p.p.m. These minimum and maximum figures, however, are naturally extreme cases, and the average figures for the affected and the non-affected soils agree very closely. Deviations from the mean become considerable in a few cases, one abnormal soil developing on incubation 278 p.p.m. of nitrates. There appears to be no significant difference between the soils when considered from this point of view. The average initial figure for the squirter soils was 8·3 p.p.m. as against 7·3 for the check samples, while the final figures after incubation were 29·5 and 29·3 p.p.m. respectively.

The nitrogen compounds of the soil are mainly organic, and in such form are unavailable to higher plants. The action of micro-organisms results in the transformation of this organic nitrogen to an inorganic and available form. This microbiological activity also results in the changing of a non-soluble form of nitrogen into a highly soluble one (nitrate nitrogen) which, being only weakly absorbed by the soil colloid, is rapidly leached from the soil. As the activities of the organisms responsible for nitrite and nitrate production from soil organic matter are closely interrelated with soil acidity[2], an effort was made to correlate nitrates with the soil reaction.

Accordingly a dot diagram was constructed in which parts per million of NO_3 were plotted against hydrogen ion concentration. A rough correlation is exhibited, the lowest figure being in an acid soil of pH 4·3, and the highest figures occurring in alkaline soils of pH 7·5 to 8·7. On the whole there is a general tendency for the more alkaline soils to develop a higher content of nitrates, but as calcium carbonite is present usually in the most acid soils the failure to obtain a more exact correlation is explained.

The geographical and topographical location and climatic conditions of the banana-growing areas are not conducive to nitrate retention. Steep slopes, well-drained soils, and high rainfall all contribute towards loss of nitrates by leaching from the soil. The incubation test, however, shows the presence of the necessary bacteria in the soils, the existence of a favourable carbon-nitrogen ratio for nitrate formation, and gives some measure of the rate of availability of the total nitrogen in the soil under the conditions then pertaining.

Lime requirement figures for Hopkins' acidity reached high figures only in isolated cases. These very acid soils were usually associated with steep slopes where severe washing had exposed a more acid subsoil. Observations on the plantations, however, failed to note any retarding effect on plant growth due to acid conditions. No mention can be found in literature regarding limiting figures of acidity for banana growth, but from consideration of its tropical natural habitat it is to be expected that it would be fairly acid-tolerant. Acidity figures in terms of pH appear to vary between fairly wide limits, but the soils above pH 8·0 and those under pH 5·5 are exceptions. The average figures are from pH 6·0 to pH 7·5.

The figures for chlorine are very low, rarely being in excess of 0·02 per cent. These determinations were carried out as a matter of interest, it being a generally accepted fact that bananas favour an appreciable salt content of the soil. It has been shown[1], however, as early as 1913 in Queensland, that our coastal soils contain sufficient salt for the needs of the plant, and that no improved crops were received after application of larger amounts.

Considered collectively, the analytical results of the seventy-seven soils from squirter-affected plantations and the twenty-seven samples from non-affected areas compare exceedingly well in most respects. Whatever differences make themselves manifest in the average figures are in favour of the squirter areas, and although individual analyses, when compared, show sometimes slight differences in a particular district, these variations disappear when the figures are averaged. The only conclusion to be drawn, therefore, from these figures is that the development of squirter is not closely related to soil conditions or nutrient deficiency. The one factor which tends to qualify this statement is the one discussed early in this report. If it were possible to locate accurately on the plantation the stools which bore squirter bananas it might be possible then to detect significant differences between the soil in those spots and the soils of non-affected areas. But without this very precise information, it does not seem practical to carry out an investigation from the soil aspect upon the results of which more reliance can be placed. If squirter developed during transport in Queensland, it would also be possible, and perhaps confirmatory, to carry out detailed analyses of the fruit and leaves of affected stools for comparison with similar analyses on non-affected plants. It is an accepted theory with some plants at least that the percentage of plant foods present in the plant itself is an index of the availability of those plant foods in the soil in which the plant is growing. Since, however, squirter does not develop freely in Queensland, it was not possible for such investigations to be carried out. This aspect of the nutritional requirements of the plant is one which may yield results in any further investigation, and an exhaustive analysis of the mineral constituents of the fruit may throw light on the subject. It is a logical possibility that any physiological breakdown of a biochemical nature in the fruit of the banana plant could be intimately bound up with the mineral constituents of the fruit. Potassium is presumably an integral constituent of protoplasm. It is possible that it may also be intimately connected with the formation of the starches and sugars of the plant. Phosphorus is in all cases essential to plant development, for it forms a constituent of many proteids. Phosphates are usually present in the living cell in a dissolved form. Nitrates and compounds of magnesium are also essential factors in plant growth, a deficiency of either causing cessation of normal development, or deficiency diseases of the plant. Although this investigation into soil nutrients has given only negative results, the above points are stressed to show the primary importance of available plant foods to the growth and development of plants.

Aspect and Drainage.

Soil texture and topographical location reduce to a minimum any possibility of bad drainage in the plantations affected by squirter, nor does geographical aspect seem to bear a relation to its occurrence. The advent of cold winds at a critical period in the development of the fruit

suggested itself as a possible cause. The discovery of squirter, however, from plantations well sheltered from westerly winds entirely disposed of this possibility, contiguous areas with similar aspect, slope, and shelter often producing fruit which on one farm was healthy and on the other affected by squirter.

Nature of Vegetation.

As a general rule scrub lands have been selected for banana-growing, but, as previously mentioned, forest areas have also been extensively exploited. Virgin country is usually selected, and the burn-off naturally supplies an abundance of mineral plant foods, particularly potash, for the needs of the plant during the early stages of its growth. This applies in a much greater degree to the scrub lands where the stand of timber is so much heavier than in the forest country. The benefit accruing from this extra available plant food is only a transitory one. The high rainfall of these areas, combined with the steep slopes, militates against the conservation of soluble material, and the plant ash constituents are rapidly leached out. It is therefore not surprising that the analyses of scrub and forest soils do not show significant differences, the reason for the difference in virgin timber being one of climatic conditions only and not of soil variability.

Conclusions from Field Observations.

The analytical data show definitely that squirter occurs on all types of soil from the poorest forest soil, which has grown bananas for twelve years without fertilization, to rich new scrub land in its first year of bunching. But one factor remains constant on all plantations—where a gully or hollow encroaches sufficiently far up the slope of the hill as to reach into the banana area, squirter is found to occur on that plantation. It would therefore appear that squirter is caused by the following conditions:—

(*a*) The fruit is primarily subjected to a cold spell on the plantation during the maturing period of the bunch, bringing about a cessation of certain physiological processes in the ripening of the fruit and rendering it subject to complete physiological breakdown in the event of further conditions such as obtain during transport.

(*b*) It is possible that further development of the breakdown process in the fruit tissues is then brought about by sudden and considerable variations in temperature which are apt to occur during transit to Southern markets at certain times of the year, or to contamination at this stage by an organism. The writer has been informed by Mr. Hack, a growers' representative on the Banana Board, that temperature variations of as much as 23 deg. were recorded in the trucks over a period of two hours.

(*c*) The ripening methods used in the Southern capitals may also contribute towards the ultimate condition of the fruit, but this is unlikely. The changes taking place in the fruit as a result of subjection to low temperature conditions may be concerned possibly with enzyme activity in the ripening and maturing of the banana, and would be principally biochemical in nature. The ripening methods may then tend towards the

accentuation of a condition brought about by cessation of enzyme activity, finally resulting in the soft, watery internal structure so characteristic of squirter.

In support of the writer's contention that the primary cause is on the plantation, the following extract is quoted from a letter signed by Mr. Ranger, Manager of the Committee of Direction of Fruit Marketing, in 1925:—

> "For example, in the latter portion of last July we had very severe frosts in Queensland. Fruit that was being railed and in transit at that time arrived in good condition, and there were no complaints of squirter. Fruit railed the following week suffered very severely from this disease. . . ."

It is also significant that the reports of squirter in bananas have increased considerably in recent years. This fact can very easily be correlated with plantation conditions. In the early days of the industry on the immediate North Coast, scrub was felled in isolated areas for commercial banana production. The cleared blocks, afterwards producing fruit, were well sheltered by the surrounding scrub from the advent of cold winds or frosts. In later years, when banana prices were at their peak, most of the available land was cleared and planted. This resulted in opening up the hillsides and the surrounding country, clearing it of all standing timber, which had previously acted as a natural protection to a tropical fruit grown out of a latitude to which it was indigenous, and generally exposing the plantation to climatic conditions which were totally unfit for their crops. The result was increasing reports of squirter, due to the altered temperatures obtaining on the plantation.

Control.

In most investigations into diseases, control measures constitute an important part of the work. But assuming that the conditions enumerated above are contributory factors in the development of the disease, it becomes clear that preventive measures of the usual type cannot be used. If squirter develops in the low-lying sections of a plantation and is caused by frosts and the settling of cold air in those places, the only control measure is the elimination of those portions of the plantation. Where destruction of natural shelter has opened the way for the ingress of cold draughts, the grower has no alternative but to seek more sheltered land. The only control which could exercise a preventive influence would be a mild winter, and the proof of this theory is exemplified in the very mild winter experienced in south-eastern Queensland in 1931, when squirter reports were less frequent than they had been for many years.

Acknowledgment.

My thanks are due to Mr. J. L. Foran, Analyst in this Laboratory, who carried out the major portion of the analytical work tabulated in this report, and to Mr. W. J. Ross, Chief Inspector of the Banana Board, for valuable assistance in the field.

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[2] Waksman, —: Principles of Soil Microbiology.

[3] Wijk, D. J. van: Soil Science, vol. XVII., 1924.

Table 1a.—SOILS ON WHICH BANANAS DEVELOP "SQUIRTER."

Laboratory No.	Soil No.	Locality.	Description of Soils.	Moisture (air dried sample).	Calculated on Soil dried at 100° C.									Lime Requirement per acre foot.		Acidity.		
					Loss on Ignition.	Chlorine.	Nitrogen.				Soluble in 1 per cent. Citric Acid.						pH.	
							Total.	As Nitrate.			Phosphoric Acid.	Lime.	Potash.	Jones.	Hopkins.	Truog Test.	Water Suspension 1 : 2	N/KCl Suspension 1 : 2
								Initial.	Incubation Period.									
									14 days.	28 days.								
				%	%	%	%	Parts	per million.		%	%	%	Cwt.	Cwt.			
3330	1	Gympie Eel Creek ..	Br. L. ..	7·7	10·4	·007	·249	5·9	27·8	19·6	·0033	·3488	trace	..	..	v. sl.	6·80	5·69
3331	2	Do. do.	Br. L. ..	8·4	11·5	·009	·208	2·7	20·3	10·6	·0013	·0484	Nil	99·6	19·2	med.	6·46	4·66
3332	3	Do. do.	R. Cl. L. ..	10·3	9·1	·011	·212	3·5	13·7	12·2	·0036	·1870	trace	..	..	v. sl.	6·88	4·90†
3333	4	Do. do.	R. Br. Cl. L.	8·0	10·1	·010	·183	3·2	16·7	16·7	·0026	·0237	trace	199·6	110·0	str.	5·38*	4·23
3334	5	Do. do.	R. Br. Cl. L.	7·1	9·9	·006	·253	5·7	27·3	14·4	·0061	·1375	·0022	97·5	2·4	sl.	6·12*	4·38†
3335	6	Do. Scrubby Creek ..	R. L. ..	7·5	9·7	·011	·206	24·9	30·6	21·3	·0003	·0660	·0105	112·4	8·7	sl.	5·70*	4·30†
3336	7	Do. do.	G.B.L. ..	11·1	13·2	·010	·296	7·0	28·1	29·5	·0012	·2120	·0039	..	..	v. sl.	7·53	5·09†
3337	8	Do. do.	R. L. ..	7·0	9·3	·005	·264	5·5	28·1	24·6	·0024	·1181	·0108	74·2	1·2	sl.	6·95	4·84†
3338	9	Do. do.	Choc. L. ..	8·1	10·6	·014	·238	4·7	20·6	21·6	·0012	·3200	·0027	..	..	v. sl.	7·16*	5·97†
3339	10	Do. do.	Choc. L. ..	9·9	13·7	·018	·423	11·8	20·0	28·4	·0027	·4300	·0079	..	..	nil	7·84	6·70
3340	11	Do. do.	Br. L. ..	6·8	9·2	·005	·300	14·0	32·0	17·4	·0021	·0725	·0043	114·5	39·3	med.	5·66*	4·75
3342	13	Do. Goomboorian ..	G. B. L. ..	6·6	13·0	·005	·330	6·0	23·6	19·7	·0095	·1748	·0145	74·2	2·8	sl.	6·84*	5·45
3344	15	Do. do.	Br. Cl. L. ..	8·6	11·0	·006	·276	6·7	16·2	25·0	·0025	·3360	·0075	..	..	nil	7·64	7·09
3345	16	Do. do.	G. Br. L. ..	7·0	11·8	·002	·211	1·7	14·4	6·9	·0103	·0512	·0088	146·3	16·9	str.	5·43	4·39
3346	17	Do. do.	Br. S. L. ..	7·1	14·7	·003	·288	3·4	21·7	11·0	·0047	·0355	·0073	144·2	9·4	str.	5·76	4·49
3347	18	Do. do.	Lt. Br. Cl. L.	6·1	11·8	·004	·334	13·6	34·6	14·7	·0167	2730	·0087	..	..	sl.	7·08*	5·55†
3349	19	Do. Widgee	R. Br. L. ..	5·9	12·5	·002	·351	7·0	31·0	29·3	·0015	·3811	·0310	..	..	nil	8·25	6·18†
3350	20	Do. do.	R. Br. L. ..	4·0	7·1	·006	·235	3·5	22·0	33·5	·0011	·3338	·0227	..	..	nil	8·51	6·22†
3351	21	Do. Wolvi Mt. ..	R. Br. L. ..	12·8	17·8	·005	·365	7·3	43·5	50·3	·0026	·2136	·0413	42·0	1·2	sl.	7·02	6·27
3352	22	Do. do.	R. Br. L. ..	14·0	18·0	·001	·344	4·0	23·5	28·3	·0034	·1765	·0088	87·0	1·2	sl.	6·46	5·55
3354	24	Do. do.	Y. Br. L. ..	7·6	3·8	·018	·109	3·0	4·0	7·0	·0375	·0454	·0280	57·0	29·0	med.	5·07	4·37
3355	25	Do. Mooloo	R. Br. L. ..	9·2	14·7	·020	·447	11·2	55·9	56·5	·0017	·4570	·0157	..	..	nil	7·74	6·53†
3356	26	Do. do.	Choc. L. ..	7·5	14·9	·042	·570	49·5	216·2	278·0	·0012	·1890	·0130	..	..	nil	7·96*	7·18†
3357	27	Do. do.	Choc. L. ..	7·6	12·1	·003	·369	15·4	36·9	54·6	·0084	·4003	·0121	..	..	nil	8·42	6·65†
3359	29	Do. Lagoon Pocket..	R. Br. L. ..	12·8	18·7	·005	·691	20·0	47·3	52·6	·0980	·4951	·0038	..	..	nil	7·98*	7·12†
3361	31	Do. Brooloo	R. Br. L. ..	6·0	5·8	·004	·213	25·0	70·6	52·3	·0046	·1360	·0577	..	..	v. sl.	8·11	7·84
3362	32	Do. Blunder Road ..	R. Br. L. ..	9·6	11·1	·002	·260	6·4	26·3	26·0	·0013	·2621	·0225	..	..	v. sl.	7·33	6·13
3363	33	Do. do.	R. Br. L. ..	5·6	8·8	·003	·215	10·5	15·7	16·3	·0025	·1536	·0350	..	..	v. sl.	6·95*	5·27†
3364	34	Do. Glastonbury ..	Br. Cl. ..	7·4	11·6	·006	·357	6·5	34·6	39·3	·0040	·3270	·0093	..	..	v. sl.	7·99	5·82†
3365	35	Do. do.	R. Br. Cl. ..	9·0	13·9	·004	·413	22·4	42·8	49·3	·0003	·5720	·0083	..	..	v. sl.	8·73	7·50†
3371	37	Cooran	Y. L. ..	4·5	11·4	·003	·303	8·0	61·1	25·0	·0010	·1261	·0059	30·0	..	sl.	6·37	5·70
3373	39	Do.	G. Br. L. ..	6·7	10·4	·009	·300	5·4	28·4	23·5	·0029	·1151	·0032	45·0	..	sl.	6·54*	4·94†
3374	40	Do.	Lt. Br. Cl. L.	9·0	11·9	·009	·300	6·0	10·1	16·8	·0025	·0140	·0044	151·0	82·4	str.	4·70	4·11
3375	41	Do.	Y. Br. L. ..	4·2	14·9	·004	·258	3·9	13·6	29·1	·0035	·0314	·0046	197·0	142·5	str.	4·56	3·89
3376	42	Do.	Br. L. ..	4·0	4·9	·002	·246	5·7	trace	8·7	·0031	·0918	·0178	..	..	v. sl.	7·00	4·55†
3378	44 (a)	Do.	G. Br. L. ..	7·1	8·5	·007	·280	11·5	2·1	33·1	·0066	·1951	·0035	..	..	v. sl.	6·76	5·76
3379	45	Cooroy	Y. Br. L. ..	7·1	9·1	·005	·288	5·1	3·8	19·2	·0011	·0288	·0058	129·0	96·2	str.	4·66	4·05
3381	47	Do.	Br. L. ..	10·0	8·3	·017	·256	6·9	10·2	22·5	·0031	·0623	·0033	81·0	36·5	str.	4·76	4·15
3383	49	Do.	Lt. Br. L. ..	1·8	7·3	·020	·316	8·6	3·3	5·1	·0048	·0378	·0063	108·1	58·9	str.	4·56	4·00
3384	50	Eumundi	G. Br. L. ..	2·4	5·9	·028	·189	5·2	23·0	1·6	·0045	·0200	·0081	148·4	101·3	str.	4·27	4·00

(a) Contains 14 per cent. stones. * Antimony Electrode. † Hydrogen Electrode.

Table 1a.—SOILS ON WHICH BANANAS DEVELOP "SQUIRTER"—*continued.*

Laboratory No.	Soil No.	Locality.	Description of Soils.	Moisture (air dried sample).	Calculated on Soil dried at 100° C.									Lime Requirement per acre foot.		Acidity.		
					Loss on Ignition.	Chlorine.	Nitrogen.				Soluble in 1 per cent. Citric Acid.						pH.	
							Total.	As Nitrate.			Phosphoric Acid.	Lime.	Potash.	Jones.	Hopkins.	Truog Test.	Water Suspension. 1 : 2	N/KCl Suspension. 1 : 2
								Initial.	Incubation Period. 14 days.	Incubation Period. 28 days.								
				%	%	%	%	Parts	per million.		%	%	%	Cwt.	Cwt.			
3385	51	Eumundi	Bl. L. ..	6·4	11·1	·030	·185	12·5	11·5	27·5	·0108	·3310	·0064	..	..	v. sl.	7·28	5·46†
3386	52	Do.	G. L. ..	3·8	7·5	·019	·381	6·0	6·5	16·8	·0252	·0480	·0078	..	..	med.	5·19	4·51
3389	53	North Arm	G. Br. L. ..	3·8	6·1	·011	·268	19·1	81·7	46·3	·0022	·1163	·0046	..	..	v. sl.	5·60	4·90
3390	54	Nambour	G. B. S. L. ..	1·5	5·0	·014	·096	7·7	2·9	2·8	·0087	·0276	·0065	82·7	62·8	str.	4·64	4·15
3391	55	Woombye	G. S. L. ..	11·8	19·9	·026	·552	61·3	38·8	92·1	·0024	·3150	·0082	..	..	v. sl.	6·64	5·99
3393	56	Nambour	Choc. L. ..	2·1	14·1	·004	·469	10·9	17·2	35·8	·0176	·6350	·0079	..	..	nil	8·26*	6·95†
3392	57	Obi Obi	G. B. L. ..	3·0	10·3	·006	·231	15·4	35·4	63·1	·0158	·4566	·0125	..	..	nil	8·00	7·30†
3397	61	Mooloolah	B. S. L. ..	3·0	6·0	·009	·179	7·5	3·1	trace	·0157	·2375	·0097	110·2	58·1	str.	5·14	4·34
3398	62	Conondale	B.L. ..	4·0	7·9	·004	·284	3·3	11·7	17·6	·0420	·1718	·0093	..	..	v. sl.	7·50*	5·97†
3399	63	Landsborough	B.L. ..	7·1	11·5	·019	·181	2·7	3·8	12·2	·0545	·1661	·0231	123·0	28·3	med.	5·33	4·41
3400	64	Do.	Choc. L. ..	5·9	15·3	·008	·318	7·2	20·4	29·6	·0197	·2521	trace	..	..	v. sl.	6·30	5·26
3402	66	Do.	Choc. L. ..	6·8	10·8	·012	·350	3·7	11·4	15·5	·0027	·1362	·0014	89·0	19·6	med.	5·41	4·49
3403	67	Do.	Choc. L. ..	8·3	22·4	·022	·410	7·6	25·4	32·3	·0072	·3380	·0061	..	..	v. sl.	6·34	5·57
3404	69 (*b*)	Do.	Choc. L. ..	6·4	8·1	·009	·402	25·5	125·7	82·3	·0183	·1455	·0010	..	..	v. sl.	5·86	5·19
3406	70	Do.	Choc. L. ..	7·9	13·4	·002	·281	3·9	16·6	14·0	·0263	·1956	·0249	..	..	sl.	6·75	5·31
3413	71	Kilcoy	Br. L. ..	3·2	9·1	·004	·266	7·3	26·3	25·3	·0216	·2265	·0040	..	..	v. sl.	7·79	6·20†
3417	75 (*c*)	Do. Neurum	G. Br. L. ..	2·8	6·4	·003	·208	1·5	13·0	24·5	·0035	·1082	·0036	..	..	sl.	6·42	5·53
3419	77	Woodford	Br. L. ..	2·8	7·8	·002	·224	2·9	22·6	20·4	·0079	·2560	·0008	63·6	2·4	sl.	5·87	5·27
3420	78 (*d*)	Wamuran	G. Br. L. ..	2·1	8·5	·001	·172	9·1	5·1	4·7	·0035	·1065	·0037	59·4	1·2	sl.	6·01	5·03
3421	79	Do.	R. Br. L. ..	2·7	11·0	·001	·241	14·5	28·9	65·6	·0051	·0432	·0056	..	..	v. sl.	7·36*	5·68†
3423	81	Do.	Br. L. ..	2·4	5·5	·0005	·367	3·3	7·6	14·1	·0039	·2220	·0118	42·4	1·6	sl.	6·72*	4·76†
3424	82	Do.	Br. L. ..	8·9	9·1	·002	·367	4·0	25·6	28·5	·0014	·1431	·0054	..	..	v. sl.	7·74*	4·84†
3429	85	Oxenford	Br. L. ..	4·1	9·9	·003	·321	trace	5·5	13·6	·0087	·0328	·0200	248·0	164·9	str.	4·49	3·54
3430	86	Do.	Buff. L. ..	4·7	7·5	·002	·314	3·6	21·2	35·7	·0103	·0352	·0199	110·2	2·7	med.	5·38	4·39
3431	87	Do.	Br. L. ..	5·3	10·5	·002	·332	7·8	24·4	47·5	·0021	·1780	·0257	..	..	v. sl.	8·08	7·09†
3433	89	Pimpama	G. Br. L. ..	3·7	10·3	·002	·395	3·2	38·5	33·2	·0038	·6730	·0301	..	..	v. sl.	8·08	7·46†
3434	90	Do.	R. Br. L. ..	4·0	13·3	·004	·427	5·2	15·7	33·8	·0008	·1890	·0595	..	..	sl.	6·76*	5·01†
3438	92	Nerang	R. Br. L. ..	7·6	8·0	·011	·297	1·0	20·5	20·1	·0029	·2400	·0066	..	..	v. sl.	7·93	5·77†
3439	93	Do.	R. Br. L. ..	6·9	12·1	·003	·320	trace	11·5	11·8	·0215	·2404	·0063	..	..	sl.	6·65	5·82
3440	94	Do.	R. Br. L. ..	8·4	14·9	·003	·337	trace	10·7	11·0	·0031	·4171	·0007	..	..	nil	8·04*	6·93†
3441	95	Do.	R. Br. L. ..	4·8	6·1	·001	·471	trace	9·5	9·3	·0155	·0907	·0201	..	..	sl.	6·50*	4·68†
3442	96	Do.	R. Br. L. ..	6·0	10·0	·001	·269	1·8	21·2	24·3	·0013	·1130	·0041	..	..	sl.	6·54*	4·86†
3443	97	Do.	R. Br. L. ..	5·2	7·9	·001	·201	trace	9·4	16·7	·0155	·0103	·0053	..	..	sl.	6·76*	4·68†
3444	98	Callagrabah	Br. L. ..	6·3	9·9	·001	·258	trace	4·7	9·9	·0012	·1420	·0057	..	..	v. sl.	7·08*	5·06†
3445	99 (*e*)	Do.	Br. L. ..	7·4	10·5	·005	·352	2·7	13·1	33·4	·0022	·1090	·0044	..	..	v. sl.	7·86	5·06
3446	100	Do.	R. Br. L. ..	8·5	11·8	·014	·294	1·3	22·5	28·5	·0054	·0540	·0150	99·6	9·0	med.	5·27	4·64
3448	102	Mudgeeraba	Br. L. ..	4·0	6·8	·0005	·280	trace	18·7	22·0	·0059	·0390	·0009	86·9	15·7	str.	5·25	4·42
..	..	Average of 77 Soils ..	..	5·2	10·4	·008	·274	8·3	26·3	29·5	·0088	·1974	·0107	..	..	..	..	..

(*b*) Contains 51 per cent. stones. (*c*) Contains 33 per cent. stones. (*d*) Contains 35·1 per cent stones. (*e*) Contains 23·2 per cent. stones.
* Antimony Electrode. † Hydrogen Electrode.

Table 1b.—SOILS ON WHICH BANANAS DO NOT DEVELOP "SQUIRTER."

Laboratory No.	Soil No.	Locality.	Description of Soils.	Moisture (air dried sample)	Calculated on Soil dried at 100° C.									Lime Requirement per acre foot.		Acidity.		
					Loss on Ignition.	Chlorine.	Nitrogen.				Soluble in 1 per cent. Citric Acid.					Truog Test.	pH.	
							Total.	As Nitrate.						Jones.	Hopkins.		Water Suspension. 1 : 2	N/KCl Suspension. 1 : 2
								Initial.	Incubation Period.		Phosphoric Acid.	Lime.	Potash.					
									14 days.	28 days.								
				%	%	%	%	Parts	per million.		%	%	%	Cwt.	Cwt.			
341	12	Gympie Scrubby Creek ..	Choc. Light C. L.	12·4	14·3	·007	·320	8·0	26·2	24·5	·0014	·3640	·0069	..	..	v. sl.	7·36*	5·70†
3343	14	Do. Goomboorian ..	G. Br. L. ..	1·1	8·4	·005	·187	1·9	13·4	17·0	·0022	·1095	·0069	55·1	2·4	sl.	6·68*	5·29
3353	23	Do. Wolvi	G. Br. L. ..	8·8	12·6	·001	·403	9·3	21·9	21·2	·0136	·0857	·0079	153·0	35·3	med.	5·28	4·29
3358	28	Do. Lagoon Pocket..	G. L. ..	8·5	16·4	·001	·515	9·4	40·0	40·5	·0091	·4060	·0035	..	..	nil	8·01	7·04†
3360	30	Do. Brooloo	Choc. L. ..	5·7	11·1	·003	·403	12·6	54·3	59·0	·0004	·3730	·0351	..	..	nil	8·58	8·35
3366	36	Do. Glastonbury ..	G. Br. L. ..	4·1	8·9	·002	·228	10·2	28·3	25·3	·0065	·2675	·0353	..	..	v. sl.	7·38	5·45†
3372	38	Cooran	Y. L. ..	6·7	10·9	·009	·300	4·6	19·7	47·0	·0015	·0135	·0049	108·0	52·2	str.	4·71	4·22
3377	43 (*f*)	Do.	Br. L. ..	3·1	7·6	·006	·281	20·9	13·2	60·0	·0066	·1072	·0105	..	..	sl.	6·20*	4·53†
3380	46	Cooroy	Y. Br. L. ..	10·4	9·3	·024	·281	4·4	7·4	13·6	·0016	·0232	·0040	159·0	162·9	str.	4·29	3·84
3382	48	Do.	Br. L. ..	6·4	8·6	·018	·253	10·3	4·5	18·2	·0028	·0867	·0020	..	..	med.	4·82	4·13
3394	58	Kin Kin	Br. L. ..	2·7	14·4	·014	·288	7·9	23·4	34·8	·0050	·0426	·0086	..	..	v. sl.	7·24	6·20†
3395	59	Do.	Lt. Br. C. L.	1·8	10·4	·002	·228	5·3	24·6	27·3	·0032	·0868	·0083	110·2	19·6	med.	5·29	4·34
3396	60	Do.	Heavy C. L.	1·3	8·9	·002	·225	5·8	22·7	31·6	·0030	·0490	·0109	..	..	v. sl.	6·58	5·76
3401	65	Landsborough	Choc. L. ..	7·3	14·2	·016	·176	9·3	14·2	24·8	·0176	·2650	trace	..	..	v. sl.	6·23	5·41
3405	68 (*g*)	Do.	Choc. Lt. C.	6·8	6·3	·003	·366	6·9	6·3	26·9	·0117	·1310	·0075	..	..	sl.	6·22*	5·24
3414	72	Kilcoy	Br. L. ..	5·5	9·6	·004	·296	7·1	25·4	24·9	·0097	·2480	·0057	..	..	v. sl.	7·78	5·97†
3415	73 (*h*)	Do.	Br. L. ..	4·7	13·8	·002	·225	3·9	8·9	15·8	·0026	·1760	·0020	..	..	v. sl.	7·34	5·68†
3416	74	Do. Neurum	Br. L. ..	5·8	12·3	·002	·363	4·7	26·2	36·1	·0032	·2761	·0017	..	..	v. sl.	7·28	6·03
3418	76	Woodford..	Br. L. ..	4·1	7·6	·001	·163	14·6	17·9	28·9	·0093	·1101	·0013	..	..	v. sl.	6·44	5·16
3422	80	Wamuran..	Br. L. ..	1·7	8·0	·0005	·182	2·6	14·4	20·9	·0056	·0306	·0043	214·1	259·0	v. str.	4·78	3·86
3425	83	Do.	Br. L. ..	4·5	7·9	·001	·218	2·7	3·1	4·2	·0048	·1189	·0035	..	..	sl.	6·64	5·70
3426	84	Caboolture	Br. L. ..	2·9	8·4	·001	·245	3·7	14·2	9·0	·0039	·2430	·0066	67·8	3·1	med.	5·62	4·51
3432	88	Oxenford	G. Br. L. ..	2·0	6·1	·001	·171	trace	10·9	19·3	·0050	·3660	·0065	148·4	57·7	str.	5·07	4·14
3435	91	Pimpama	G. Br. L. ..	2·2	5·7	·002	·247	12·4	43·2	60·0	·0048	·0950	·0336	..	..	sl.	6·49	5·44
3447	101	Callagrabah	R. Br. L. ..	6·1	12·6	·003	·304	2·4	31·1	30·8	·0109	·1118	·0099	..	..	sl.	6·36*	4·76†
3449	103	Burleigh Heads	Choc. Cl. L. ..	14·6	15·9	·004	·362	7·6	34·5	28·4	·0012	·1548	·0007	..	..	sl.	6·04	5·02
3450	104 (*i*)	Do.	Choc. Cl. L. ..	9·8	13·1	·003	·339	8·2	37·2	41·2	·0091	·1070	·0218	..	..	med.	5·87	5·05
		Average of 27 Soils		5·4	10·5	·005	·280	7·3	21·7	29·3	·0058	·1647	·0092	..	..	..	..	..

(*f*) Contains 20·1 per cent. stones. (*g*) Contains 51·5 per cent. stones. (*h*) Contains 42 per cent. stones. (*i*) Contains 31·5 per cent. stones.

* Antimony Electrode. † Hydrogen Electrode.

MARKETING PASSION FRUIT.

By JAS. H. GREGORY, Instructor in Fruit Packing.

THERE are many growers at present growing passion fruit who do not think that it would pay them to grade and pack their fruit for market. These growers often wonder why they do not get the prices quoted in the market reports, and blame everybody but themselves for this state of affairs. When one sees the many classes of passion fruit, such as first quality, small, crinkly, woody, dummy, and diseased fruit that are often all thrown together to make a case, it is easy to understand why there is a big difference in prices. Growers have often complained that they have not gained materially in enhanced prices after going to the trouble of packing, forgetting that it takes time to restore, by good grading and packing, the confidence that has been destroyed by slipshod methods. It is only by the regular and continued application of sound up-to-date methods that a brand becomes known and appreciated, with the consequent increase in demand and price. Good grading and packing, coupled with regular supplies to the same distributors irrespective of market vagaries, will always secure the best results for the season's marketing.

Harvesting.

To harvest passion fruit different methods are used, growers in some cases picking and in others allowing the fruit to fall. The best method is to pick; although in the colder parts of the State, situated near the markets, it does not affect the selling value on the local market to allow the fruit to fall. When sending any distance, the fruit should always be picked and not allowed to fall. In hot weather the fruit should be picked when nearly fully coloured, and should be placed in a sheltered place to cool off before being packed. In the cooler part of the season, the colouring of the fruit can be allowed to develop to its maximum before harvesting. By picking before the fruit gets heated, or by harvesting in the later part of the afternoon and allowing the fruit to stand and cool overnight the grower will have his fruit in an excellent condition for packing.

Close attention to the cooling is well worth while, assisting the fruit to carry longer distances and to arrive in better condition at the end of its journey. Stalks may be left on, but care should be taken to remove the dead part of the blossom that adheres to the stalk. This, when not removed, is a serious source of infection for mould development during transit over long distances. Shortening the stalks by clipping down to about a quarter of an inch in length when sending over long distances reduces to a great extent the risk of mould infection. Owing to the extra time and labour involved, it would possibly not pay to clip the stalks for local market as there possibly would be no gain in the price realised.

Care should be taken to avoid as much as possible damage to the fruit, which results from careless handling, causing rubbing of the skin, thereby greatly disfiguring the fruit. By paying due attention while packing, carefully tipping the fruit on to a bench (Plate 8) for packing, and not trying to pack from the picking containers, rubbing can be practically eliminated. Tip only one case of fruit at a time on to the bench as too much fruit on the bench leads to rolling the fruit about, causing damage to the skin. It is an advantage to cover the packing bench with bags. A simple bench can be made by making a frame and using sacks with fine netting fixed beneath to strengthen the sacks. Care should be taken to tilt the back of the bench so that fruit will always roll to the packer.

Grading.

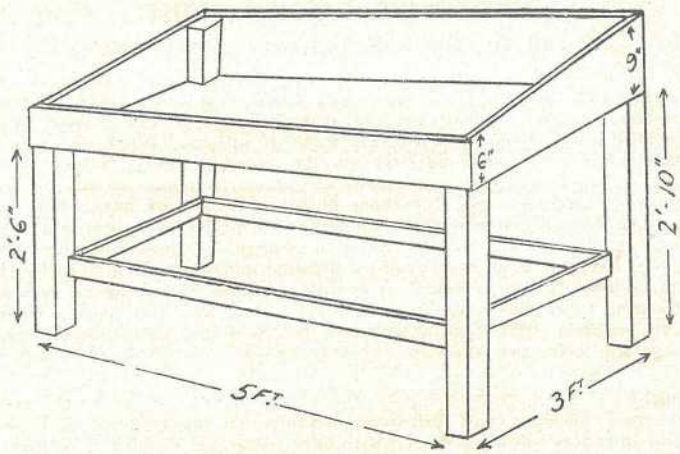
As the best prices are obtained for uncrinkled fruit, care should be taken to keep it from developing this trouble after packing. Keeping fruit in a cool place, and as dark as possible, helps to retard crinkling, for light and heat both have the effect of hastening the crinkling with subsequent loss in value. When marketing, it is suggested that growers adopt the terms "special," "standard," and "plain," for designating the grades of their fruit. As these terms are understood in the trade in the grading of other fruits, the buyers would soon become acquainted with their use for passion fruit. It is suggested that they be as follows:—

Special.—Large and medium sized fruit, full of pulp and free of dummy or blemished or diseased fruit.

Standard.—Large and medium sized slightly skin-blemished fruit, full of pulp and free of dummy or diseased fruit.

Plain.—Small sized fuit, and all sizes of crinkled and blemished fruit, such as limb marked or woody specimens free from dummy or diseased fruit.

"Special" and "standard" grades should be packed, but owing to the mixed sizes of the "plain" grade it would be very hard to make a pack with the possible small quantities of various classes of fruit placed in the "plain" grade. If all growers adopted this system, agents and buyers would soon understand the quality of fruit they were handling.



Fruit Bench to assist in Grading.

PLATE 8.—BENCH FOR HOLDING FRUIT WHILST PACKING.

Tip one case at a time to lessen the chance of damage to the fruit caused through it having to be rolled about to obtain the correct sizes for packing when more than one case is placed on the bench at a time.

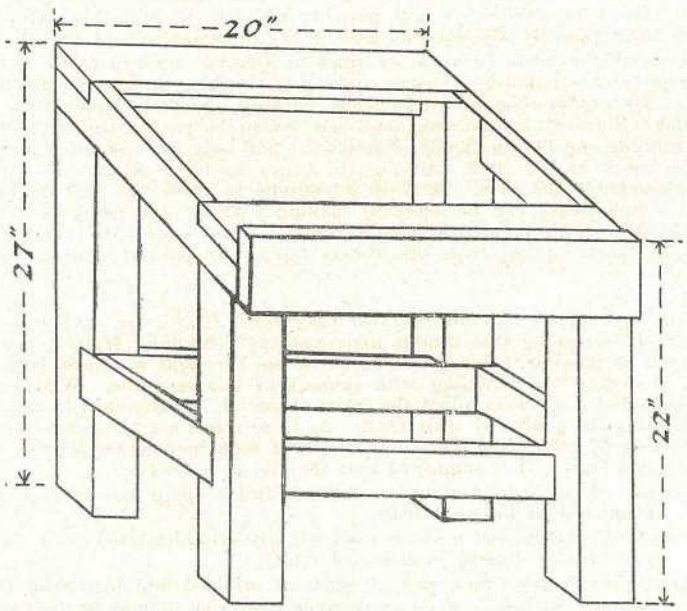


PLATE 9.—PACKING STAND TO HOLD TWO CASES.

Note the tilt on the stand which helps to hold the fruit in position whilst packing.

Grading can be done when picking. By having two picking containers and sorting the fruit into two qualities when harvesting, extra handling and rolling about on the benches, with its increase in damaged fruit, will be to a great extent avoided. A good system is to place all "special" fruit into one container, and "standard" and "plain" in the other, these two qualities being separated whilst packing. Care should be taken to eliminate all diseased fruit, dummies, or woody passions.

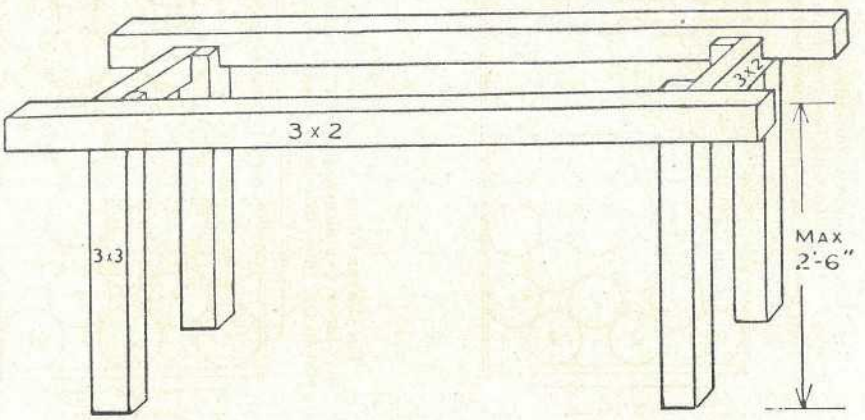


PLATE 10.—NAILING-DOWN BENCH.

This enables the bottom of the case to bulge slightly with the pressure of the fruit. This keeps the pack tight in transit, preventing the fruit from rubbing or becoming damaged.

Sizing.

Sizing is an operation that, to save extra handling with the risk of damage, is best carried out whilst packing. Three cases of "special" or "standard" grades can be packed at a time, and a fourth case for holding and specimens of "plain" grade found can be placed alongside the packer. This method saves handling and facilitates operations.

Shed Equipment.

A packing stand (Plate 9), a sloping bench approximately 5 feet by 3 feet (Plate 8), and a nailing-down bench (Plate 10) are all the necessary equipment in the shed.

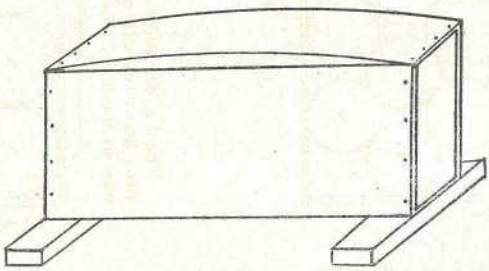
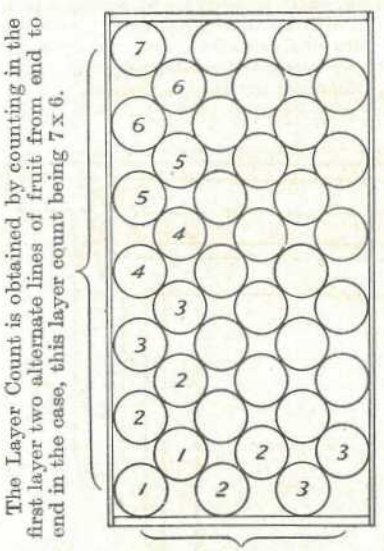


PLATE 11.—NAILING DOWN ON BATTENS.

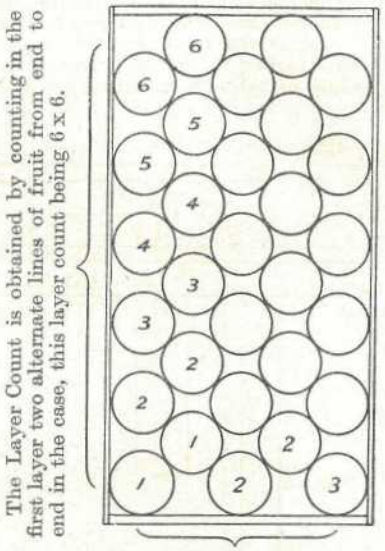
Where a grower does not have a nailing-down bench, two pieces of 3 x 2 placed under the ends whilst nailing make a good substitute.

HOW TO READ AND USE THE PACKING TABLE.



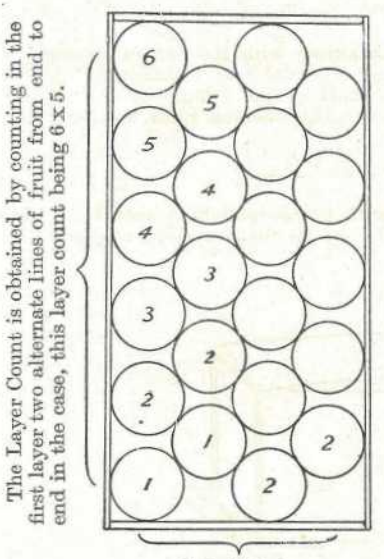
3–3 PACK.

The Pack gets its name from the way the first six fruit are placed in the layer. The Count is made of the first two lines of fruit across the case.



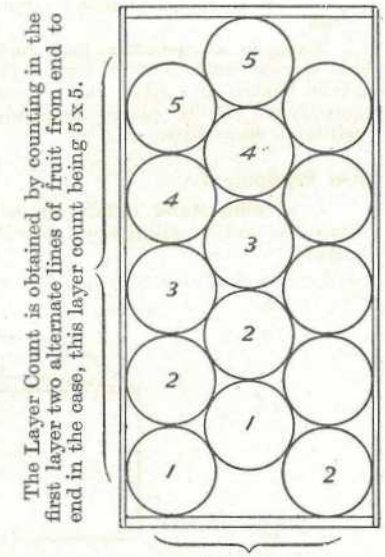
3–2 PACK.

The Pack gets its name from the way the first five fruit are placed in the layer. The Count is made of the first two lines of fruit across the case.



2–2 PACK.

The Pack gets its name from the way the first four fruit are placed in the layer. The Count is made of the first two lines of fruit across the case.



2–1 PACK.

The Pack gets its name from the way the first three fruit are placed in the layer. The Count is made of the first two lines of fruit across the case.

PLATE 12.

Cases and "Get up" of Fruit.

The best type of case is one with close fitting boards. No lining paper is needed with a box of this description. Where the boards of the cases are apart it is advisvisable to use clean plain white or coloured paper, and line the cases. A thin layer of woodwool on the top and the bottom of the case is an added help in the good carriage of the fruit over long distances.

Many methods of packing have been tried. Rolling in, facing and square packing, but the diagonal pack is the best, having many advantages over all the other methods. Ease of packing and the enhanced appearance given by this pack are noticeable. Passion fruit packed on the diagonal system appear the same, whether top, bottom, or sides are opened for the inspection of the buyer, the straight lines up and down, diagonally, and across the case being very attractive. The straight lines in each layer are an indication of correct packing, the lines of fruit getting out of place when the operator is grading badly and packing incorrectly.

Another advantage is the numerical system of counts that can be used, the totals of the various packs never varying. As no individual fruit rests upon another, but must rest in the pocket formed by four fruits of the layer beneath, it can readily be seen that pressure crinkles are eliminated. The height of the fruit in the case is also very easy to regulate by opening or closing the pockets. With straight, faced, and rolled packs the regulating of the height of the fruit in the case is very difficult, this being the main reason of low and slack packs with the fruit being damaged through moving in the case. In the long half-bushel case (26 by 6 by 7⅛) the 2—2 pack does all the best commercial sizes, eliminating the trouble, experienced in straight packs, of trying to fit the fruit tightly across the case. The 3—2 pack is only used for very small fruit. The dump half-bushel case (18 by 8⅜ by 7⅛) uses the 3—3 pack, the 3—2 pack being used only for the very large fruit of the Mammoth type. Fruit should be packed to a height of ½ inch to ¾ inch above the top of the half-bushel box. It is not recommended to use bushel cases. Growers will possibly find that during periods of heavy supply it may not be profitable to pack the very small fruit.

The following ready reckoning table gives the types of packs and counts used in packing both kinds of cases.

Packs and Counts used to bring Passion Fruit to the Correct Height in the Half Bushel Dump Case and the Long Half Bushel Case.

Half Bushel Dump Case, 18 inches long, 8⅜ inches wide, 7⅛ inches deep.

Pack.	Layer.	No. of layers.	Total.	Count in dozens.
3—3	9 x 8	5	255	21 doz. and 3
3—3	8 x 8	5	240	20 doz.
3—3	8 x 7	5	225	18 doz. and 9
3—3	7 x 7	5	210	17 doz. and 6
3—3	7 x 6	5	195	16 doz. and 3
3—3	6 x 6	5	180	15 doz.
3—3	6 x 5	5	165	13 doz. and 9
3—2	7 x 7	4	140	11 doz. and 8
3—2	7 x 6	4	130	10 doz. and 10

Long Half Bushel Case, 26 inches long, 6 inches wide, 7⅛ inches deep, clear of division.

The packs and layer counts shown are for one compartment of the box, and the count is the total count for the whole box.

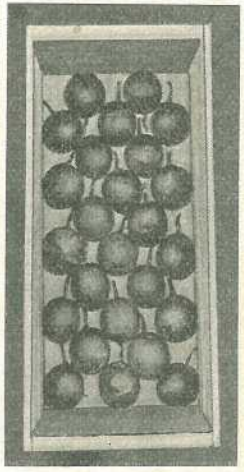
Pack.	Layer.	No. of layers.	Total.	Count in dozens.
3—2	5 x 5	6	300	25 doz.
2—2	7 x 6	5	260	21 doz. and 8
2—2	6 x 6	5	240	20 doz.
2—2	6 x 5	5	220	18 doz. and 4
2—2	5 x 5	5	200	16 doz. and 8
2—2	5 x 4	5	180	15 doz.
2—2	4 x 4	5	160	13 doz. and 4
*2—1	6 x 6	4	144	12 doz.
*2—1	6 x 5	4	132	11 doz.

* Instead of placing the fruit end for end with the case it is necessary to place the fruit across the case with the stalks turned inwards, otherwise the fruit will pack too low. (Plate 22.)

It is not recommended to pack passion fruit in bushel cases. The same packs with double the number of layers will bring the fruit to the correct height in the bushel case. (Plate 16.)

LONG HALF BUSHEL CASE. 3-2 PACK.

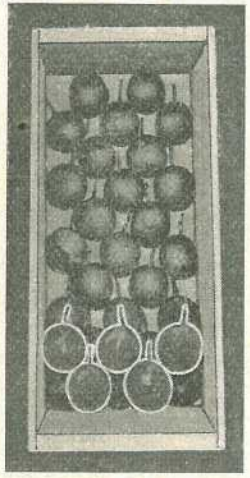
First Layer.



3-2 Pack. 5 x 5 Layer.

This layer starts with three passion fruit placed across the end of the case.

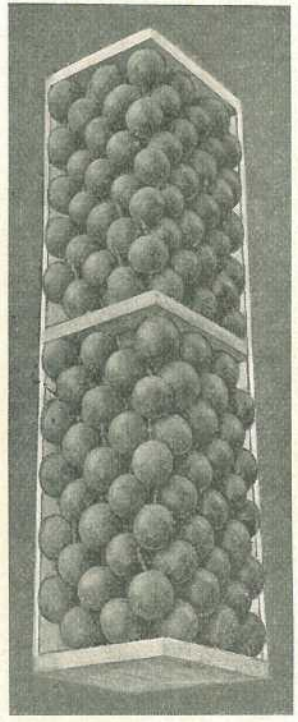
Second Layer.



This layer starts with two passion fruit placed in the two pockets between the first three fruit of the first layer.

Finished Case.

Top. Side.



3–2 Pack. 5 x 5 Layer.
6 Layers. Total 300.

Note the alignment of the fruit in the case.

PLATE 13.

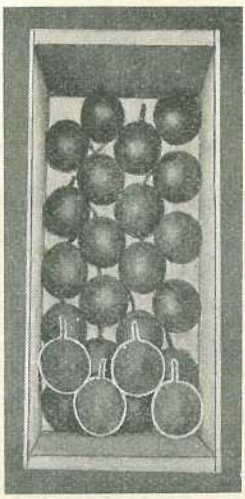
Packing the Long Half Bushel Case.

It will be found that the 3—2, 2—2, and 2—1 packs are used to pack the full range of sizes when packing in the long bushel case.

3—2 Pack.

This pack gets its name from the position in which the first five fruit are placed in the case, the first layer being started with three across the end (one in each corner and one exactly in the middle, see Plate 12). In the spaces between these three fruit two more are placed, thus forming the 3—2 from which the pack gets its name. This is repeated until the layer is finished. It will be noted that the fruit is placed in the layer with the stalks facing away from the wood of the case-end, until the last line is reached, when the stalks are placed away from the other end of the case by reversing the last two or three fruit. The second layer is then started by placing two passion fruit on the two cavities formed by the first three fruit of the first layer, the layer being finished by placing a passion in each of the spaces between the fruit of the first layer. Care should be taken to reverse the end line of fruit as in the first layer. The case is finished by repeating these layers. The 3—2 pack contains six layers. Care should be taken to keep the lines of three or two straight, and at right angles to the sides of the box. Fruit should be brought to one-half to three-quarters of an inch in height above the top of the case.

HALF LONG BUSHEL CASE. 2–2 PACK.
How to start the Second Layer.



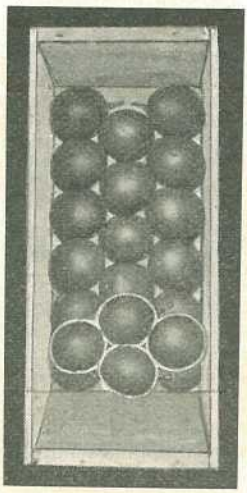
The second layer is started by placing two passion fruit on the pockets between the first two fruit of the first layer. The layer is completed by placing the fruit on the balance of the pockets.

PLATE 14.

2—2 Pack.

This pack is started by placing a passion fruit in the left-hand corner of the case and another midway between the edge of this passion and the right-hand side of the box. In the two spaces between these we place two more passions. This gives the pack its name, 2—2 pack (see Plate 12). The same rule is adopted in placing the fruit as in the 3—2 pack, all stalks facing away from the packer, and fitting in the pockets with the last line reversed. The layer is finished by repeating the lines of two. The second layer is placed on the pockets of the first layer. (Plate 14.) The case is finished by repeating these layers, the finished case containing five layers. Care should be taken to keep the lines of two at right angles to the sides of the case. Three-quarters of an inch above the top of the case is the correct height for the fruit to be packed.

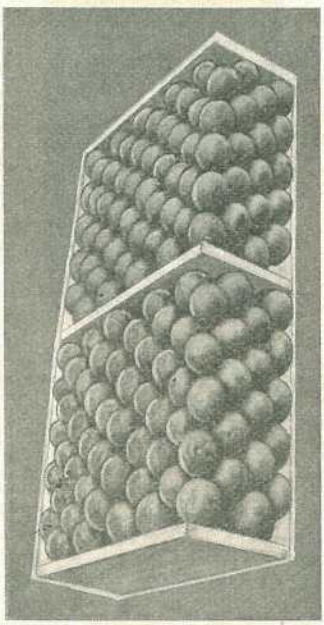
2–1 PACK.
How to start the Second Layer.



The layer is started with one fruit placed in the pocket between the first two fruit in the first layer.

PLATE 15.

LONG BUSHEL CASE.
Finished Pack.



2–2 Pack. 5 x 5 Layer. 10 Layers. Total 400.

Packs in this case are the same as in the half-bushel, but have double the number of layers. It is not recommended that the bushel should be used, the trade desiring the half-bushel for preference.

PLATE 16.

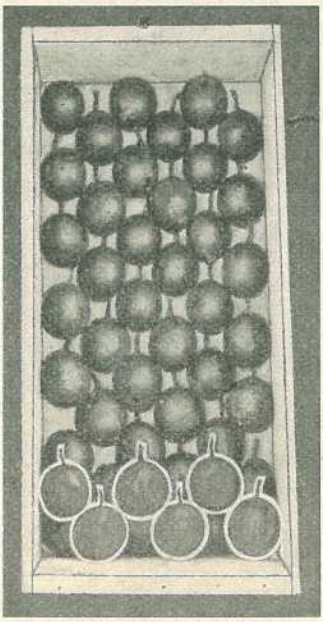
2—1 Pack.

This pack is different from the others in the fact that the fruit, instead of being placed end for end in the case, is placed across with the stalks turned inwards. The first layer is started by placing a passion fruit in each corner of the case, and one in the space between, forming the 2—1 pack from which the pack gets its name (see Plate 12). This is repeated until the layer is finished. The second layer is started by placing one passion on the space between the two first fruits of the bottom layer, then two, finishing the layer by placing fruit on the pockets of the first layer (Plate 15). This system of packing is continued layer by layer until the case is full, four layers being necessary to fill the case. This pack, owing to the smaller pockets, will not come as high above the top as the other packs, half an inch being a sufficient height.

The Dump Half Bushel Case.

Practically all sizes of passions can be packed in this case by using the 3—3 pack, only the very large fruit requiring the 3—2 pack.

HALF BUSHEL DUMP CASE. 3—3 PACK.
How to start the Second Layers.



3–3 Pack.

The second layer is packed by placing three passion fruit on the pockets of the first layer, repeating this line by line of fruit until the layer is complete.

PLATE 17.

3—3 Pack.

This pack is very easy to do, providing care is taken in placing the first six passion fruit in the first layer. These are placed in a layer of three across the end of the case, placing the first fruit in the left-hand corner and spacing the other two equal distances apart between the corner fruit and the right-hand side of the box. This leaves three even spaces between the fruit in which we place the next three passions, forming the 3—3 from which the pack gets its name. (Plate 12.) Care must be taken to place the fruit in straight lines at right angles to the side of the box. The layer is then completed by placing lines of three in the spaces left between each line of fruit until the end of the case is reached. The fruit is placed facing the same as the 3—2 and 2—2 packs in the long half bushel, the same care being necessary in reversing the last three across the case. The second layer is placed upon the pockets of the first layer (Plate 17). Three-quarters of an inch above the top is the correct height for this pack.

3—2 Pack.

This is done in the same manner as the 3—2 in the long half bushel, with the difference that there are only four layers in the dump half bushel instead of six as in the long half bushel. Half to three-quarters of an inch is the correct height above the top for the fruit in the finished case.

Faults are easily noticeable. If any of the straight lines in any of the packs become crooked or the fruit loose in the layer it is a sign that the pack is going wrong, usually through bad sizing. A thin layer of woodwool top and bottom is an improvement to the pack, especially for long distance transit.

HALF BUSHEL DUMP CASE, 3-2 PACK.
How to start the Second Layer.

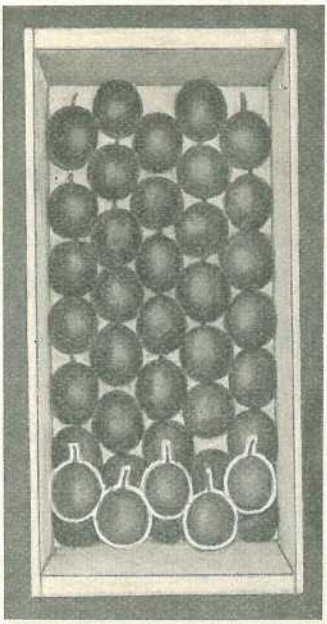


PLATE 18.

Note the alignment of the fruit in the case, also that no fruit rests one upon the other but in the pockets of the layer beneath.

The following rules are a good guide to successful marketing:—

1. No two passions should rest directly one upon the other but should rest in the pockets of the first and subsequent layers.
2. See that fruit comes to the correct height in the case, at least a minimum height of one-half to three-quarters of an inch being necessary.
3. See that all lines appear straight, across, from end to end, and diagonally in the case.
4. Keep all crinkled and woody passions out of top grades.
5. Handle carefully and eliminate skin rubbing.
6. See that the 2—1 pack has the fruit placed across the case and not end for end as in other packs.

Cases.

Cases should be made with close-fitting timber. Lining paper should be used, as passion fruit do not crinkle as quickly if the fruit is kept cool and not exposed to light and air. Clean plain white or coloured paper should be used, being preferable to the use of newsprint, which is cheap and looks it. If the weather is hot whilst packing, damp bags placed on the packed cases will assist in keeping the fruit cool and will retard cringling.

Branding.

To conform to the Fruit and Vegetables Act growers must brand the end of the case legibly with the name of the variety of fruit and their name and address in a space measuring 5 inches by 2 inches. The number of dozens or total fruit in the case should also be stencilled on the end. It is suggested that the number of dozen is the best system of stencilling to use. When exporting overseas it is necessary that the address of the grower contains the word "Australia."

Growers using fancy labels should see that the word "Australia" is included in the address on the label.

Export Packing.

There is the prospect of a market to be obtained outside of Australia. Passion fruit does not store in the refrigerator as satisfactorily as some other fruits, but with care a safe storage period of a month to five weeks can be assured. Fruit when being shipped should be pre-cooled before being placed in the ship's refrigerator. The same packs as when unwrapped are used for the fruit for export, but each fruit should be wrapped in sulphite tissue paper, as this isolates each unit from possible infection from one another if infected with mould. Care should be taken to see that all stalks are cut short before packing as this helps to eliminate the possible infection from moulds. A thin layer of woodwool top and bottom is necessary. Passions packed in this way should carry satisfactorily to America and Eastern markets. Care should be taken to see that only first-quality fruit is packed for export consignments. Fruit must not be allowed to fall or become fully ripe, but should be harvested when mature though not fully coloured. Tests conducted in Victoria by the Department of Agriculture have shown that fruit picked from pruned vines is superior in every way for exporting over long distances to fruit from unpruned vines.

Wrapping.

The fruit is wrapped by placing it in the centre of the sheet of wrapping paper, gathering all the corners together, giving the fruit a twist, and folding the finished ends on to the cheek of the fruit. This forms a pad on which the fruit is rested when placed in the case, the pad in the second and subsequent layers in the case resting in the pockets of the layer beneath. Care is necessary to see that the fruit is wrapped with the shiny side of the paper to the outside.

Hints for Successful Export.

1. Harvest fruit in the cool part of the day and keep as cool as possible during handling.
2. Pre-cool before loading into ship's hold.
3. Clip stalks to avoid mould (*Cladosporium herbaram*) infection.
4. Wrap each fruit, and place woodwool on top and bottom. As wrapping paper is used there is no necessity for lining paper.
5. Handle with care and as little as possible to climinate damage to the skin.
6. Do not pack fallen or over-matured fruit.
7. Use the half bushel dump case and see that the boards are close fitting.

Nailing Down.

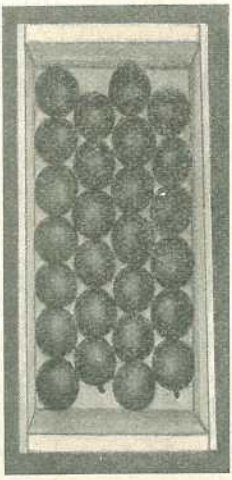
When nailing down battens should be placed beneath each end of the case to permit the bottom to bulge if necessary when applying the lid. A nailing-down stand can be made of two lengths of 3 by 2 placed edgeways and fastened 15 inches apart for the dump half bushel case, or 21 inches apart for the long half bushel case (see Plate 10).

This can be made to go on a bench top or can be made with legs as a separate nailing-down bench.

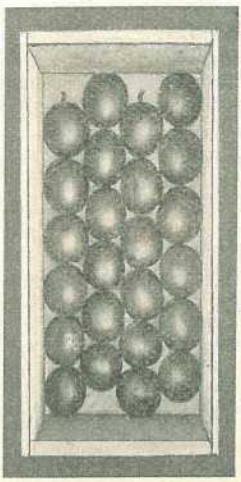
Acknowledgment.

I desire to thank Messrs. Anderson and Woolcott and J. Bishop, of Mount Tamborine, for allowing me to pack and photograph their fruit for this publication.

LONG BUSHEL CASE. 2–2 PACK.
First Layers.



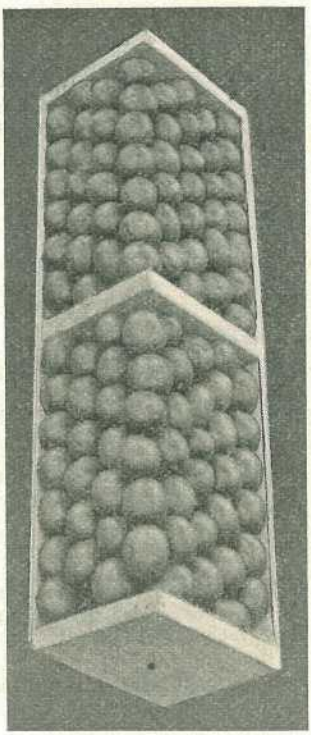
2–2 Pack. 7 x 6 Layer.



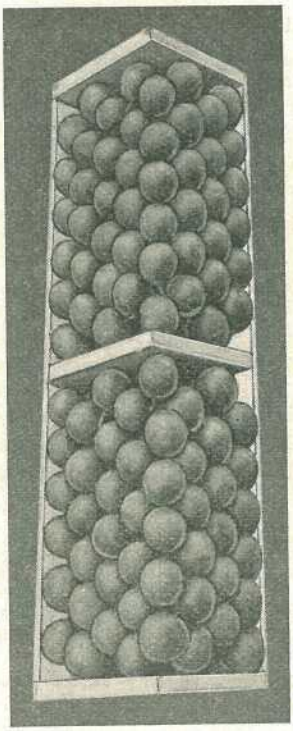
2–2 Pack. 6 x 6 Layer.

SPECIAL NOTE.—This layer represents one compartment only of the complete container.

Top. Side. Finished Cases. Side. Top.



2–2 Pack. 7 x 6 Layer.
5 Layers. Total 260.

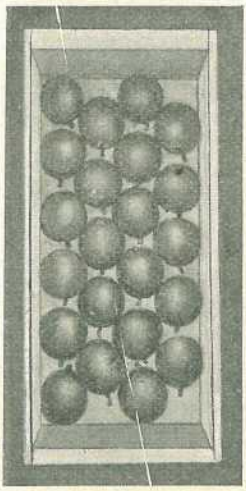


2–2 Pack. 6 x 6 Layer.
5 Layers. Total 240.

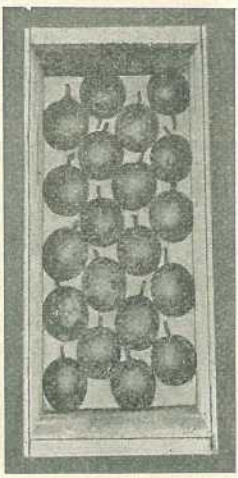
Note the alignment of the fruit diagonally, across, and up and down the case. No fruit rests directly one upon the other.

PLATE 19.

LONG BUSHEL CASE. 2–2 PACK.
First Layers.



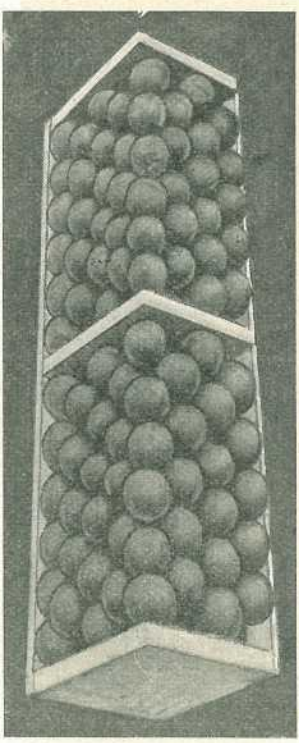
2–2 Pack. 6 x 5 Layer.



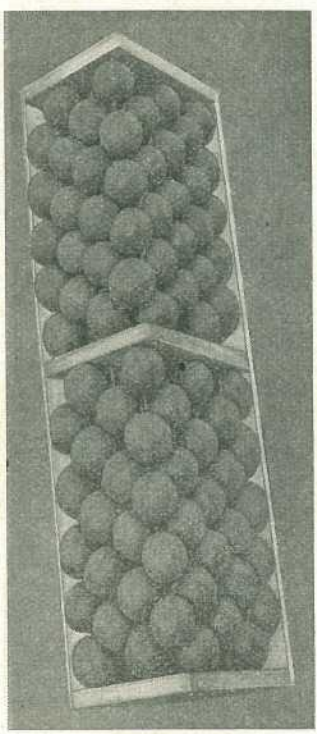
2-2 Pack. 5 x 5 Layer.

SPECIAL NOTE.—This layer represents one compartment only of the complete container.

Side. Top. Finished Cases. Top. Side.



2–2 Pack. 6 x 5 Layer.
5 Layers. Total 220.

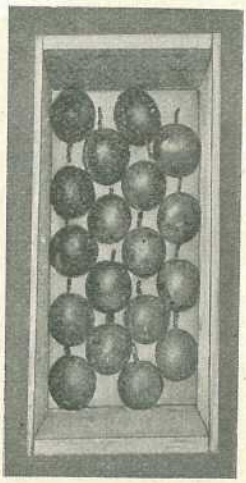


2–2 Pack. 5 x 5 Layer
5 Layers. Total 200.

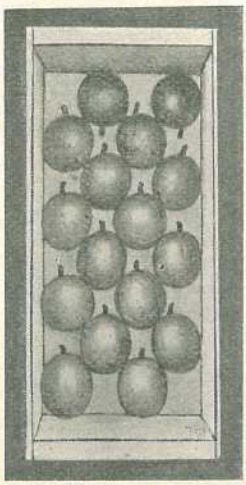
Note the alignment of the fruit diagonally, across, and up and down the case. No fruit rests directly one upon the other.

PLATE 20.

LONG BUSHEL CASE. 2–2 PACK.
First Layers.



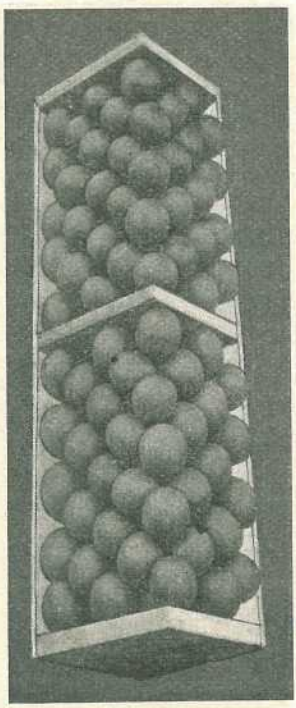
2–2 Pack. 5 x 4 Layer.



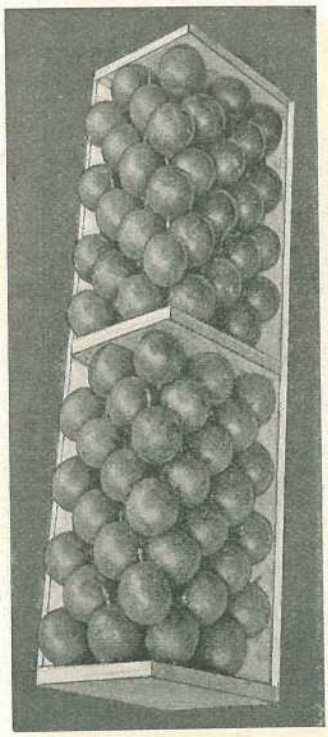
2–2 Pack. 4 x 4 Layer.

SPECIAL NOTE.—This layer represents one compartment only of the complete container.

Side. Top. Finished Cases. Top. Side.



2–2 Pack. 5 x 4 Layer.
5 Layers. Total 180.

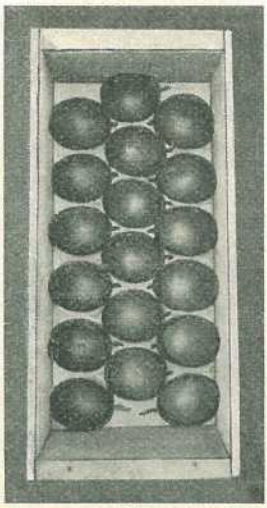


2–2 Pack. 4 x 4 Layer.
5 Layers. Total 160.

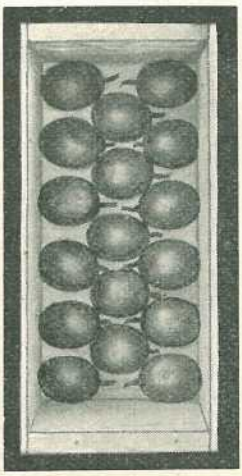
Note the alignment of the fruit diagonally, across, and up and down the case. No fruit rests directly one upon the other.

PLATE 21

HALF LONG BUSHEL CASE. 2–1 PACK.
First Layers.



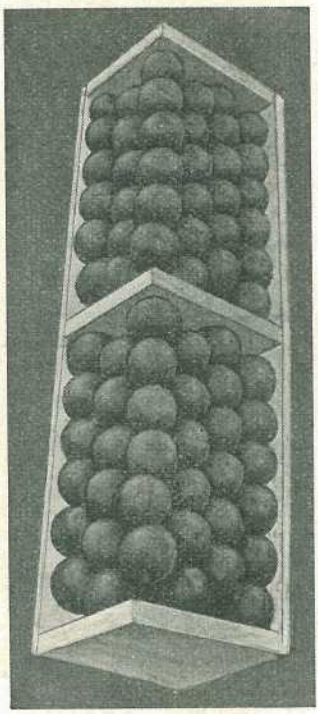
2–1 Pack. 6 x 6 Layer.



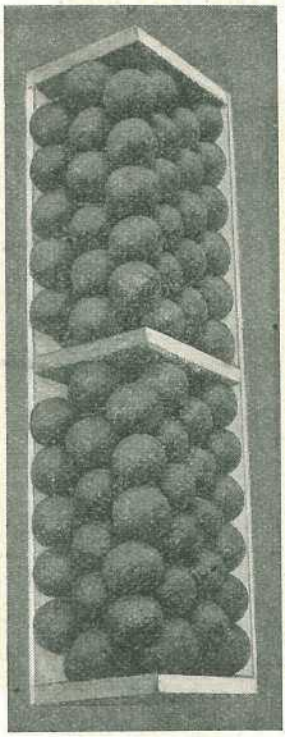
2–1 Pack. 6 x 5 Layer.

NOTE.—The fruit in this pack is placed across the case and not end for end as with all the other packs.

Top. Side. Finished Cases. Top. Side.



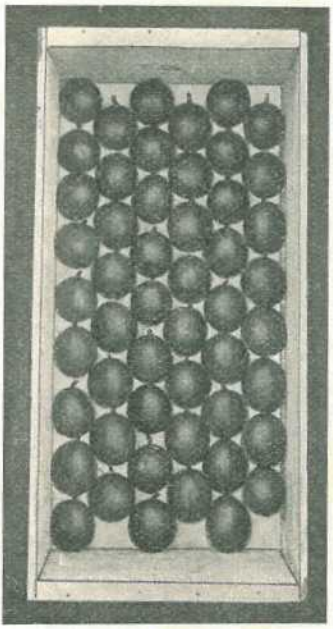
2–1 Pack. 6 x 6 Layer.
4 Layers. Total 144.



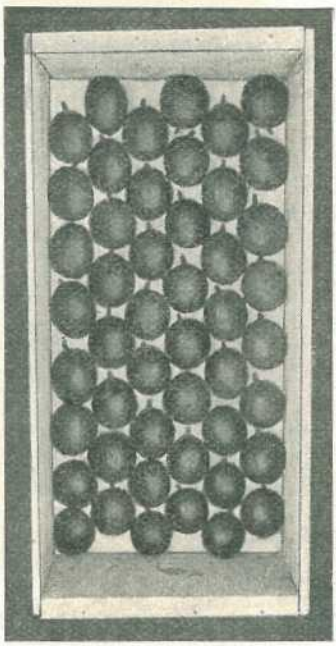
2–1 Pack. 6 x 5 Layer.
4 Layers. Total 132.

PLATE 22.

HALF BUSHEL DUMP CASE. 3–3 PACK.
First Layers.

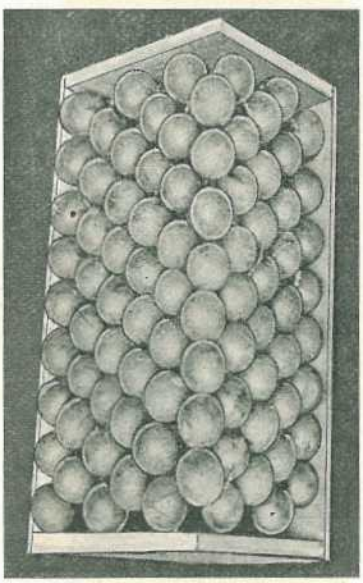


3–3 Pack. 9 x 8 Layer.

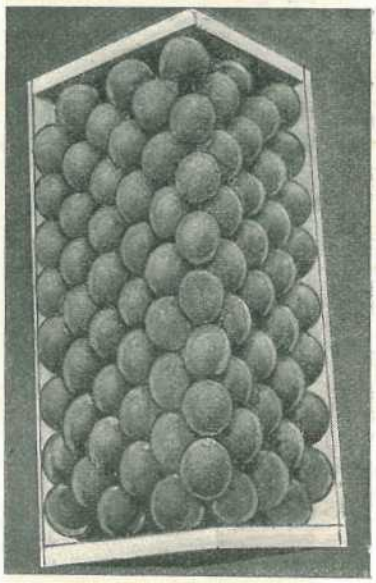


3–3 Pack. 8 x 8 Layer.

Top. Side. Finished Cases. Top. Side.



3–3 Pack. 9 x 8 Layer.
5 Layers. Total 255.

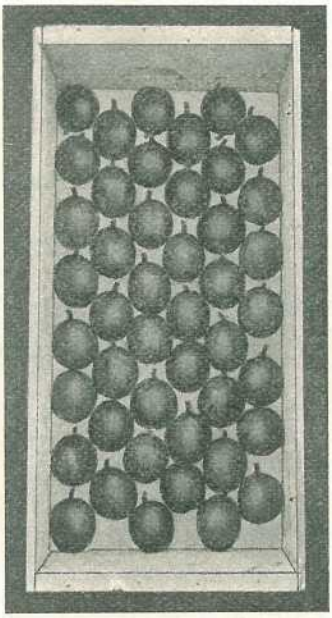


3–3 Pack. 8 x 8 Layer.
5 Layers. Total 240.

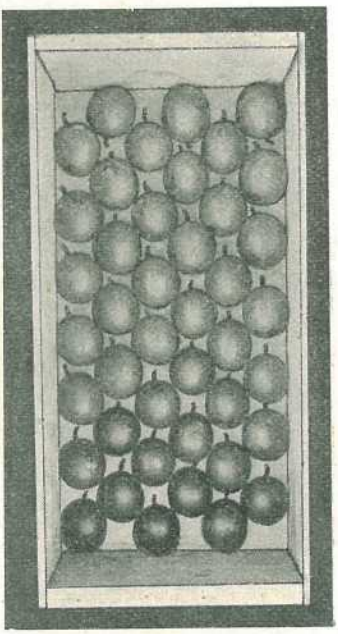
Note the alignment diagonally, across, and up and down the case.

PLATE 23.

HALF BUSHEL DUMP CASE. 3–3 PACK.
First Layers.

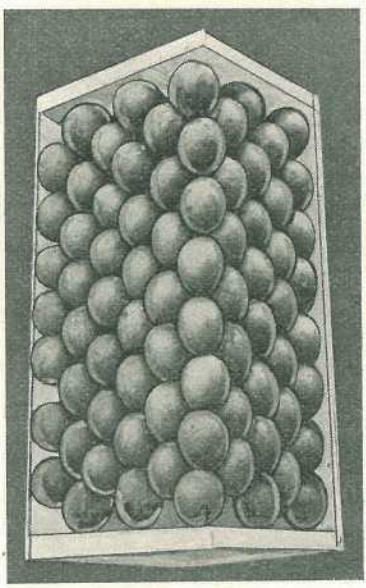


3–3 Pack. 8 x 7 Layer.

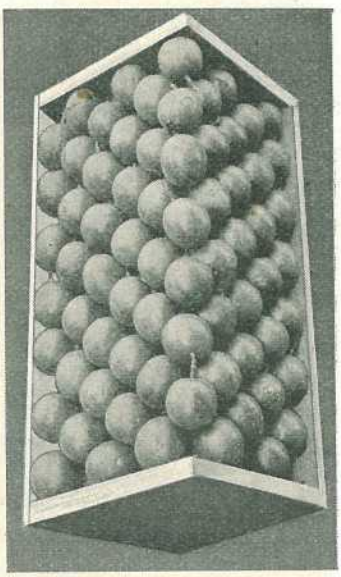


3–3 Pack. 7 x 7 Layer.

Top. Side. Finished Cases. Top. Side.



3–3 Pack. 8 x 7 Layer.
5 Layers. Total 225.

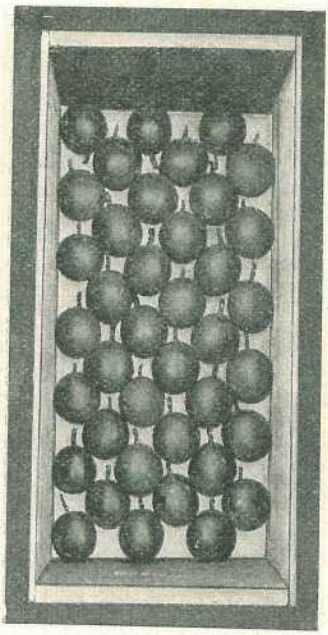


3–3 Pack. 7 x 7 Layer.
5 Layers. Total 210.

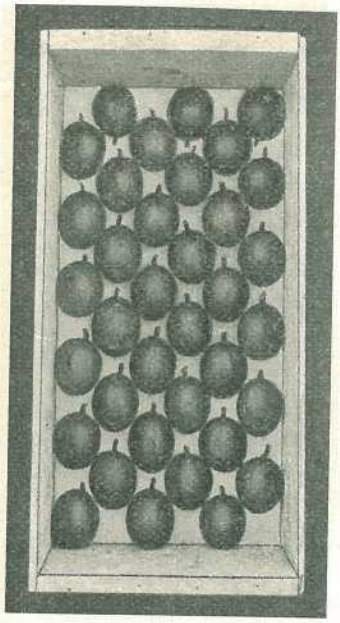
Note the alignment diagonally, across, and up and down the case.

PLATE 24.

HALF BUSHEL DUMP CASE. 3–3 PACK.
First Layers.

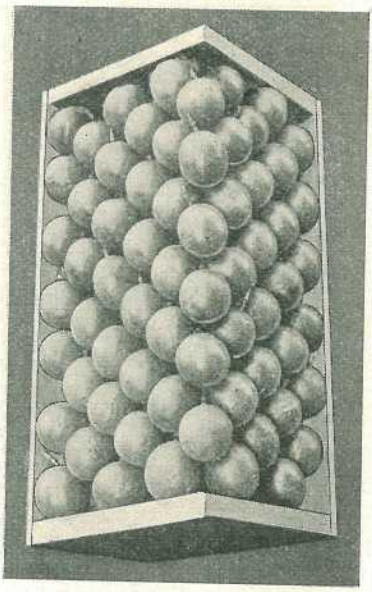


3–3 Pack. 7 x 6 Layer.

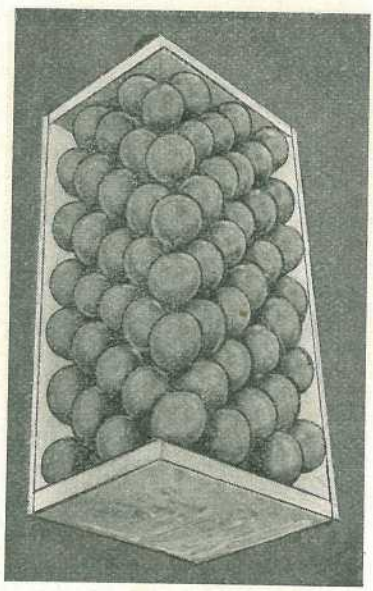


3–3 Pack. 6 x 6 Layer.

Top. Side. Finished Cases. Side. Top.



3–3 Pack. 7 x 6 Layer.
5 Layers. Total 195.

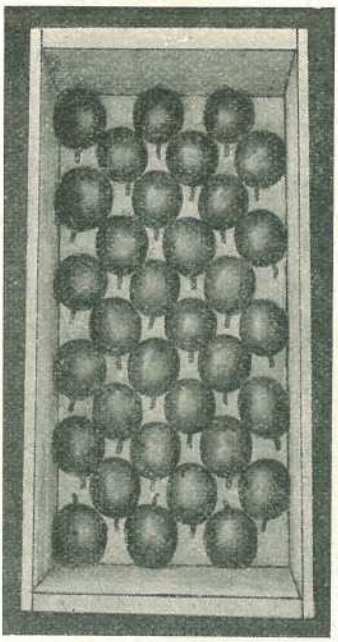


3–3 Pack. 6 x 6 Layer.
5 Layers. Total 180.

PLATE 25.

HALF BUSHEL DUMP CASE. 3-3 PACK.

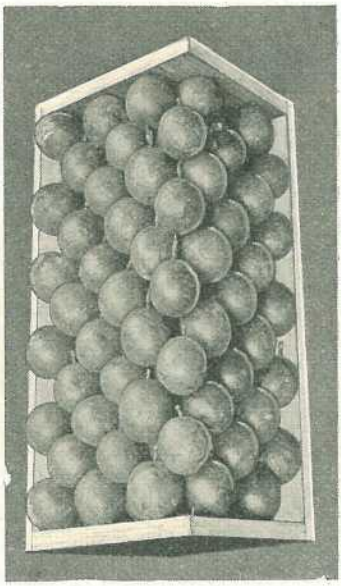
First Layers.



3-3 Pack. 6 x 5 Layer.

Finished Case.

Top. Side.

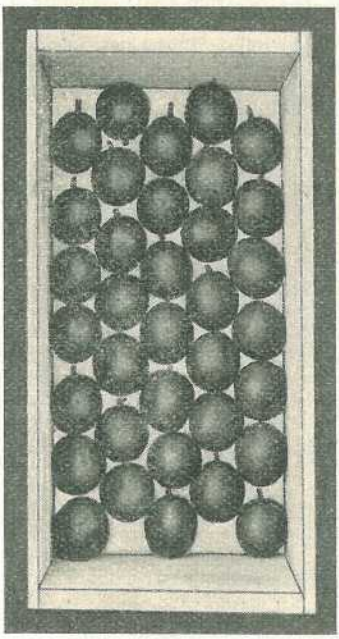


3-3 Pack. 6 x 5 Layer. 5 Layers. Total 165.

PLATE 26.

HALF BUSHEL DUMP CASE. 3-2 PACK.

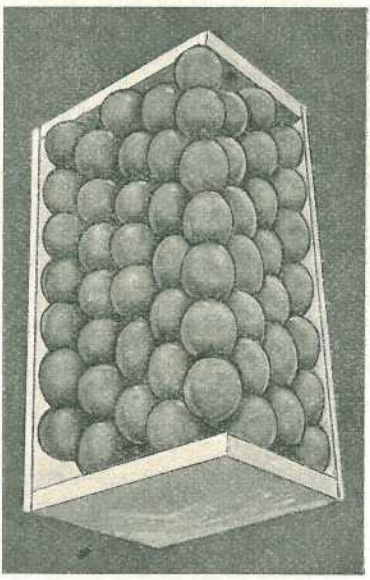
First Layer.



3-2 Pack. 7 x 7 Layer.

Finished Case.

Top. Side.



3-2 Pack. 7 x 7 Layer. 4 Layers. Total 140.

PLATE 27.

FARMERS' SHEEP AND WOOL.

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

(*Continued from the March issue.*)

PART IX.

This is the ninth article of a series planned for the purpose of supplying information sought from time to time by readers interested in sheep and wool; and also with the hope of stimulating interest in sheep-raising in Queensland on relatively small holdings.

CLASSING THE CLIP.

THE high standard of woolclassing attained in Queensland has created confidence and a feeling of security among wool buyers. It is necessary that this standard should be maintained by small as well as large flockmasters. The big stations usually have flocks sufficiently numerous to justify the employment of a qualified classer. It is really the get up of these clips that has gained for us the high reputation which the wool business now enjoys. It is to the small flockowner who does not usually employ a classer that I wish to direct my remarks. Every sheep farmer knows that from a sheep there will be shorn a low grade of wool as well as the good, clean fleece wool. To keep these grades separate is very important, but first consideration should be given to the matter of general cleanliness. Have a good clean shearing board of a size suitable to requirements and keep it clean. When a sheep is shorn the fleece should be picked up and thrown out, cut side down on the wool table for skirting.

Skirting the Fleece.

In the best of fleeces there is a falling away of length and quality along the outside edge or skirt of the fleece, as it embraces the wool from the legs and the points running out to the bare parts, also the fatty edges and stained portions. Usually fleeces will be met with in one of three classes, and all the fleeces from one flock will be practically the same. Firstly, it may be free from seed; secondly, the edge only may carry seed; thirdly, the seed may extend well up the sides, leaving only the portion along the back free. No. 1 will need but a light skirting, merely removing all short, matted, fatty, or heavy conditioned wood as well as the stained portions, which should be removed from all fleeces. No. 2 is a fleece lightly seeded, from which the whole of the wool carrying seed should be removed, thus giving a heavy skirting, especially on the front portion and flanks. No. 3 is a fleece that carries seed up the sides, and making it free would mean removing the best of the body wool into the pieces, leavng very little more than the back wool, which is usually not up to the standard of the rest of the fleece wool. It is advisable to skirt lightly, just removing the heavy burry or seeded points, fatty edges, and stains.

By placing a basket at each end of the skirters' table the wool from the breech end may be placed in one, and that from the sides and the neck in the other basket. In following this system it will be found that all stains will be placed in the basket at the breech end, hence the necessity for picking up and throwing out properly. After the fleece is skirted it should be rolled. Where the pressure of work is great a very slack method is often adopted, but to do it properly one-third of the side should be turned in the full length of the fleece, then the same side folded in again. This will expose the back wool in full length. Then turn in the one-third that is left at the other side of the fleece; and turn in the neck and roll from the breech. When rolled (Plate 28) the side and shoulder wool, which should be the best wool of the fleece, will be exposed, while the back wool will be in the centre.

Another method and one which I favour for treating the fleece where small flocks are shorn is to sort each class of pieces from the fleece before rolling; thus—first remove all stained wool, then skirt the fleece placing each class in separate baskets, making the classes according to skirtings as described later.

The fleece should then be placed on the classer's table, which should be sufficiently large to hold thirty to forty fleeces when they may be classed into as many classes

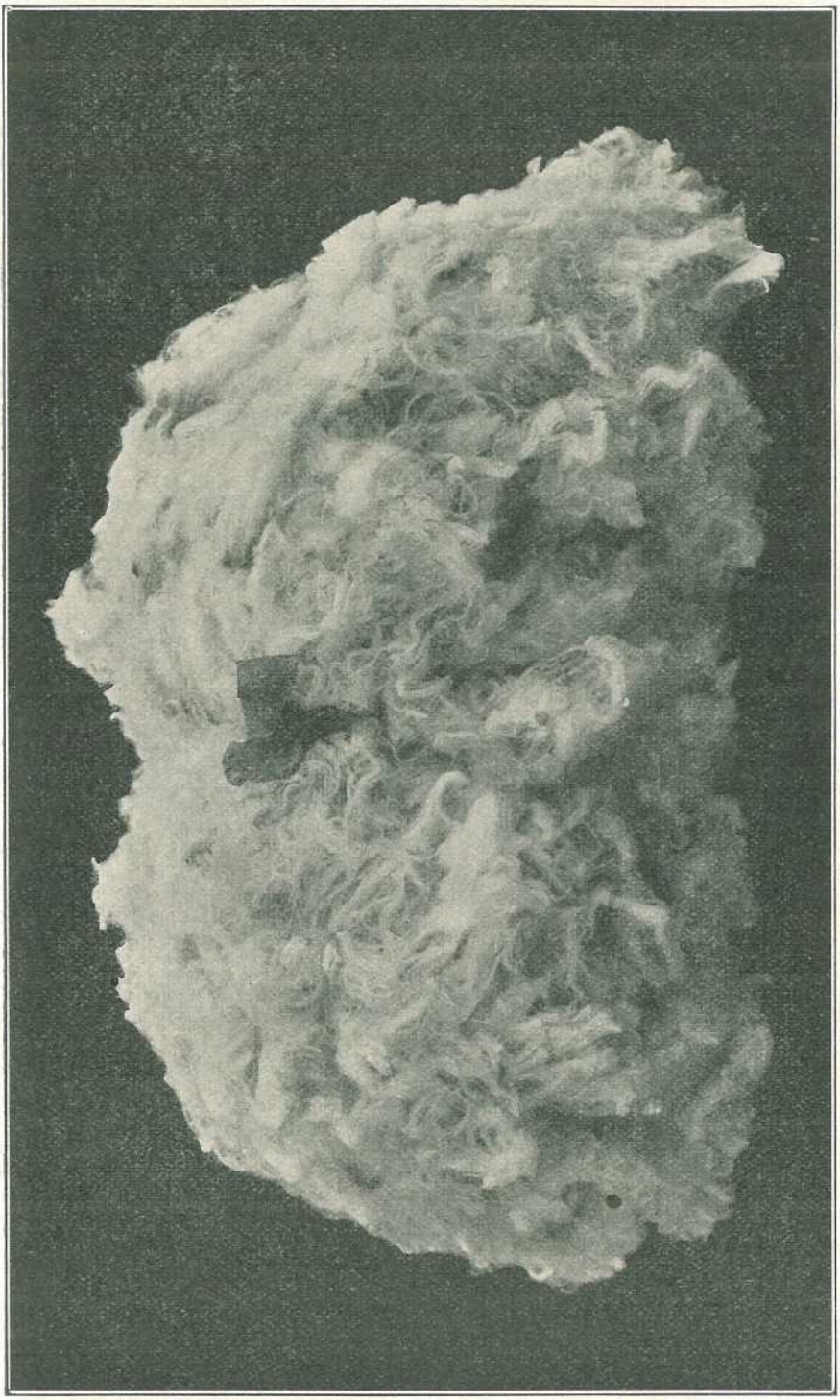


PLATE 28.—FLEECE SKIRTED AND ROLLED.

as decided by the classer, who should have a thorough knowledge of his work, the type of sheep and number in the flock, and the requirements of the trade.

When the baskets are full of skirtings they should be emptied on to the piece picker's table, which should be placed against some convenient wall. The contents of each basket should be kept separate, for it saves much time in sorting the pieces.

The Skirtings.

Skirtings should contain the following sorts:—Broken pieces, which will be the brightest, lightest, longest, and most free from vegetable fault, taking in most of the neck wool, if it does not contain too much moits or sticks. The size of the flock decides to a great extent the number of classes. First pieces, closely allied to brokens. If the quantity does not warrant making brokens they may come under this heading, when the sort will contain all the best and brightest from the skirtings. Second pieces should contain all the shorter and heavier conditioned after the first are taken out. Stained pieces should contain all heavy fatty ends and stained portions from the skirtings and bellies after all dags are removed.

Locks.

Locks are the bitty pieces, second cuts, and small portions that fall through between the laths of the wool tables. They should have foreign matter removed, also dags.

There is always a mixture of pieces, trimmings, locks, &c., on the shearing board, which should be kept swept up after the fleece is picked up. These sweepings should be run over the piece picker's tables where the breech ends are sorted. They will then work in with either pieces, stains, or locks.

Bellies.

The fatty ends and stained portions should be removed and the bellies packed separately. If in large lots, they should be classed into two sorts. In any case they should be trimmed up to free them from stains.

Classing the Fleece Wool.

The requirements of the trade must influence the decision of the classer in bulking his sorts. When classing the fleece wool, consideration must be given to the number of sheep to be shorn, and the number of sorts made accordingly in order to get the best results. A bulk line consists of five bales or over, which will be submitted to auction, where it is sold under the competition of all buyers. A long bulk line of wool from the one owner usually meets with a better demand than do short bulk lines of several owners of the same quality; still both are sold catalogued in bulk lines. It is, therefore, easy to realise the advantage of having long lines, but when it comes to star lots, that is four bales and under, the disadvantage of selling under those conditions is very marked, as the price is influenced first from being a short line, and second that there is not the same keen competition from the different buyers. For the classer to follow on fixed set lines is impossible when classing the fleece wool. Each class to be made should be of a given standard with the idea of getting it into a bulk line, and this standard once established should be maintained until the whole of the wool from the flock is allotted to the different classes.

As a sufficient quantity becomes available it should be pressed and its distinguishing class and number put on, and then passed on to the brander, who marks the bales with the owner's brand, the class of wool it contains, showing a distinguishing mark for breed and probably sex. Rams' wool, weaners and lambs should be kept separate and branded accordingly. Each bale should be numbered carefully and booked up according to specification to forward to the broker for entering up in his sale catalogue.

Three chief factors are taken into account by the buyers when coming to a conclusion on the value per lb. of greasy wool—namely, spinning qualities, length of fibre, and yield.

Terms Used in Classing.

When classing a clip of, say, 2,000 merino ewes, the following classes should be made from fleece wool:—

AAA.—This class should contain all long, bright, light-conditioned wool of good quality, sound enough to stand the strain of the combing machines. Any wool too bold and strong for this class of a 60s count should be placed in AAA combing.

AA.—Shorter than the foregoing. It can be more irregular in length, colour and quality, fair in yield.

A.—This class should contain all the heavy-conditioned low-yielding fleeces.

Any fleeces carrying too much condition or badly bred or matted should be broken up and put into the piece lines in order that they do not reduce the value of the good bulk lines of fleece wool. A properly prepared clip should carry even and regular lines throughout.

Classing Crossbred Wools.

Owing to the distinct variations in the crossbred wools it is necessary that each class be as even as possible in the spinning quality. The same consideraton regarding bulk lines must be given as when classing merino. The greater the number of sheep to be shorn the more thorough the classing should be.

AAA Crossbred.—All the fine crossbred wool sound, of good colour, and light condition, all wool 3 inches or over, should be embraced in this class, spinning counts 56s.

AA Crossbred.—The balance of the long wool of lower-spinning quality, sound, and of fair colour and yield, 48s to 54s spinning counts.

A Crossbred.—All fleeces too coarse for the foregoing classes.

Pieces Crossbred.—In sorting crossbred pieces, if they range from fine to coarse, it is best to make two lines, calling the fine line first piece crossbred and the coarse sort pieces crossbred. Bellies, stains, and locks are treated in the manner indicated for merinos.

Comeback Wool.

This is a valuable class and should be classed carefully, thus:—AAA should contain all the well grown light-conditioned fleeces of 58s-60s quality. AA Comeback should embrace the heavier-conditioned wool of fair length, and may be straighter and coarser. A Comeback.—Short, irregular coarse and heavy-conditioned comeback wool. Pieces Comeback.—These may vary to some extent and should be treated according to quality and length if the quantity is great enough, or they may be placed in either the merino or crossbred pieces according to their quality, in order to reduce the number of classes.

The Wool Room.

To keep the wool clean from the time it is shorn until baled up is a matter of great importance. From the shearing board to the wool press the floor should be kept clean. After each sheep is shorn the floor should be swept and no accumulation of dirt or dust allowed in any part of the wool room.

Classing Merino Lambs' Wool.

Each fleece of lambs' wool should be brought on to the table separately. The roller table should be covered with hessian, as the lambs' wool does not hold together and too much would fall through the screen. Each fleece is sorted and put direct into the basket according to class. The longest and brightest wool, if free from seed, should be placed in the top line and branded AA Lambs, and the shortest and heaviest-conditioned sort in the second line and branded A Lambs. All burry or seedy wool should be kept separate and branded Lambs.

The three chief points to be considered when sorting lambs' wool is length, quality, and condition.

Crossbred Lambs.

Much the same process is followed in sorting crossbred lambs, the number to be shorn to be the deciding factor.

Trade Definitions.

Combing.—Signifies that the wool is of sufficient length to be combed, and sound enough to withstand the tension of the combing machine (2 inches and over).

Tops.—After the wool goes through the combing machine and is freed of all weak and cross fibres it is delivered as top or sliver, when all fibres are lying parallel to each other.

Noil.—The weak and cross fibres combed out of the wool in the process of combing.

Clothing.—This term denotes that the wool is short, fine, and possessing good felting properties. It goes through the carding machine just the reverse of the combing process.

Quality in Wool.—This means a combination of fineness according to breed; it must be bright, soft, elastic, kind to the touch, sound and true.

Character.—This term means the general character of the wool of any breed; it is closely allied to quality. Character in merino wool indicates an even crimpy formation, bright white in colour, soft and true to the character of that breed. Character in Lincoln is based on its length of staple, and must be full, bold, massive, and the crimps of a wavy nature lustrous in colour.

Sound.—This term signifies that a staple of the fleece will stand sufficient tension to allow it to be combed without losing too much in noil. It is a very valuable and necessary quality in merino wool over 2 inches in length.

Strong.—This term should convey a different meaning to the term sound, as it means the actual diameter of the fibre and may not necessarily be sound.

Tender.—This term means that the staple will not stand the tension necessary in combing.

A Break.—This term means that the wool will break in a given place. Both above and below the break may be quite sound.

Staple.—This term means a combination of fibres formed into a natural body during growth and bound together by binders. It is by these staples the wool is tested and classed for soundness.

Crimp.—This is the name given to the wave in the fibre. The wave proper is found in long coarse wools, such as in the Lincoln and Leicester, while the merino shows a distinct crimp. The greater the number of crimps per inch the finer the wool as a general rule.

Serrations.—These are the notched edges on the fibre, and are invisible to the naked eye. The finer the wool, the greater the number of serrations per inch. It is the great number of serrations in a fine merino wool that makes it so valuable for felting purposes.

Condition.—This is a term used when describing wool as to quantity of yolk—i.e., light or heavy condition, good or bad condition.

Yolk.—This is a greasy substance secreted by the skin. Its function is to lubricate the fibres and prevent them from felting as well as preserving the wool against severe climatic conditions. It is one of the chief characteristics of wool, and varies greatly according to the breed of sheep.

Yield.—The percentage of clean dry wool after yolk and all foreign matter has been removed by scouring. Yield is a very important factor in determining the value of greasy wool. To determine the yield, multiply the scoured weight by 100 and divide by the greasy weight. *Example.*—A parcel of greasy wool weighs 8,550 lb., when scoured it is reduced to 4,104 lb. Thus $\frac{4{,}104 \times 100}{8{,}550} = 48$. Yield of scoured product, 48 per cent. All greasy wools are bought on their yield of the clean scoured product. Yield as applied in this respect is illustrated thus. A line of wool is estimated to yield 48 per cent., the clean value of which is 42d. per lb. Thus the greasy cost will be $\frac{48 \text{ per cent.} \times 42\text{d.}}{100} = 20.16\text{d. per lb.}$

Bale.—A bale of greasy wool should weigh 200 lb. gross.

Butt.—A bale below the standard weight.

Badge.—An irregularly-shaped pack not in shipping order.

Draft.—One pound of wool in every cwt. must be allowed by the seller to the buyer.

Tare.—The weight of the pack or container deducted from the gross weight.

Carbonising.—A seedy class of wool which must go through the process of carbonising to get it free.

Wool Classing.—This means the grading of whole fleeces into different classes, each class or grade to be as near as possible in length, soundness, colour, condition, and quality.

Wool Sorting.—This means the dividing of the fleeces into as many grades as it contains. No fleece is left whole, but is separated according to length, soundness, and spinning quality. Portions of the different fleeces are put together and called matchings.

Count.—This is a necessary term used by the manufacturer of worsteds to indicate the number of hanks of 560 yards that is spun from 1 lb. of combed top.

Spinning Quality.—This means the actual length of yarn that can be spun from 1 lb. of combed top. Five hundred and sixty yards of spun yarn makes one hank, one hank equals one count; thus, a wool of 60s counts × 560 yards equals 33,600 yards of spun yarn.

[TO BE CONTINUED.]

REPORTED PARALYSIS IN SHEEP.

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

DISTRICT Stock Inspector Tannock, of Charleville, recently reported to this office a state of "paralysis" in sheep and suggested that a sheepman from this office and a botanist investigate on the spot. As a consequence, acting under instruction, I, accompanied by Mr. Francis (Botanist) left Brisbane on Friday, 1st April, for Charleville.

Complete arrangements had been made by Mr. Tannock, and an itinerary prepared which enabled us to see most of the stock affected and the properties on which same had grazed when in that state.

A first visit was made to a property 70 miles north of Charleville. Here the external symptoms were as follows:—A disinclination to travel, and if forced, inability to rise. After a considerable period, a sheep can get up, but will again go down if forced, a very pronounced hump in the back and a general lack of muscular cohesion. Deaths may occur in the paddock to some slight extent, but, generally speaking, it is the forcing of a flock which leads to mortality. It is quite possible that the trouble would not be noticed in some cases unless the sheep were disturbed.

In the case of wethers a urine scald is noticeable and there appears a difficulty in urination.

Post-mortems were carried out and the internal symptoms were as follows:—The bladder is not normal, but conditions differ somewhat. In some cases the bladder is over full and distended and the urine is practically colourless. In other cases the bladder contains very little urine. When this occurs the liquid is very cloudy and thick and slight blood stains are noticeable. In both cases there is evidence of a derangement of the urinary system. The kidneys, or rather one kidney, has in some cases been found affected with a dark patch. In no cases have both kidneys been affected. The heart is normal.

In the case of every sheep killed, the lungs are more or less congested. I do not attribute the disease to this symptom, but am under the impression the congestion is caused by straining and struggling after the malady has made its appearance. This would appear to be borne out by observation of the sheep which have been affected and have then recovered.

As in former cases met with (see previous reports Maranoa district), and examination of the stomachs reveal the following:—The first stomach was normal and full, likewise the second stomach, the bible or third stomach appears to have functioned properly. In one case only was there any suggestion of dryness. The fourth stomach, in every case examined, instead of containing a green fluid, is inclined to be dry and empty. This stomach is not functioning as it should. Inflammation commences in the entrails immediately joining the fourth stomach, and in some cases extends several feet along the gut. Occasionally there are blood stains to a greater or lesser extent. No worms of any description were found in the sheep on this property. Oestrus ovis (nasal fly) was also absent in the sheep killed.

District Stock Inspector Tannock agrees with me that the trouble is dietetic.

The assistance of Mr. Francis (Botanist) was therefore sought in the search for a weed or plant likely to have the effect described.

Three plants in all came under suspicion—viz., one species of Sida corrugata, Malvastrum specimen, and Solanum. (For full botanical report see separate report by Mr. Francis.)

On every property visited where there were affected sheep, one or all of these plants were encountered, and it was noticeable the extent to which they had been eaten, even in preference to good grasses. All three plants are regarded by Mr. Francis with suspicion, and I am of the opinion that, taken in quantity and under certain seasonal conditions, one or all of the suspected plants may have been the cause of the gastro-enteritis found.

This theory would appear to have support from the fact that on one property at least the owner definitely stated, when shown the suspected specimens, that in two paddocks on the run where there had been no trouble, the plants complained of did not exist.

Wagstaff's non-poisonous drench has been found effective, and pending further research by officers of this Department, I advise its use. Two fluid oz. per day whilst down.

In further support of the gastro-enteritis diagnosis I mention the fact that the ailment is always at its worst during extremely hot weather, provided good rains have preceded the heat. Although only reported to the Department this year, the sickness has been known in the Charleville and Cunnamulla districts for a number of years. In the past no great losses have occurred. I have formed the impression that the malady is likely to be purely seasonal. Extremely hot weather following heavy rains seems to be the condition under which the sickness is at its worst. The eradication of the suspected plants is impossible.

In all eight properties were visited covering an area of country situated from 70 miles north of Charleville to a considerable distance west and east of Cunnamulla and embracing also the Wyandra district. Symptoms and pastures (as far as the suspected plants are concerned) were sufficiently alike to pronounce the sickness identical on all properties visited.

Report by W. D. FRANCIS, Assistant Government Botanist.

From the 4th to the 10th April I accompanied Mr. Tannock, Inspector of Stock, and Mr. Hodge, Instructor in Sheep and Wool, on an inspection of some of the country in which the sickness in sheep occurred.

Messrs. Tannock and Hodge, as a result of their inquiries, formed the opinion that the sickness was due to something that the sheep had eaten. It was my duty to examine the country in an endeavour to locate any plants which could be connected with the symptoms shown by the sick sheep.

It was learned from stockowners and stockmen that the sickness generally manifested itself when the sheep were driven, and that it was rarely seen in animals which were not moved about.

When they become affected the sheep arch their backs and move with a peculiar gait. In later stages of the complaint they are unable to move and appear to be paralysed in the limbs. Most stockowners were of the opinion that fat sheep were more prone to be affected than others. In one instance a stockowner stated that young lambs contracted the sickness on his property.

The behaviour of the sick sheep as outlined is similar in several respects to the symptoms described by Dodd and Henry in the disease shown as "staggers" or "shivers" (Science Bulletin 23, Dept. Agriculture, N.S.W.). It is especially to be noted that the symptoms rarely appear until the sheep are driven. This characteristic is a feature of "staggers" or "shivers," and was emphasised by the stockowners at Charleville and Cunnamulla in describing the present malady in their districts. A Malvaceous plant (*Malva parviflora*) was found by experiments to produce the symptoms of "staggers" or "shivers" in sheep in New South Wales. It is somewhat significant that two Malvaceous plants (*Sida corrugata* and *Malvastrum spicatum*) are very common and abundant constituents of the herbage in the areas where the sheep were affected in the Charleville and Cunnamulla districts. These two plants were also very extensively eaten in those areas. There is, therefore, reason to suspect that these plants may be the cause of the sickness of the sheep.

although proof of this suggestion is lacking. The suggestion is based upon the similarity of the symptoms in the experimentally produced cases in New South Wales and those shown by the sick sheep near Charleville and Cunnamulla, and upon the botanical relationship of the plant responsible in New South Wales to the two species so common in the Charleville and Cunnamulla areas.

As the literature on the subject is not often available in country districts, the following extracts have been made from Dodd and Henry's Bulletin which is quoted above and which deals with "staggers" or "shivers" in sheep in New South Wales:—

> "Neither sex, age, nor condition appear to have any influence on its occurrence, but young animals are said to suffer most severely, even suckling lambs and foals being affected. Experimentally, it will be seen that in suckling lambs the disease made its appearance much quicker than in adults. Fat animals appear to suffer most as concerns adults, but this is probably because they are heavy feeders and have most weight to carry. . . . The occurrence of the disease in very young lambs from a few days old suggests that the causal agent may be transmitted in the mother's milk.
>
> "The disease is much more prevalent in some years than in others, being influenced by the character of the season. As a rule, it is more evident during or following a good rainfall, when there is a luxuriant growth of herbage in spring, following a mild winter. It has, however, been seen in a dry season when only dried herbage was available as fodder.
>
> . . . . . .
>
> "As a rule, no symptoms are seen so long as the animals are grazing quietly in their paddocks, but, in the case of sheep, if an affected mob is started on the road, they may travel a few hundred yards, or a few miles (according to the severity of the case), and then affected animals will begin to lag behind. These move with a rather stiff action of the hind legs, an arched back, and a stretched out head. They travel thus for a little distance, rapidly becoming worse and then stop. Respiration is rapid but shallow, and pulse quick. If urged, the affected animals will travel a few yards and again stop. Sooner or later a quivering or trembling of the muscles of the various parts, most commonly of the shoulders and hindquarters, but at times extending over the whole body, ears, and legs, will become apparent. At last the animals drop with head and legs stretched out, or with the body resting on the sternum with the forelegs doubled under. Many animals whilst down can be approached and handled without their making any effort to escape. If allowed to rest, these sheep will, after a time get up, and wander away of their own free will. If harassed by being compelled to walk, they will die. . . . Temperatures noted have varied from 104 deg. to 106 deg. Fahr. The sensory reflexes are weak and absent.
>
> . . . . . .
>
> "No pronounced lesions have been observed anywhere."

QUEENSLAND SHOW DATES, 1932.

Kilcoy: 30th June and 1st July.
Home Hill: 1st and 2nd July.
Townsville: 5th to 7th July.
Gatton: 6th and 7th July.
Woodford: 7th and 8th July.
Cleveland: 8th and 9th July.
Charters Towers: 13th and 14th July.
Caboolture: 14th and 15th July.
Rosewood: 15th and 16th July.
Ingham: 15th and 16th July.
Laidley: 20th and 21st July.
Nambour: 20th and 21st July.
Cairns: 19th to 21st July.
Esk: 22nd and 23rd July.
Ayr: 22nd and 23rd July.
Mount Gravatt: 23rd July.
Bowen: 27th and 28th July.
Maleny: 27th and 28th July.
Atherton: 28th to 29th July.
Pine Rivers: 30th July.
Royal National: 8th to 13th August.
Crow's Nest: 24th and 25th August.
Wynnum: 26th and 27th August.
Mary Valley, Imbil: 2nd and 3rd September.
Enoggera: 3rd September.
Pomona: 14th and 15th September.
Malanda: 14th and 15th September.
Beenleigh: 16th and 17th September.
Rocklea: 24th September.
Southport: 7th and 8th October.
Nerang: 14th October.

COTTON GROWING.

PREPARATION OF LAND.

R. W. PETERS, Cotton Experimentalist.*

THIS is the first of a new series of lecturettes on cotton growing which will be given during the 1932-33 season. It should be understood, however, that the suggestions which will be made during these lecturettes are put forth only as ideas, which each grower should test out on his own soils to see how applicable they are to his conditions. The different types of soils and the variation in climatic conditions between seasons and districts, makes it extremely unlikely that any hard and fast rules can be laid down for all growers.

It is pointed out that these variations in seasonal conditions make it most difficult to obtain each season the maximum yield that a soil can produce. Row and plant spacings, or soils which may give the best results in a wet season, may be entirely unsuitable for a dry one. It is stressed that each grower study cotton-growing on his own farm, and endeavour to ascertain which soil or soils and what methods will give suitably profitable returns over a long series of crops, rather than try each season to obtain the best yield that the soil is capable of producing. It is the variation in crop yields which has contributed largely to the unrest and distress connected with agriculture throughout the world. When this is more widely appreciated, it is believed that greater attention will be paid to eliminating the poor yields rather than trying always to obtain the highest possible yield, for the latter happy condition is never accomplished.

In a country like Queensland, where such wide variations in climatic conditions occur, not only between seasons but in the one season, it is especially necessary that every possible precaution should be taken to eliminate the poor returns. One failure may offset the gains obtained over two or three seasons, and it is better to prevent this if possible rather than depend on an extra good crop making up the loss. It is advisable, therefore, that each cotton-grower study carefully his own conditions and test out the methods used by his most successful immediate neighbours, and any suggestions made by this Department. In this connection, methods found suitable for growing cotton in other countries should be carefully experimented with on only a small scale rather than on the whole of one's crop, for it is seldom that conditions are alike in two countries. A method suitable for cotton-growing in the United States might be exactly the opposite required here, for the climatic conditions are mostly entirely different.

Select Suitable Soils.

It is strongly suggested, therefore, that before preparing land for cotton-growing, it should be ascertained what type of soil is most likely to produce good yields of sound cotton under a wide range of conditions. Generally speaking, the clay loams overlying a clay subsoil, at a depth of 18 to 24 inches, appear to offer the best possibilities in this respect. The explanation is not entirely clear, but it has been noticed over a long series of seasons of varying nature and in different districts that these types of soils apparently can be relied upon to produce profitable crops of cotton, provided good cultural methods aiming at conserving moisture are practised.

Most Suitable Soils.

The following soils may be grouped under the heading of suitable clay loams:—Forest soils, consisting of heavy clay alluvial flats of the type usually associated with a mixture of blue gum, ironbark, and bloodwood trees; heavy clay loam alluvial flats originally carrying large box trees with a scattering of blue gums; the better classes of the grey or greyish brown clay loams of the lower slopes associated with box and ironbark trees; the brown clay loams of the slopes originally carrying a good class of narrow-leaf ironbark and in some districts silver-leaf ironbark; and in scrub soils—the heavy brigalow scrub soils or the brown clay loams of the mixed softvine and brigalow scrubs. All of these soils are generally capable of producing profitable yields of cotton of good quality, provided a variety of cotton suitable for the district is grown on them.

Limitations of Other Soil Types.

There are other classes of soils which may produce excellent yields of cotton under favourable conditions, such as the deep loams and sandy loams adjacent to the creeks in most of the cotton-growing areas; the softvine scrub sandy soils of a

* In a radio talk from 4QG.

red or in some districts grey colour; the sandy loams overlying clay on the alluvial flats which are often associated with small box trees with an admixture of ironbark; and the heavy black waxy clays of the alluvial flats, or in the "plains" country. All of these types, with the exception of the heavy black waxy clays are not very drought resistant, and require rain fairly frequently in order to prevent shedding of squares and young bolls, or damage to the fibre of unopened bolls during any periods of high temperatures or heat waves. The heavy black waxy soils may give excellent yields in seasons of moderate rainfall, but owing to their requiring several days of drying weather before cultivating operations can be performed, excessive weed growth frequently adds considerable expense to the cost of production during a wet season.

Plough Before Winter Rains.

The most suitable soil for cotton-growing having been decided upon, it is suggested that the first ploughing be done in time to obtain the full benefit of any winter rains that may occur. The experiences of growers located in most of the cotton-growing districts, and experiments on the Cotton Research Station in the

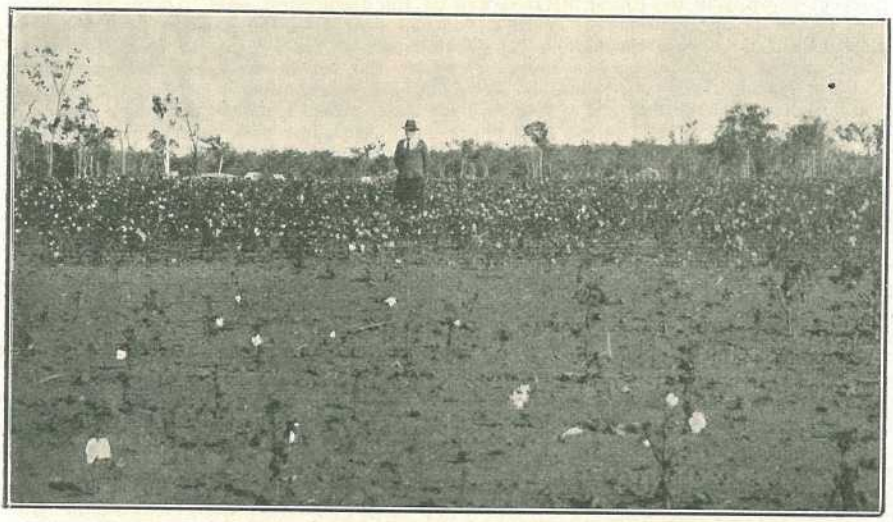


PLATE 29.—FALLOWING EXPERIMENT, COTTON RESEARCH STATION.

Illustrating benefit obtained under droughty conditions of plant cotton on a long-fallowed seed bed. Plants in foreground in cotton-following-cotton plot; plants around figure in background in cotton-following-long-fallow plot. Season 1931-32.

Callide Valley, all indicate that early planting on early and well prepared seed-beds greatly increase the chances of obtaining profitable yields. In experiments at the Cotton Research Station, carried out over several seasons, gains of at least 4 per cent. more moisture in the layer of soil from 4 to 6 inches below the surface have been obtained in the early ploughed plots following some summer crop, as compared to where cotton has followed cotton. The same or even greater differences in amounts of moisture have existed in the 10 to 12 and 16 to 18-inch levels. As these differences represented an improvement of around 15 to 25 per cent. in the moisture content of the soils, the value of such practices can be appreciated.

Three factors may have contributed to these gains:—(1) the early ploughed land allowed of better penetration of any winter rainfall; (2) ploughing after the cotton crop usually could not be done until in July after most of the winter rains had occurred; and (3) where cotton followed shallow rooted crops like Giant panicum or maize, less subsoil moisture had been taken by such crops than was the case where cotton plants with their deep rooting system had been grown. In this present season on the Research Station the cotton crops on land where maize was grown last season, have come through the extreme drought better than where cotton has followed cotton of last year.

Fallowing.

It is pointed out, however, that a gain of yield is not always obtained by planting on fallowed seed-beds, especially on rich alluvial soils. The wetter the period after planting the less likely there will be any advantage, and in springs when heavy rainfall is experienced before December it is possible that excess growth may occur on long fallowed rich alluvial flats. In dry springs the advantages are clearly indicated, however, for not only are better strikes maintained, but better development of the plant occurs during the dry periods, especially if the crop has been planted early. Likewise, during dry periods and heat waves in January and February, cotton on fallowed land is less likely to shed than where cotton is following cotton on late prepared seed-beds, especially if the rainfall has been light in the spring.

Long Fallowing.

It has been suggested at different times that growing cotton on land which has been fallowed all of the previous season would increase the possibilities of obtaining good yields. It is questionable, however, if this is necessary or of economic advantage, except possibly in the driest districts and on the droughtiest soils. In the first place no return is obtained from the land for one year, and the expense of the maintenance of the fallow throughout the previous season, as well as the cost of cultivation of the cotton crop, has to be borne by the return from one season. Also, in wet seasons fallowing would be decidedly expensive, thus increasing the cost of production. Furthermore, if spring rainfall is experienced, more than ample moisture is available where the land has been ploughed in April in a season of normal rainfall, and the seed-bed made after the first rains occurring in June. There may also be danger, particularly on rich alluvial soils, of excessively increasing the nitrogen content of the surface soils by fallowing all through the previous season. This is to be avoided, for most of the alluvial soils in the main cotton-growing areas have more than ample supplies of nitrogen now, and any increase will tend to cause rank growth of plant.

Rotate the Cotton Crop.

It is suggested, therefore, that cotton-growing be combined in a crop rotation in such a way that with small acreages, cotton will be grown only on land which has grown a summer crop, and the seed-bed prepared in time to obtain the full benefit of any winter rains. Where a large acreage of cotton is to be grown it is advisable that only as much of the old cotton land be planted to cotton in the next season, as can be cleared and put into shape in time to conserve any winter rainfall. The rest of the acreage for the new crop should have been in some summer crop which matured in time to allow of ploughing before the surface moisture from the late summer rains had been lost. This not only avoids the rush of getting the whole seed-bed prepared in a short time, often when it is too dry to work up efficiently, but also allows the new crop to be sown as soon as the first planting rains occur, and on a well-prepared seed-bed containing ample moisture.

Ploughing.

The most suitable depth and the proper number of ploughings depend considerably on the soils and the crops grown previous to preparing the land for cotton. Generally speaking, one good ploughing to a depth of 6 inches followed by harrowings at appropriate times should make a suitable seed-bed for growing cotton on most soils. New grass country, old trashy crop land, and very heavy clay soils may require different treatment. Local experience will prove the best guide in this respect. It is pointed out, however, that each season considerable acreages of cotton are lost on land that has been cross-ploughed so late that a firm compact seed-bed could not be obtained with only light planting rains. Good strikes were obtained, but the tap roots of the young seedlings soon reached dry soil overlying the subsoil and died during stress periods in November.

The following practice has been found at the Research Station to give good results where cotton is to follow cotton. Cut off and burn the old bushes as early as possible, sacrificing some of the late top crop if necessary in order to plough during early July, and thus obtain some benefit of the usual June rains. Plough 5 to 6 inches deep, and within a fortnight cross disc with a disc harrow to break down and firm the seed-bed. Harrow with spike-tooth harrow if good August rains occur, otherwise wait until the planting rains, when a good cross harrowing is given

prior to planting. This method may not suit very heavy clay loams, but it is strongly suggested that wherever suitable the soils below the surface be compacted after the first ploughing rather than loosened up by further ploughings. Conservation of seed-bed and subsoil moisture is the most acute problem connected with cotton-growing in most of Queensland, and when more attention is paid to this factor undoubtedly much better strikes will be obtained and stands maintained under adverse conditions.

SUMMARY.

Summarising the points which have just been made, it is believed that cotton can be grown profitably over a wide range of districts and climatic conditions in this State. Particular attention should be paid to selecting the most suitable soils for each range of conditions and variety of cotton. Plant only on well-prepared seed-beds either wholly in rotation with summer crops in the case of small acreages, or partly so with growers planting large areas. Endeavour to obtain firm compact seed-beds as early as possible, for the general experience has been that cotton seedlings stand up to stress conditions on these better than on late prepared, open, loose ones. Plant as much cotton as can be taken care of properly. Greater yields will be obtained with a lessened cost of production. Grow cotton, for the Australian demand is increasing yearly.

AUSTRALIAN BIRDS—IMPORTANCE TO AGRICULTURE.

In an illustrated lecture on Australian Bird Life given recently by Mr. T. W. Hamilton, secretary of the Gould League of Bird-lovers, to members of the Sydney University Agricultural Society, the necessity for appraising the economic value of the various species of birds was strongly emphasised. The lecturer, in stressing the interest taken by farmers and their families in bird life, referred to numerous sanctuaries established by them in the protective confines of their homesteads simply by providing a source of water for the bird visitors.

The adaptation of birds to different environments had resulted in a great diversity of birds, said Mr. Hamilton. They might, however, be classified into three great groups—water birds, birds of the air, and land birds. The water birds, characterised by boat-shaped bodies, greasy feathers, and webbed feet, and embracing swimmers, waders, and divers, included many valuable economic species. Thus the huge deposits of phosphate rock on Ocean and Nauru Islands, so important as a source of material for the manufacture of superphosphate were formed from the guano deposits laid down by birds in this group. Huge flocks of gannets on Cat Island, in the Bass Strait, and penguins on the Five Islands, of Wollongong, were responsible for similar phosphatic debris, which might ultimately be of economic importance. Other important members of this group were the ducks, destroying quantities of rice on the irrigation area, and the ibis, which consumed large numbers of grasshoppers.

The second group, the birds of the air, which had long wings and streamlined bodies, included such insectivorous birds as the swift and swallow, whose work in battalions probably had a cumulative effect in keeping down such insect pests as the fly and mosquito. Hawks also belonged here, and, although they were reputed to worry the flocks, helped to keep rabbits and rodents in check.

The land birds, which formed the third group, included runners—birds with long legs and necks—and flying and perching birds having well-developed wings and legs. Amongst the runners, the emu, always a picturesque Australian feature, received variable treatment from squatters. Thus, whilst many protected them, others, because they were supposed to spread the prickly-pear, foul pastures, destroy fences, and to frighten ewes at lambing time, broke their eggs and did all they could to harry them.

The flying and perching birds, including such important representatives as the magpie, peewee, wagtail, and wren, were perhaps our most important insectivorous friends, the lecturer added. In addition, the peewee, by devouring snails in swamp areas, helped to keep down the fluke trouble, and the honeyeaters, by carrying pollen on their beaks, helped in the fertilization of flowers—the waratah, for example. Parrots, however, were a mixed blessing, for, in spite of their value in destroying weed seeds, the rosella often did much damage in the orchard, and the white cockatoo at times made inroads into maize and wheat crops.

THE CULTIVATION OF GRASSES.

CAREFUL SELECTION OF SEED.

By F. F. COLEMAN, Officer in Charge of Seeds, Fertilizers, and Stock Foods Investigation Branch.

A VERY interesting address on the cultivation of highly nutritive grasses and the careful selection of grass seed was delivered by Mr. F. F. Coleman, Secretary of the Pasture Improvement Committee, and an officer of the Department of Agriculture in the Widgee Shire Hall on 24th May, under the auspices of the Gympie Ward of the Queensland Local Producers' Association.

Mr. Coleman said that there was no need for a Queensland farmer to buy foreign grown seed, as most of his requirements could be supplied from seed grown in Queensland or the Southern States, or obtained from New Zealand, England, and Canada. It was frequently overlooked that even such seeds as mangel, swede, and turnips were grown extensively in England where seed-growing was an important industry, occupying many thousands of acres and employing a large amount of skilled agricultural labour, the actual seed grower or farmer having a specialised knowledge of the straggling or rogueing of crops.

Queensland Grown Seed.

Leaving out the cereals, the principal seeds grown in Queensland were Sorghums, *Sorghum sudanense* (Sudan grass), *Setaria italica* (Foxtail millet), Japanese millet, white panicum, and sometimes a small acreage of the so-called white French millet (*Panicum miliaceum*). The Foxtail millets include all forms of Setaria, in Queensland miscalled panicum, and many farmers complained every year that the crops did not turn up to their expectations. In this particular direction, a start could at once be made with the growing of certified seed. It was impossible to distinguish the seed of the dwarf growing variety from the tall grower, and it would not be advisable to attempt a field selection of any of the strains at present on the market. A small quantity of seed had, however, been saved from plants that might well be described as light in colour, tall in growth, and late seeders, the varieties that lead to disappointment were usually a bit darker in the leaf, formed their seedheads very early, and under dry conditions rushed into seed when they were about a foot high. Assuming farmers were honest with themselves, it was obvious that no one would attempt the growing of the dwarf early.

The Merchant and Grower.

As far as the seed merchant was concerned, he was absolutely at the mercy of the seed grower, who might submit a wonderful sheaf of plants showing all the characteristics of the tall late, yet when the seed had been threshed, it would be found on careful examination that the resulting crop contained a large percentage of dwarf early. On careful examination under a good lens, it was possible to tell in the early stages of growth as to which category the plant belongs. Assuming a man had 10 acres of this crop, it was obvious that the millions of plants could not be examined individually. The position was, therefore, that given a small quantity of seed saved from isolated plants, and thoroughly examined by a competent officer of the Department of Agriculture, it would, if the idea takes on, be possible to sow a small area with such stock seed and produce seed in commercial quantities. During growth the area would have to be carefully examined to ascertain if by any chance it contained any undesirable characteristics. Assuming such seed was threshed at a place free from all impurities and other strains of millet, it should be possible to put the resulting crop up into bags, sealing them with an appropriate mark, and forward the resulting crop to a seed merchant equipped with efficient seed cleaning machinery, which was necessary to take out the weed seeds that are more or less present in all crops. The seed merchant would then be in a position to offer for sale certified tall late Setaria seed. A stumbling block was that farmers persisted in calling setaria, panicum, or giant panicum. Actually, giant panicum, if the words meant anything, indicated the material offered for sale consisted of seeds of Panicum maximum, which was Guinea grass.

Crops Suitable for Queensland Conditions.

A somewhat similar procedure was required for other plants. However, the fact must not be overlooked that the crops essentially suitable for present conditions of Queensland agriculture, would include *Setaria italica* (Foxtail millet), white panicum, Japanese millet, white French millet, Sudan grass, all varieties of saccharine sorghum, cowpeas, and last, but not least, lucerne. In the case of lucerne,

it must not be overlooked that many paddocks within our State were dodder infested, and also contained weeds that it is difficult to separate from the crop required. This, therefere, comes back again to better farming, and the sowing of assured strains on land that had been properly prepared, and was free from a profusion of weed seeds in the soil. Seed certification did not mean to rush about, looking at small paddocks of unknown parentage, but a careful examination of paddocks suitable for seed purposes on notification from the actual grower that it was his intention to save for seed a definite area. At present, many tons of lucerne seed were grown in the Southern States and sold to Queensland merchants. This might well be grown in our own State if more care were exercised in the field.

Queensland was a large producer of Rhodes grass seed. Unfortunately, many samples contained seeds of other varieties of Chloris, also the seeds of worthless plants. Greater care should, therefore, be adopted in the growing of Rhodes grass seed. Merchants to their cost, knew only too well the trouble that some of them had experienced in the purchase of small lots, every bag of which differed from the next, and on inquiry it had been sometimes found that the seed represented material collected from several farmers during a period of probably over one year, and represented seed produced on paddocks varying in character and weed growth.

There are several large Rhodes grass seed growers who usually find a ready market for their crop in the Southern States.

Paspalum dilatatum.

Unfortunately, there were several varieties of paspalum. Paspalum dilatatum was the one of the most importance for grazing purposes. Many samples of both Queensland and New South Wales Paspalum dilatatum seed represented crops harvested before they had fully ripened. To get seed—of high germination—it was essential that hand-shaken seed be the only seed collected. It was no infrequent occurrence for a merchant to submit a sample representing twenty bags of paspalum that he had purchased and find that the bulk did not come up to the grower's sample which had been hand-shaken and probably carefully selected, with the result that such small sample represented seed of high germination, while the bulk seed was of poor quality. Again, it was necessary for growers to exercise far greater care than had hitherto been the case. They should also remember that very large quantities of Paspalum dilatatum seed were produced in the Northern Rivers of New South Wales. Apart from the fact that every dairyman who grows paspalum seed was losing a tremendous weight of green feed that should have been grazed in the early stages of growth, it was questionable if many ever made a deliberate attempt to grow paspalum for seed purposes. In many instances, the seed lacked quality owing to the land's deficiency in phosphates. Although phosphates did not directly make grass grow, their absence was against the plant forming grain. The formation of fully-grown caryopses was the first essential for heavy seed of good growth, as it was quite possible to get a tremendous bulk, over 90 per cent. of which would be useless.

Requirements of Seed Production.

In seed growing, one had to look for places suitable for the plant's whole life-cycle. It therefore followed that Rhodes grass, which would put up with drier conditions than exist on the coastal belt, produceed good seed in the Gayndah and some other inland districts. Paspalum on the other hand, a grass that requires more moisture, did well within the coastal belt. Both of these were summer plants. When they came to other grasses, such as oats, which is a grass, it should always be kept in mind that winter-growing plants required cooler conditions to produce the best of the seed crop, therefore, oats for seed purposes, if grown in, say, the Yangan district, would have a quite different appearance than those grown further North. This again brought them to the fact that Prairie grass, a winter-growing plant, did well under the cooler conditions of the Darling Downs, and it should be quite possible to grow for seed purposes Australia's supply of Prairie grass on the Yangan-Killarney Line. Care, of course, would have to be taken to ensure a thorough preparation of the land, and the getting rid of all bad weeds, such as Hexham Scent (*Melilotus parviflora*), which it should be remembered, was a yellow flowered sweet clover. The white flowered sweet clover would have the same obnoxious characteristics if permitted to get into the wheat or other grain. Districts that were suitable for the growing of Prairie grass seed, and were capable of growing good heavy oats, would lend themselves to a start in the direction of producing true Perennial Rye grass, also Perennial Canary grass (*Phalaris tuberosa*).

There was, however, a catch in the growing of such crops. When the buyer was obsessed with the idea of price, he would in the end be taken down, as the ready

seeding forms of Rye grass are not perennial. It was possible by the aid of a quartz lamp to examine the germinating seeds of Rye grass, and find the absence or presence of fluorescence. This was again work for the specialist. With *Phalaris tuberosa*, it could not be too strongly stated that there existed a considerable quantity of Canary seed that probably would give better results during the first year, and then die out. It was obvious that the first essential for any grower who intended producing *Phalaris tuberosa* was to clean up the whole farm and get rid of all other forms of Phalaris. It would not be safe to grow *Phalaris tuberosa* on land that had carried the canary seed of commerce which means the one used as bird seed. A true strain of *Phalaris tuberosa* would probably not produce any seed during the first year. It therefore followed that anyone who attempted the growing of such plants would have to look forward to practically three years' work before he would have any returns for his outlay. During this period the paddock should be carefully inspected by a competent officer, and only saved for seed when the existing crop met with the officer's full approval. Care must always be exercised in the growing of new crops, as it would be possible for several large growers to produce a quantity of seed and flood the market, the demand being at present small, the price high, and practically no demand outside of Australia.

Those who were interested in the growing of such crops might well make a small attempt, but should never rush into seed growing unless they were fully aware of the care required, and the time that must elapse before they could turn their crop into money. Perennial plants, such as *Phalaris tuberosa* and true perennial rye grass, were crops that would stand grazing for many years. It therefore followed that until the pasture had been properly established, seed could not be produced in the easy manner that was possible with annual plants, such as prairie, oats, or millets.

Further Experiments Necessary.

Mr. Coleman went on to stress the necessity for further experimental work with many varieties of grasses. At present they could not go very far, and it was only through the backing of the farmers themselves that they could hope to obtain the facilities necessary to unearth the large amount of valuable information yet unknown with regard to grasses. It was the varying conditions in Queensland and their effect on grasses and seeds that required careful investigation; these conditions were vastly different to those in the Southern States. Long plodding work was necessary, and with the help of the farmer his Department would do its utmost to improve pastures throughout the State.

Use of Fertilizers.

Mr. Coleman referred at length to fertilizers, outlining the respective effects of nitrogen, superphosphate, potash, lime. Where land did not contain sufficient phosphates it usually lacked the conditions suitable for good root growth, and the use of superphosphate and sulphate of ammonia was necessary to remedy this defect, while the nitrogen contained in this fertilizer mixture gave a leafy growth which was so necessary for good feeding qualities. With superphosphate giving an improved root growth, and nitrogen improving the leaf, the combination of the two greatly enhanced the feeding qualities of grasses treated in this manner. Lime was described to him by an American as "making the soil friendly to the plant," and this truly was what it did. Potash was not always required, but its effect is linked up closely with nitrogenous fertilizers, which increase the size of the leaf; potash corrects the possible ill-effects of an excess of nitrogen, and is of particular value in lands that will not readily produce clovers or lucerne.

There was still much information to be obtained with regard to clover, remarked the speaker. Clover would not take root in hard soil. Renovation was necessary first. It was astounding the effect superphosphate had on some varieties of clover. Where the clover had already grown and died out, new growth could be established more easily than on new ground.

In answer to a question, Mr. Coleman stated that so far as the Gympie district was concerned, there was not as yet any definite information regarding the Montgomeryshire late-flowering red clover; it would be quite a year or more before it would be possible to form an opinion.

In the course of the following discussion, Mr. T. Steele outlined the experimental work which he was carrying out on his farm. He had four paddocks and was treating each of them with a different mixture of fertilizer. Good results had been obtained up to the time the caterpillars had ravaged the paddocks, but since the recent rains the growth was responding well, and given a good season some important results would be obtained.

THE NUT INDUSTRY IN QUEENSLAND.

ITS POSSIBILITIES.

By H. BARNES, Instructor in Fruit Culture.*

MANY people are just beginning to realise the possibility of deriving a reasonable return from nut growing. Up to the present, it might be said, the nut industry in Queensland is undeveloped; judging, however, from the many inquiries which are being made by prospective growers, it may not be long before nut growing has a definite place in our rural economy.

THE QUEENSLAND NUT.

The Queensland nut has been stated by experts in various parts of the world to be one of the finest nuts grown, and we are fortunate, in this respect, that it is indigenous to our coastal districts. This is its native home, and, of course, it naturally follows, that it will grow better, and produce bigger and finer crops here than in other countries to which attempts have been made to introduce it.

That the value of the nut is realised in foreign countries is evident from the number of requests which have been made for seed, and the demands for large quantities for commercial purposes, up to 10 tons, which have been made. At present the supply is not nearly sufficient to meet our own requirements, let alone supply those of other countries.

Where It Thrives Best.

Since it is indigenous to the coastal scrub lands the Queensland nut thrives best in conditions as closely approaching those of its natural habitat as possible. Banana plantations are usually planted on good scrub lands, and many of these would make excellent sites for the growing of nuts. The trees would not appreciably affect the growth of the bananas, and the farmer would have the advantage that, if the nuts were planted at the same time as the bananas, when the bananas were finished the nut trees would be coming into bearing, so that the ground would not lie idle. Banana plantations also are usually protected from heavy winds by sheltering woods, and this is of considerable importance to the nut trees. Wild nut trees seen growing in open country invariably carry a heavier crop on the sheltered side away from the prevailing winds than on the more exposed side, proving that the provision of shelter is advisable.

Planting Points.

When planting an orchard with Queensland nuts they should be set approximately 24 ft. apart, allowing plenty of room for expansion. This distance will allow of seventy-five trees being planted to the acre. The trees will commence to bear in five or six years and will gradually increase in production each year, attaining the maximum yield in twelve to fifteen years. Opinions vary amongst growers as to the yield that may be expected from trees in full bearing, but it appears that round about 80 lb. per tree per annum may be regarded as an average. Mr. H. J. Rumsey, of Dundas, New South Wales, who is the author of a book on nut growing, mentions an average return of 20 to 30 lb. per tree, or about 1 ton of nuts to the acre. He admits, however, that his figures are based on low returns from poor trees growing in a district with only a small rainfall, or, in other words, in an unsuitable district. He adds that, with watering, he would expect to at least double this yield. On Queensland scrub lands, however, where there is ample rainfall and more natural conditions for growth, there is no necessity for watering, and better returns than those expected by Mr. Rumsey may be looked for. The present market price for the nuts is 8d. to 1s. per lb., and the small quantities offering are eagerly sought after by merchants, confectioners, &c., who find many uses for them. Once the Queensland nut tree has become established it requires very little attention; on account of its hardiness it will stand up well under adverse conditions, and no disease so far has been known to attack it.

Improved Varieties.

There are several distinct varieties of the Queensland nut which vary in size and in the thickness of the shell. The actual value of the crop is gauged according to the proportion of the weight of the kernel to that of the shell. The Queensland

* In a Radio Address from 4QG.

nuts growing under natural conditions in our scrubs mostly possess comparatively hard, thick shells, requiring the exercise of considerable pressure to crack them. In recent years, however, attention has been directed towards the propagation of the better strains of which a limited number of bearing trees are located in the Southern districts and in New South Wales. They have not been classified into varieties but are sold under local names, such as "Thin Shell," "Everbearing," "Medium Shell," "Narrow Leaf," &c.

(CAUTION COUNSELLED.—In making a statement on the production of Queensland nuts recently, the Minister for Agriculture and Stock (Mr. Frank W. Bulcock) was speaking from personal experience, as he has made several experiments in growing the nuts at his farm near Cleveland. Mr. Bulcock said that prospective growers of Queensland nuts should go carefully into the matter before embarking on their production. It had been said that nut growers might secure extraordinarily high returns from an acre, but there was no data on hand to support that assertion, and it would be unwise of people to rush into their production in that hope. There was nothing to guide prospective growers on such important matters as fertilizers, while it had to be remembered that trees did not come into bearing for five years, and that only certain types of soil would produce Queensleand nuts. The Minister added that he intended to acquire a small area of land in Brisbane, and would detail an officer of his Department to make tests in order to see what there was in the industry under judicious management.—Ed.)

THE PECAN NUT.

Regarding the pecan nut, this is closely allied to the walnut; in fact, it belongs to the same natural family. It is indigenous to and grows wild in various parts of the United States and the Gulf of Mexico, but up to the present has not been cultivated to any extent as an ordinary orchard tree in Queensland; however, its possibilities are well worth considering. It is one of the most important nuts grown in America, and is excellent both in quality and in delicacy.

The few trees that are in this State are grown over a wide range of localities; some are growing in the North, some in the South, and some at Toowoomba. The tree is also grown in various parts of South Africa where it is looked upon as highly profitable. The propagation of the pecan nut from seed is not difficult, and further information on this aspect may be obtained from the Department of Agriculture. The trees thrive best in deep fertile loams and on river flats, but although it favours this type of country it has what may be termed an obliging nature and adapts itself to a fairly wide range of soils. Here again our banana farmers could quite profitably use their banana land. Although the tree is partial to fairly moist conditions the subsoil requires to be well drained, as the main roots have the reputation of seeking water at a great depth.

The planting of seedlings should be avoided as far as possible because, as is the case with most other trees, the product of seedlings is variable no matter how carefully they are selected; so the working over of proved varieites is resorted to. Some difficulty was at first experienced in obtaining good results with grafting, but this difficulty has now been practically overcome.

Pecan nut trees grow to an enormous size when planted under favourable conditions. Specimens in existence in America are 9 feet in diameter and up to 170 feet high. Although a few nuts are borne after four to five years, anything like a crop cannot be expected until the tree reaches an age of eight to twelve years when the yield may total 3 bushels of nuts, increasing as the tree gets older up to perhaps 20 bushels. The pecan tree is very long-lived, and in a good deep fertile soil will grow and bear for 100 years or more.

Food Value of Nuts.

Before concluding, I would like to mention a few facts regarding the value of the nut as an article of food. Many people, perhaps, do not fully realise just what a highly concentrated and valuable food the nut really is. Dr. Morris, an eminent authority on the value of nuts generally, is very emphatic on the subject of nuts as a standard food. He has written a book on the subject, and in one portion he states: "Nuts furnish proteins of such fine quality that they supply the elements necessary to render more complete the proteins of cereals and other vegetable foods." From these few words we deduce that nuts are not, as we may, perhaps, have been inclined to look upon them, a delicacy to be indulged in at Christmas time and on other festive occasions, but are really a necessary article of our daily food; so that, to the many slogans: "Use more wool" and "Eat more fruit," &c., we might very well and with advantage add another, "Eat more nuts."

CITRUS FERTILIZER TRIALS.

R. L. PREST, Instructor in Fruit Culture.

FOLLOWING is a report of recent fertilizer trials carried out by the Fruit Branch:—

No. 1 plot—Mapleton Farm College.

No. 2 plot—R. A. Ulcoq's Orchard, Gayndah.

No. 3 plot—V. G. Pack's Orchard, Montville.

Fertilizer.	Before Trials.		During Trials.		
	1927.	1928.	1929.	1930.	1931.
	Cases.	Cases.	Cases.	Cases.	Cases.
No. 1— Sulphate Ammonia .. 12 lb. Nauru Phosphates .. 14 lb. Sulphate Potash .. .. 4 lb.	1½	2	2	8	10
No. 1A— Sulphate Ammonia .. 15 lb.	1½	2	2	7	8
No. 2— Sulphate Ammonia .. 4 lb. Dried Blood .. .. 4 lb. Nauru Phosphates .. 8 lb. Sulphate Potash .. .. 3 lb.	1½	2	3	8	7
No. 2A— Dried Blood .. .. 16 lb.	1½	2	2½	6	5
No. 3— Sulphate Ammonia .. 6 lb. Nauru Phosphates .. 9 lb. Sulphate Potash .. .. 3 lb.	2	4	3	7	7

Plot.	Cost of Fertilizer, 1930-31.	Average Net Returns, 1931.
No. 1 ..	3s. 6d. per tree	5s. 0d. per case; 45s. 0d. per tree
No. 2 ..	3s. 0d. per tree	7s. 6d. per case; 45s. 0d. per tree
No. 3 ..	3s. 0d. per tree	5s. 6d. per case; 38s. 6d. per tree

Plot No. 1.—Mapleton Farm College: Variety, Valencia Lates.

The trees on this plot are in a healthy condition, foliage and fruiting-wood good. An excellent crop set, during the hot, dry period experienced in December-January. The fruit received a check, but filled out well on maturing. It was well distributed over the trees and of even size, good quality, and markedly free from disease. The fertilizer of section 2 of this plot has been altered to the complete mixture.

Plot No. 2.—R. A. Ulcoq's Orchard, Gayndah: Variety, Beauty of Glen Retreat

On this plot all trees with the exception of three are in a healthy condition, foliage and fruiting-wood good. Investigation disclosed that Armillaria mellea was the cause of the three trees sickening. They are making a satisfactory recovery after treatment. The crop set well, but was rather on the large size for the dry period during December-January, the irrigation plant at present installed being inadequate. Until this is remedied, care must be exercised in regulating the crop. The fruit was well distributed over the trees and of good size and qaulity. On section 2 the fertilizer was altered to the complete dressing.

Plot No. 3.—V. G. Pack's Orchard, Montville: Variety, Sabinas.

As in the case of the other plots, trees are in a healthy condition, foliage and fruiting-wood good. The crop set evenly, and proved to be of good size and free from disease. Here a section of eight Scarlet trees have been included for pruning and fertilizer observation.

Comments.

The practical management of the soil whereby profitable crops may be grown without materially reducing the fertility of the land rests on five fundamental principles, viz.:—(1) Drainage; (2) tillage; (3) organic matter; (4) lime; and (5) fertilizers. Obviously the removal of excess water depends on adequate drainage, while aeration and all the activities that attend it rests both on drainage and tillage. The upkeep of the soil organic matter by the use of farmyard manure, and by turning under green crops, has been emphasised in earlier notes as fundamental to continuous productivity. Finally, the judicious use of commercial fertilizers must receive careful attention.

The striking increase in yields for 1930-31 crops over the previous yields shows clearly that badly run-down orchards can be brought back to good bearing only after several years of good care. Nitrogen appears to be one of the most important elements required. Fertilizers containing nitrogen, phosphoric acid, and potash show very satisfactory results, and with slight variation to suit local conditions mixtures used will serve as a guide for fertilizing programmes.

POULTRY RAISING EXPERIMENTS.*

By P. RUMBALL, Poultry Expert.

The Honorary Poultry Advisory Committee, in deciding on a scheme of experiments to be carried out under its auspices, found it desirable to inquire into the methods at present adopted in feeding growing stock. A comparison of methods commonly employed in this State with those in operation and recommended elsewhere suggested that local farmers fed too little protein in the early stages of growth.

A feed test, begun on 2nd October, 1931, *and discontinued in March,* 1932, *fully confirmed these conjectures. In addition, valuable information was obtained relative to the cost of rearing of both cockerels and hens. Now that the rearing of cockerels for market, either local or overseas, is becoming of greater importance, and because of the increasing number of immature cockerels placed on the markets, the information given in this article should assist materially in deciding on the economics of cockerel rearing, and make for the rapid production of well-grown birds.*—ED.

STOCK USED.

IT was decided, in order to work with birds that had had no set back, to rear chickens from the time of leaving the incubator. Two hundred White Leghorns and 100 Australorps day-old chickens were secured. In the rearing of these birds a considerable quantity of data has been collected, which has a bearing not only upon the rearing of cockerels but also upon the more important (to the farmer) sex—pullets.

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SYSTEMS OF FEEDING.

The all-mash system of feeding was adopted as it was considered that this was the best method of controlling the kind and consumption of food of individual birds. Feeding was commenced thirty-six hours after hatching. The mash was placed in shallow trays about 1 inch in depth during the first few days. The trays were then increased to a depth of 2 inches, and later troughs about 4 inches wide were used. A piece of netting was placed on the top of the mash in the trough so that it would sink as consumption took place. This prevented the birds from scratching the mash out of the troughs.

During the first week, 8 feet of feeding space was allowed for every 100 chickens. This was later increased to 12 feet for every 100 birds. At the time when shallow trays were being used, the mash was not covered with netting, and, consequently only a little at frequent intervals could be added to the containers, which were never allowed to become empty.

RATIONS.

Before preparing the ration, information was gathered from individual producers on their method of feeding. In the majority of cases it was considered that insufficient protein was supplied. With the object of demonstrating the advisibility or otherwise of feeding an additonal amount of protein, two rations almost identical with respect to grain but containing different amounts of protein concentrates were fed. Liberal use was made of milk by-products for the first eight weeks. Later, protein of vegetable origin replaced the usually more expensive animal proteins. These rations will be referred to as a high protein ration and a low protein ration.

[RATIONS (Figures all in pounds).]

	8 Weeks.		8 Weeks—Maturity.	
	High Protein Ration.	Low Protein Ration.	High Protein Ration.	Low Protein Ration.
	Lb.	Lb.	Lb.	Lb.
Maize meal	40	49	56	60
Bran	20	20	10	12½
Pollard	20	20	10	15
Meat and bone meal	7½	3¾	5	3½
Dried buttermilk	10½	5¼	5	..
Salt	1	1	1	1
Codliver oil	1	1	1	1
Peanut meal	..	..	10	5
Bonemeal	..	..	2	2
Crude protein content	17·15	15·01	18·07	14·57
Cost per 100 lb.	8s. 3d.	7s. 3d.	8s. 11d.	8s.

NOTE.—In both cases it will be noticed that high protein rations are more costly than the low protein ration, and that the cost of the rations used from eight weeks to maturity was higher than during the earlier growing period. This is due to the increase in value of fodder during the latter period, and not to the nature of the ingredients used.

It was originally intended to reduce the amount of protein when the birds had reached the age of fourteen weeks. This, however, was not done as no previous record was available of a feeding test conducted under Queensland conditions.

REARING.

The cold brooder system was adopted. This was used in an iron shed 6 feet deep and 8 feet long. For protection against the south-easterly weather, half of the front was covered with corrugated iron. The cold brooder was set up on a wooden floor upon which a bag was spread. After the chickens were placed under this brooder the curtain was dropped and kept down for twenty-four hours. It was then permanently raised and the chickens allowed to wander in and out of the

brooder at will. Their range, however, was restricted by a circular barrier of 1-inch wire netting, which, for the first day, was touching the four corners of the brooder. The range was extended by lengthening the netting from day to day, until at the end of seven days they had the entire liberty of the house. On the eighth day they were given the liberty of a 23 feet by 8 feet netting run, and kept under these conditions until four weeks of age. The number of the chickens in each pen was then halved. This reduced the number in a shed to 50, and they were kept under these conditions for another four weeks. The birds were then classified as to sex, separated and submitted to various conditions.

WEIGHING OF BIRDS AND FEED.

The chickens used in each batch were weighed on being placed under the brooder, and at the end of each week the birds in every test were weighed collectively. The food consumed was weighed and recorded before being placed in the receptacle in each pen. At the end of each week the balance unconsumed was recorded.

SECTION 1.

WHITE LEGHORN CHICKENS.

The following table gives in ounces the average food consumed and weight of chickens at weekly intervals:—

TABLE 1.

Age.	High Protein.		Low Protein.	
	Weight of Chickens.	Food Consumed.	Weight of Chickens.	Food Consumed.
	Oz.	Oz.	Oz.	Oz.
Day old	1·3	..	1·32	..
1 week	1·97	1·64	1·87	1·36
2 weeks	3·31	3·36	2·81	2·95
3 weeks	5·31	4·80	4·07	3·61
4 weeks	7·61	6·46	5·72	4·68
5 weeks	9·94	7·58	7·58	5·70
6 weeks	12·92	8·96	9·83	7·32
7 weeks	16·65	8·65	12·21	9·43
8 weeks	20·41	13·29	15·56	11·34
Total food consumption	..	54·74	..	46·39
Total cost per chicken	..	3·4d.	..	2·5d.

Reared—		
Cockerels	47	44
Pullets	44	51

The foregoing table gives striking evidence of the desirability of increasing the protein content of the ration. It increases the cost of rearing each chicken, but at eight weeks chickens reared on the high protein ration were stronger, more vigorous, and in every way more desirable.

SECTION 2.

WHITE LEGHORN COCKERELS.

When the chickens had reached the age of eight weeks the cockerels were separated from the females and handled with the object of ascertaining whether the development that would take place at any period would justify their retention by producers.

Half of the cockerels reared under each ration were placed in pens and half in batteries. Each lot was collectively weighed and the advantage in weight in each case given to the battery-treated birds. However, owing to the use of unsuitable wire for the flooring of the battery, that part of the test had to be discontinued. These birds were reared up to the eighteenth week.

The following table gives the average weight in ounces of cockerels, and food consumption at fortnightly intervals. The weight of food consumed at eight weeks as shown in the table is the average for all chickens:—

TABLE 2.

Number of Birds.	High Protein Ration 23.		Low Protein Ration 22.	
Period.	Weight of Bird.	Weight of Food.	Weight of Bird.	Weight of Food.
When placed in pen—	Oz.	Oz.	Oz.	Oz.
8 weeks	21·4	54·74	16·3	46·39
10 weeks	28·8	29·80	20·9	24·60
12 weeks	34·7	32·38	27·2	29·13
14 weeks	42·3	31·83	32·9	30·47
16 weeks	47·8	31·27	37·4	29·60
18 weeks	51·1	35·84	43·6	37·48
Total cost of food consumed in pence		14·19	..	11·57
Total weight of food consumed in ounces		215·86	..	197·67

In this section of the experiment it will be noticed that up to ten weeks a greater development was obtained by the feeding of a high protein ration; that after ten weeks the rate of development is about the same as on the low protein ration. Further work is required to confirm this point.

DEVELOPMENT OF SEX.

The early detection of sex, made possibly by the pronounced comb development of birds fed upon the high protein ration, will assist farmers who at present, in no circumstances, will consider the raising of White Leghorn cockerels until they are in the best state to market. It would have been possible, with little or no margin of error, to cull out the cockerels before they were two weeks of age in these pens. This, however, was not possible with the chickens fed upon the low protein ration.

SECTION 3.

WHITE LEGHORN PULLETS.

The following table gives the average weight in ounces of pullets and the food consumption at fortnightly intervals. The weight of the bird shown at eight weeks is the average weight at that period, and that of the food, the average consumption for chickens for both sexes:—

TABLE 3.

Number of Birds.	High Protein Ration 44.		Low Protein Ration 51.	
Period.	Weight of Bird.	Weight of Food.	Weight of Bird.	Weight of Food.
	Oz.	Oz.	Oz.	Oz.
8 weeks	18·8	54·74	14·7	46·39
10 weeks	23·7	23·50	18·9	21·70
12 weeks	29·6	25·63	23·8	23·84
14 weeks	35·3	26·63	29·5	26·81
16 weeks	36·1	28·54	33·6	27·12
18 weeks	42·0	27·17	36·4	26·24
20 weeks	45·9	29·07	40·0	29·28
Total weight of food consumed in ounces		215·28	..	201·38
Total cost of food consumed in pence		14·15	..	11·8

It will be noted that in this test the pullets receiving the high protein ration continued to show an increased rate of development until the twelfth week, and that from then until the twentieth week the gain was 16.3 oz. on the high protein ration, and 16.2 oz. on the low protein ration. It appears, therefore, that little

advantage was gained by the feeding of a high protein ration after the age of twelve weeks (compare Section 2).

Practical farmers who visited the station were impressed with the development of the White Leghorn pullets reared upon the high protein ration. One farmer stated that while the low protein ration pullets compared favourably with October hatched chickens upon the commercial farms, the high protein ration chickens showed the stamina and development of August and September hatchings.

SECTION 4.

AUSTRALORP CHICKENS.

In this section the Australorps were reared to the age of eight weeks upon the high protein ration. The following table gives the average weekly weight in ounces of the chickens and the food consumption:—

TABLE 4.

Period.	Chick Weights.	Food Consumption.
	Oz.	Oz.
Day old	1·36	..
1 week	2·14	1·53
2 weeks	3·61	3·32
3 weeks	5·84	5·05
4 weeks	8·68	7·20
5 weeks	12·08	6·89
6 weeks	15·86	10·62
7 weeks	20·17	13·95
8 weeks	25·31	15·05
Total consumption of food in ounces	..	63·61
Total cost of food consumed in pence	..	3·94

Birds reared—

Cockerels	38
Pullets	55

The most outstanding feature was the satisfactory development made. The cockerels were then divided into two lots, one lot being placed in batteries and the other lot reared in pens. The battery test was abandoned (*see* Section 2).

SECTION 5.

AUSTRALORP COCKERELS.

The following table gives the weight in ounces of the Australorp cockerels, food consumption, and gain per fortnightly period. The food consumption shown at eight weeks is the average for both sexes:—

TABLE 5.

FEEDING—HIGH PROTEIN RATIONS.

Number of Birds, 19.

Period.	Weight of Bird.	Food Consumption.	Gain per Period.
	Oz.	Oz.	Oz.
8 weeks	27·5	63·61	..
10 weeks	38·5	35·90	11·0
12 weeks	49·1	40·88	10·6
14 weeks	60·3	40·22	11·2
16 weeks	72·4	45·88	12·1
18 weeks	85·0	51·39	12·6
20 weeks	93·7	55·75	18·7
22 weeks	103·5	50·41	9·8
24 weeks	108·2	47·16	4·7

From the figures above, a very uniform rate of development is indicated up to the eighteenth week. At that period the rate of development began to decrease rapidly. This was due to the fact that the birds were approaching maturity.

The feeding costs per bird from the tenth week until the eighteenth week varied from 2.4 pence to 3.4 pence per fortnightly period. Twelve ounces increase in body weight were produced for this cost. A similar expenditure on food for the later periods secured only four to nine ounces. From the point of view of costs, producers should consider the disposal of males of this variety at or about the age of eighteen weeks. From then onwards the birds commence to make rapid sexual development, and, consequently, do not materially increase in weight. Birds that are sexually mature do not command the same market value as those that are not. This still further emphasises the necessity of disposal before that stage is reached. The average weight at this period is in the vicinity of 5 lb. This is a handy sized bird to market and finds a ready demand.

SECTION 6.

AUSTRALORP PULLETS.

These pullets were reared to the age of eight weeks upon a high protein ration. They were then divided into two lots, one lot being placed upon the high protein ration, and the other upon the low protein ration, as indicated for birds reared from eight weeks to maturity. The following table gives the average weight in ounces of pullets and the fortnightly food consumption:—

TABLE 6.

Number of Birds.	High Protein Ration 23.		Low Protein Ration 22.	
Period.	Weight of Bird.	Weight of Food.	Weight of Bird.	Weight of Food.
	Oz.	Oz.	Oz.	Oz.
8 weeks	24·2	63·61	25·5	63·61
10 weeks	32·6	32 48	32 1	31·45
12 weeks	40·6	33·55	39·2	34·00
14 weeks	50·7	37·21	47·8	40·18
16 weeks	58·3	37·66	53·7	44·43
18 weeks	62·5	39·00	57·6	37·02
20 weeks	72·5	44·66	66·1	41·33
22 weeks	80·0	48·26	76·6	53·66
Total weight of food consumed in ounces ..		336·43	..	345·68
Total cost of food consumed in pence ..		22·21	..	20·86

From the foregoing figures it will be noted that in both cases there is a definite and continued rate of development up to the age of fourteen weeks; that the rate of development on the high protein ration is greater than upon the low protein ration; that from the fourteenth week there is a decline in the rate of development for a period, but from eighteen weeks onwards development takes place at a rate similar to that of the earlier period.

The figures taken as a whole suggest that increased protein is desirable with Australorps until the fourteenth week, and that from then the rate of body development is not sufficient to warrant the continuance of a high protein ration. (Compare Section 2.)

MORTALITY.

A most pleasing feature of the experiment was the relatively low mortality. The following table gives the death rate up to the eighth week:—

TABLE 7.

Period.	High Protein Ration.		Low Protein Ration.
	Australorps.	Leghorns.	Leghorns.
Number placed in brooder	100	100	101
1 week	6	5	5
2 weeks	1	1	..
3 weeks	..	..	..
4 weeks	..	..	..
5 and 6 weeks	..	2	..
7 and 8 weeks	..	..	1

OUTBREAK OF COCCIDIOSIS.

When the chickens were four weeks of age an outbreak of Coccidiosis occurred. Chickens in all pens were passing blood freely. Immediate treatment was resorted to and the losses due to this disease were reduced to three chickens. The treatment adopted was as follows:—A mixture of Iodine (resublimate), ¼ oz.; Potassium Iodide, ½ oz.; Water, 25 oz., was made. Three ounces of this solution was added to a quart of fresh skimmed milk and heated until it became white. This milk and iodine mixture was then added to 2 gallons of drinking water. Treatment was continued until the birds were seven weeks of age.

SUMMARY.

The test has demonstrated in no uncertain manner the following:—

(1) Feeding a ration, the protein content of which is relatively higher than that normally used during early life, assists in development and increases stamina. This is particularly valuable in the rearing of late hatched chickens.

(2) A high protein ration facilitates the separation of sexes in Leghorns—a feature of economic importance to those who do not raise cockerels for market.

(3) (*a*) The efficiency with which the Australorp cockerel converts food as compared with the Leghorn.

(*b*) The following table helps to establish (3) (*a*):—

QUANTITY OF FOOD CONSUMED PER 1 LB. OF LIVE WEIGHT GAINED.

Period.	Australorps.	Leghorns.
	Oz.	Oz.
9 weeks	39·16	43·78
12 weeks	45·74	53·91
15 weeks	48·90	58·35
18 weeks	52·30	67·35
21 weeks	58·63	..

(4) If breeders are unable to rear Australorp cockerels profitably for table purposes it is of little use for them to try to rear Leghorns.

(5) In this experiment a high protein ration appears to have given no advantage when fed to Leghorns after the age of twelve weeks, and in the case of Australorps, after fourteen weeks.

ACKNOWLEDGEMENT.

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TO SUBSCRIBERS—IMPORTANT.

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

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

PRODUCTION RECORDING.

List of cows, officially tested by officers of the Department of Agriculture and Stock, which have qualified for entry into the Advanced Register of the Herd Book of The Australian Illawarra Shorthorn Society, The Jersey Cattle Society, The Guernsey Cattle Society, and The Friesian Cattle Society, production charts for which were compiled during the month of May, 1932 (273 days period unless otherwise stated).

Name of Cow.	Age.	Milk Production.	Butter Fat.	Owner.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORN.				
Blossom of Penrhos	Mature ..	16,367	699·149	A. Sandilands, Wildash
Nellie 3rd of Sunnyview ..	Mature ..	14,717·45	616·107	W. H. Thompson, Nanango
Lilac	Mature ..	12,284·75	527·937	S. Mitchell, Warwick
Daisy 9th of Oakvilla	Mature ..	7,595·22	446·527	H. Marquardt, Wondai
Cherry of Penrhos	Mature ..	10,337	439·950	A. Sandilands, Wildash
Ruby of Corunna	Mature ..	9,694·83	429·641	J. Phillips, Wondai
Stately of Fairholme	Mature ..	11,424·65	425·864	Q.A.H.S. and C., Gatton
Tina II. of Yaralla	Mature ..	10,574·51	399·655	Hickey and Sons, Wilston
Westbrook Molly	Mature ..	10,278·22	390·557	F. G. G. Couper, Westbrook
Curly 5th of Arley	Mature ..	9,348·05	385·244	E. D. Lawley, Maleny
Strawberry of Penrhos ..	Mature ..	9,496	383·727	A. Sandilands, Wildash
Roseleaf of Hill Top	Mature ..	11,584·92	367·366	J. A. Heading, Cloyna
Handsome 6th of Rosenthal ..	Snr. (4 yrs.)	10,508·5	412·439	S. Mitchell, Warwick
Dinah 4th of Westbrook ..	Snr. (4 yrs.)	8,253·2	366·228	F. G. G. Couper, Westbrook
Trump 3rd of Rosemount ..	Snr. (4 yrs.)	7,611·25	339·078	J. Robertson, Bingera Siding
Dainty 3rd of Arley	Snr. (4 yrs.)	8,770·4	338·781	E. D. Lawley, Maleny
Hope 8th of Rosenthal.. ..	Jnr. (4 yrs.)	7,475·75	329·137	S. Mitchell, Warwick
Amy of Hawthorne	Jnr. (4 yrs.)	9,121·91	369·236	H. M. Graham, Oakfields
Ruby III of Thurles	Jnr. (4 yrs.)	11,229·11	404·793	Hickey and Sons, Wilston
Gentle III of Blacklands ..	Snr. (3 yrs.)	8,742·1	345·118	N. V. Slaughter, Harrisville
Fussy of Kingsdale	Jnr. (3 yrs.)	9,279·2	425·058	A. A. King, Mooloolah
Lass II of Oakvilla	Snr. (2 yrs.)	9,292·68	367·846	W. Marquardt, Wondai
Springdale Princess VII. ..	Snr. (2 yrs.)	8,990·06	356·685	A. J. Caswell, Wongalpong
Lilac 2nd of Rosenthal ..	Snr. (2 yrs.)	7,450	300·401	S. Mitchell, Warwick
Model 2nd of Alpha Vale ..	Jnr. (2 yrs.)	10,373·15	436·435	W. H. Thompson, Nanango
Rose of Sunnyview	Jnr. (2 yrs.)	10,869·3	416·923	J. Phillips, Wondai
Irene of Sunnyview	Jnr. (2 yrs.)	10,453·27	416·537	J. Phillips, Wondai
Rosette of Sunnyview	Jnr. (2 yrs.)	9,154·68	395·541	J. Phillips, Wondai
Kitty of Sunnyview	Jnr. (2 yrs.)	9,431·57	390·945	J. Phillips, Wondai
Clara of Westbrook	Jnr. (2 yrs.)	6,852·2	313·306	F. G. G. Couper, Westbrook
Widgee Waa Beauty V. (272 days)	Jnr. (2 yrs.)	8,503·55	299·338	A. J. Caswell, Wongalpong
Envy of Blacklands	Jnr. (2 yrs.)	8,089·05	289·717	A. Pickels, Wondai
Phyllis of Penrhos	Jnr. (2 yrs.)	7,009	282·871	A. Sandilands, Wildash
Buttercup 4th of Arley ..	Jnr. (2 yrs.)	6,486·7	275·651	E. D. Lawley, Maleny
Peggy VI. of Golelea (265 days)	Jnr. (2 yrs.)	6,684·54	268·315	E. M. Franklin, Wongalpong
Dnalwon Countess	Jnr. (2 yrs.)	6,714·79	266·457	A. J. Caswell, Wongalpong
JERSEY.				
Oaklands Larkspur Lass 4th ..	Mature ..	8,343·5	542·447	A. N. Webster, Maleny
Carlyle Larkspur 5th	Mature ..	6,678·28	370·819	J. Williams, Wondai
Carlyle Larkspur Countess ..	Snr. (4 yrs.)	8,650·712	440·520	J. Williams, Wondai
Glengariffe Nobles Foxglove ..	Snr. (4 yrs.)	6,304·8	331·437	Cox Bros., Maleny
Nobly Born Irondeal	Snr. (3 yrs.)	7,181·77	413·12	Sinnamon and Sons, Moggill
Morag 3rd of Peachester ..	Snr. (3 yrs.)	5,720·05	356·502	D. Macdonald, Peachester
Trinity Gerbera	Snr. (3 yrs.)	6,232·6	320·765	E. J. O'Keeffe, Nambour
Newhills Queenie 2nd	Snr. (3 yrs.)	5,598·6	319·343	J. N. Robinson, Maleny
Wonderful Maid	Jnr. (3 yrs.)	7,989·06	399·378	Sinnamon and Sons, Moggill
Pavillans August Segunda ..	Jnr. (3 yrs.)	6,669	329·291	Sinnamon and Sons, Moggill
Dina 9th of Viola	Snr. (2 yrs.)	5,906·02	338	H. T. Mayers, Nambour
Carnation Lockets Pride ..	Snr. (2 yrs.)	5,996·34	325·515	Spresser and Sons, Brassall
Avocaview Golden Lady 2nd ..	Snr. (2 yrs.)	6,274·3	279·28	A. M. Webster, Maleny
Daisy of Billabong	Jnr. (2 yrs.)	7,416·56	371·869	J. Mollenhauer, Moffatdale
Sybel of Calton	Jnr. (2 yrs.)	6,769·1	354·364	C. Burow, Goomeri
Dainty Idyle of Burnleigh ..	Jnr. (2 yrs.)	6,066·78	320·914	W. W. Mallett, Nambour
Nobles Favourite of Glenmoore	Jnr. (2 yrs.)	6,292·5	305·215	J. and R. Williams, Kingaroy
Bella Scott of Brooklands ..	Jnr. (2 yrs.)	5,678·04	295·539	J. Williams, Wondai
Trinity Coquette	Jn . (2 yrs.)	5,211·34	294·433	Sinnamon and Sons, Moggill
Wee Dot of Burnleigh	Jnr. (2 yrs.)	5,191·2	291·674	W. W. Mallett, Nambour
Trecarne Roselea 3rd	Jnr. (2 yrs.)	4,771·34	277·676	T. A. Petherick, Lockyer
Trinity Mariette	Jnr. (2 yrs.)	5,130·69	274·591	Sinnamon and Sons, Moggill
Trinity Violet	Jnr. (2 yrs.)	5,124·84	266·353	Sinnamon and Sons, Moggill
April Morn of Woodbine ..	Jnr. (2 yrs.)	5,530·74	270·114	J. Williams, Wondai
Majesty's Claribelle of Brooklands	Jnr. (2 yrs.)	5,790·465	261·171	J. Williams, Wondai
Glengariffe Nobles Coulisse 3rd	Jnr. (2 ysr.)	4,386·95	260·022	Cox Bros., Maleny
Trecarne Thelma	Jnr. (2 yrs.)	4,692·26	255·478	T. A. Petherick, Lockyer
Opal of Burnleigh	Jnr. (2 yrs.)	4,217·5	254·055	W. W. Mallett, Nambour
Retford Chimes	Jnr. (2 yrs.)	5,839·26	249·832	T. A. Petherick, Lockyer
Trecarne Rose 6th	Jnr. (2 yrs.)	4,873·86	245·993	T. A. Petherick, Lockyer
Wattleflower 2nd of Wattlegrove	Jn . (2 yrs.)	4,284·25	244·763	J. W. Evans, Boonah
Majesty's Rose of Brooklands..	Jnr. (2 yrs.)	4,884·02	241·274	J. Williams, Wondai
Pineview Prim	Jnr. (2 yrs.)	4,777·42	294·374	Hunter and Sons, Borallon

PRODUCTION RECORDING—*continued.*

Name of Cow.	Age.	Milk Production.	Butter Fat.	Owner.
		Lb.	Lb.	
GUERNSEY.				
Linwood Trefoil	Snr. (2 yrs.)	5,370·7	284·453	W. A. K. Cooke, Maleny
Linwood Best Girl	Snr. (2 yrs.)	5,527·8	279·799	W. A. K. Cooke, Maleny
FRIESIAN.				
Inavale Grace VIII.	Jnr. (2 yrs.)	8,066	293·385	A. O. Stumer, Boonah
Oaklands Holly Rock	Snr. (2 yrs.)	7,541·13	278·530	W. Richters, Tingoora

SELECTING A DAIRY HEIFER.

C. F. McGRATH, Supervisor of Dairying.

THE ability to produce large quantities of milk is the dairy heifer's heritage, and when she develops and takes her place as a producer the herdsman's ability to feed and care for her is the all-important factor that enables her to give of her best.

In the selection of a dairy heifer, the form and general character will, to a great extent, indicate whether she is fitted by nature to develop into a good producing female.

Careful selection and breeding of high-class dairy stock establishes conformation and type, and a calf bred on dairy lines possesses dairy form and character, as distinct from the beef form and character.

The trained eye of the judge can see the dairy value of the calf and can discern the dairy type as distinct from the beef type in a heifer when quite young. The pedigree, which constitutes a compilation of facts concerning her immediate ancestry, and the production records of her ancestral dams on both the dam and sire sides are important factors in determining the future dairy value of the young heifer and as a guidance in the selection of the better class dairy stock. Constitution is important in the young heifer. A deficiency in any quality necessary to ensure a well-grown, well-developed, thrifty animal indicates that the heifer will not make a profitable dairy cow.

The form of the dairy heifer with a future as a profitable producer is in miniature a duplicate of a good type fully-developed dairy female. The dairy characteristics of the calf are indicated by an absence of any surplus flesh; she is somewhat angular and spare.

The head is typical of her breed, the eye large and bright, and muzzle large, ears of average size, neck lean and lengthy, sloping with the shoulders. She is sharp over the shoulders, ribs well sprung, with good heart girth. The forequarters are light. The digestive capacity is indicated by the depth through the barrel from the centre of the back to the navel. Good depth indicates ample mill power to convert the food into milk. The greater the depth through the middle the greater the production is likely to be. The back is straight. There is a good length from the hip to the pin bones and from the hip to the flank. The thighs are flat and free from fleshiness; the line of the thigh is incurving.

The bones should be light and not coarse. The tail should be thin and free from flesh. All of these points should indicate that there is no tendency to lay on flesh.

The as yet undeveloped udder, milk veins, and wells are reliable indications of the heifer's future value as a dairy animal. The skin covering and surrounding the immature udder is soft and loose with teats well placed. The milk veins can be followed with the finger and milk wells gauged. Comparatively well-developed milk veins and large milk wells indicate usefulness as a dairy cow.

The hair is soft, fine, and oily, and the skin thin, loose, soft, and pliable to the feel. The animal should be bright and thrifty, indicating a good constitution and capable of development by proper feeding and handling.

Select the heifer with care and do not allow the influence of pedigree to override your better judgment as to grave faults that she may possess, especially lack of constitution.

POINTS IN DAIRYING PRACTICE.

THE dairy farms of the State constitute the foundation of an industry that has developed so as to become one of the State's most important primary industries, representing an annual value of upwards of £7,000,000.

It is realised that the dairy farmer to be efficient must be more than a willing worker with a strong back and arm.

The successful dairyman is a business man adopting the most efficient methods in the conduct of his business. Foresight and efficient cultural methods will enable the dairy farmer to provide a regular supply of suitable food for the dairy herd.

Rotational grazing and top-dressing of native and introduced pasturage, production of fodder crops, and the conservation of fodder are important factors that make for efficiency in the industry. Having made provision for a supply of fodder it is necessary to check the production of each individual cow in order to secure the profitable utilisation of the food consumed by the removal from the herd of all animals that do not reach a payable standard of production.

The efficient dairy cow properly fed and cared for is akin to an efficient machine in a modern factory supplied with the required material for conversion into a desired product.

The cow converts the bulky fodders grown on the dairy farm into the condensed form of milk which, through the operations of our modern equipped dairy factories, is still further condensed into butter and cheese. The value of butter and cheese exported overseas annually approximates a value of £4,500,000.

The average production of the herd is an all-important factor in the success or failure of the undertaking, and is directly influenced by the return from each low-yielding cow as well as by that of the higher producers. Efficient methods will not allow of the retention in the herd of producers below a payable standard with the consequent loss of profit returned by the higher producers. The low producers reduce the average return from the herd, and in some instances eat up all the profits, and must not be influenced by the high yields of a few individual cows in the herd, as it is the average production of the herd over the full milking period that really counts.

The elimination of unprofitable producers allows of an actual saving in feed and labour, and makes for efficiency.

Dairy farming, like every other business, has two main activities—first, to produce what the market requires at a reasonable cost; and secondly, to sell the products to the best advantage. Organised marketing is receiving the attention of the various boards constituted under the provisions of the Primary Producers Organisation and Marketing Act, where increased attention is being given to the various phases of the production sections of the industry by improvement of pastures, growing of fodder crops, the conservation of fodder, and production recording.

The topic of herd recording has been given prominence to in the press and by various bodies associated with the industry. A large number of dairy farmers do not fully realise that their progress and the prosperity of the industry depends upon the management of the dairied land and the individual return from each cow constituting the dairy herd. The number of cows submitted for production recording represent but a small proportion of our dairy herds.

It is an economically sound practice to submit the herd to production recording, which must cover the full lactation period, and can with advantage be continued from year to year.

The knowledge obtained will secure efficiency in the conduct of one's business. Systematic herd testing enables the dairy farmer to advance towards a near maximum return from his herd—

(1) By the application of business principles to his operations.
(2) By determining the value of each cow's product and locating the unprofitable cow.
(3) By providing the opportunity of increasing the production of the herd, by selecting and breeding the high-producing females to a selected dairy sire.
(4) By selecting high producers it makes it possible to keep fewer cows and yet produce the same quantity of milk and fat, and ensures more economic feeding.

Herd recording increases the value of tested animals and their progeny, and promotes systematic breeding of the better class of dairy cattle.

GESTATION CHART FOR BREEDING SOWS.

Jan.	Date of Farrowing.	Feb.	Date of Farrowing.	March.	Date of Farrowing.	April.	Date of Farrowing.	May.	Date of Farrowing.	June.	Date of Farrowing.	July.	Date of Farrowing.	Aug.	Date of Farrowing.	Sept.	Date of Farrowing.	Oct.	Date of Farrowing.	Nov.	Date of Farrowing.	Dec.	Date of Farrowing.
1	22 April	1	23 May	1	20 June	1	21 July	1	20 Aug.	1	20 Sept.	1	20 Oct.	1	20 Nov.	1	21 Dec.	1	20 Jan.	1	20 Feb.	1	22 Mar.
2	23 „	2	24 „	2	21 „	2	22 „	2	21 „	2	21 „	2	21 „	2	21 „	2	22 „	2	21 „	2	21 „	2	23 „
3	24 „	3	25 „	3	22 „	3	23 „	3	22 „	3	22 „	3	22 „	3	22 „	3	23 „	3	22 „	3	22 „	3	24 „
4	25 „	4	26 „	4	23 „	4	24 „	4	23 „	4	23 „	4	23 „	4	23 „	4	24 „	4	23 „	4	23 „	4	25 „
5	26 „	5	27 „	5	24 „	5	25 „	5	24 „	5	24 „	5	24 „	5	24 „	5	25 „	5	24 „	5	24 „	5	26 „
6	27 „	6	28 „	6	25 „	6	26 „	6	25 „	6	25 „	6	25 „	6	25 „	6	26 „	6	25 „	6	25 „	6	27 „
7	28 „	7	29 „	7	26 „	7	27 „	7	26 „	7	26 „	7	26 „	7	26 „	7	27 „	7	26 „	7	26 „	7	28 „
8	29 „	8	30 „	8	27 „	8	28 „	8	27 „	8	27 „	8	27 „	8	27 „	8	28 „	8	27 „	8	27 „	8	29 „
9	30 „	9	31 „	9	28 „	9	29 „	9	28 „	9	28 „	9	28 „	9	28 „	9	29 „	9	28 „	9	28 „	9	30 „
10	1 May	10	1 June	10	29 „	10	30 „	10	29 „	10	29 „	10	29 „	10	29 „	10	30 „	10	29 „	10	1 Mar.	10	31 „
11	2 „	11	2 „	11	30 „	11	31 „	11	30 „	11	30 „	11	30 „	11	30 „	11	31 „	11	30 „	11	2 „	11	1 April
12	3 „	12	3 „	12	1 July	12	1 Aug.	12	31 „	12	1 Oct.	12	31 „	12	1 Dec.	12	1 Jan.	12	31 „	12	3 „	12	2 „
13	4 „	13	4 „	13	2 „	13	2 „	13	1 Sept.	13	2 „	13	1 Nov.	13	2 „	13	2 „	13	1 Feb.	13	4 „	13	3 „
14	5 „	14	5 „	14	3 „	14	3 „	14	2 „	14	3 „	14	2 „	14	3 „	14	3 „	14	2 „	14	5 „	14	4 „
15	6 „	15	6 „	15	4 „	15	4 „	15	3 „	15	4 „	15	3 „	15	4 „	15	4 „	15	3 „	15	6 „	15	5 „
16	7 „	16	7 „	16	5 „	16	5 „	16	4 „	16	5 „	16	4 „	16	5 „	16	5 „	16	4 „	16	7 „	16	6 „
17	8 „	17	8 „	17	6 „	17	6 „	17	5 „	17	6 „	17	5 „	17	6 „	17	6 „	17	5 „	17	8 „	17	7 „
18	9 „	18	9 „	18	7 „	18	7 „	18	6 „	18	7 „	18	6 „	18	7 „	18	7 „	18	6 „	18	9 „	18	8 „
19	10 „	19	10 „	19	8 „	19	8 „	19	7 „	19	8 „	19	7 „	19	8 „	19	8 „	19	7 „	19	10 „	19	9 „
20	11 „	20	11 „	20	9 „	20	9 „	20	8 „	20	9 „	20	8 „	20	9 „	20	9 „	20	8 „	20	11 „	20	10 „
21	12 „	21	12 „	21	10 „	21	10 „	21	9 „	21	10 „	21	9 „	21	10 „	21	10 „	21	9 „	21	12 „	21	11 „
22	13 „	22	13 „	22	11 „	22	11 „	22	10 „	22	11 „	22	10 „	22	11 „	22	11 „	22	10 „	22	13 „	22	12 „
23	14 „	23	14 „	23	12 „	23	12 „	23	11 „	23	12 „	23	11 „	23	12 „	23	12 „	23	11 „	23	14 „	23	13 „
24	15 „	24	15 „	24	13 „	24	13 „	24	12 „	24	13 „	24	12 „	24	13 „	24	13 „	24	12 „	24	15 „	24	14 „
25	16 „	25	16 „	25	14 „	25	14 „	25	13 „	25	14 „	25	13 „	25	14 „	25	14 „	25	13 „	25	16 „	25	15 „
26	17 „	26	17 „	26	15 „	26	15 „	26	14 „	26	15 „	26	14 „	26	15 „	26	15 „	26	14 „	26	17 „	26	16 „
27	18 „	27	18 „	27	16 „	27	16 „	27	15 „	27	16 „	27	15 „	27	16 „	27	16 „	27	15 „	27	18 „	27	17 „
28	19 „	28	19 „	28	17 „	28	17 „	28	16 „	28	17 „	28	16 „	28	17 „	28	17 „	28	16 „	28	19 „	28	18 „
29	20 „	—	—	29	18 „	29	18 „	29	17 „	29	18 „	29	17 „	29	18 „	29	18 „	29	17 „	29	20 „	29	19 „
30	21 „	—	—	30	19 „	30	19 „	30	18 „	30	19 „	30	18 „	30	19 „	30	19 „	30	18 „	30	21 „	30	20 „
31	22 „	—	—	31	20 „	—	—	31	19 „	—	—	31	19 „	31	20 „	—	—	31	19 „	31	22 „	31	21 „

NOTE.—Black figures in above table indicate date of service.

This chart presents in an instructive form figures relating to the gestation period of brood sows. For example, a sow mated to the boar on 1st January is due to farrow on 22nd April; a sow mated on 1st July is due on 20th October. The chart should be preserved for future reference by breeders of all classes of pigs. The normal period of gestation, *i.e.*, the period from the time of conception to the birth of the young pigs, is 112 days, this period is sometimes remembered as roughly three months three weeks three days, or 16 weeks. With very young sows the period is sometimes of shorter duration, and instances are on record where young sows have farrowed at from 100 to 108 days after becoming pregnant; on the other hand, old sows in abnormal condition have been known to carry their young for more than 140 days.—E. J. SHELTON, H.D.A., Senior Instructor in Pig Raising.

AGRICULTURE ON THE AIR.

RADIO LECTURES ON RURAL SUBJECTS.

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

On Tuesdays and Thursdays of each week, as from 5th July, a fifteen minutes' talk, commencing at 7.30 p.m., will be given on subjects of especial interest to farmers. Following is the list of lectures arranged:—

SCHEDULE OF LECTURES

BY OFFICERS OF THE DEPARTMENT OF AGRICULTURE AND STOCK.

RADIO STATION 4QG, BRISBANE (AUSTRALIAN BROADCASTING COMPANY).

Tuesday, 5th July, 1932—"Selection of Sugar-cane for Planting Purposes." A. F. Bell, B.Sc., Plant Pathologist.

Thursday, 7th July, 1932—"Brooding Chickens." J. J. McLachlan, Poultry Inspector.

Tuesday, 12th July, 1932—"Disease-resistant Varieties of Sugar-cane—How They are Developed." A. F. Bell, B.Sc., Plant Pathologist.

Thursday, 14th July, 1932—"Red Rot and Related Diseases." W. Cottrell Dormer, B.Sc. Agric., Assistant Pathologist.

Tuesday, 19th July, 1932—"Cotton Varieties" (First Lecture). R. W. Peters, Cotton Experimentalist.

Thursday, 21st July, 1932—"Cotton Varieties" (Second Lecture). R. W. Peters, Cotton Experimentalist.

Tuesday, 26th July, 1932—"Shade Trees for the Farm." C. T. White, Government Botanist.

Thursday, 28th July, 1932—"Flowering Shrubs for the Home Garden." C. T. White, Government Botanist.

Tuesday, 2nd August, 1932—"Ornamental Climbers." C. T. White, Government Botanist.

Thursday, 4th August, 1932—"Diseases of the Grape Vine." R. B. Morwood, M.Sc., Assistant Plant Pathologist.

Tuesday, 9th August, 1932—"Chicken Feeding." P. Rumball, Poultry Expert.

Thursday, 11th August, 1932—"Notes on Sugar Conference at Porto Rico." A. F. Bell, B.Sc., Plant Pathologist.

Tuesday, 16th August, 1932—"Maize Varieties and Their Suitability for Various Districts." C. J. McKeon, Instructor in Agriculture.

Thursday, 18th August, 1932—"Tobacco." G. B. Brooks, Director of Agriculture.

Tuesday, 23rd August, 1932—"Tobacco Exploratory Work in Queensland." G. B. Brooks, Director of Agriculture.

Thursday, 25th August, 1932—"The Cultivation of Maize." C. J. McKeon, Instructor in Agriculture.

Tuesday, 30th August, 1932—"Importance of Efficient Cleansing and Sterilising of Dairy Utensils." C. J. Pound, Government Bacteriologist.

Thursday, 1st September, 1932—"Plant Disease Investigation." J. H. Simmonds, M.Sc., Plant Pathologist.

Tuesday, 6th September, 1932—"Propagation of Tobacco Seedlings." R. A. Tarrant, Instructor in Agriculture.

Thursday, 8th September, 1932—"Preparation of Land for Tobacco." R. A. Tarrant, Instructor in Agriculture.

Tuesday, 13th September, 1932—"Fertilizers for Tobacco." R. A. Tarrant, Instructor in Agriculture.

Thursday, 15th September, 1932—"Cotton Planting and Cultivation." R. W. Peters, Cotton Experimentalist.

Tuesday, 20th September, 1932—"A Brief Talk to the Small Selector on the Ordinary Operations on a Sheep Selection throughout the year." J. L. Hodge, Instructor in Sheep and Wool.

Thursday, 22nd September, 1932—"Diseases of Pumpkins and Allied Crops." L. F. Mandelson, B.Sc., Assistant Plant Pathologist.

Tuesday, 27th September, 1932—"Parasites and Methods of Control" (First Lecture). James Carew, Senior Instructor in Sheep and Wool.

Thursday, 29th September, 1932—"Parasites and Methods of Control" (Second Lecture). James Carew, Senior Instructor in Sheep and Wool.

CLIMATOLOGICAL TABLE—MAY, 1932.

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	29·98	83	72	85	5, 6, 7, 20	70	14, 16, 24, 25, 26, 27, 31	378	13
Herberton	..	71	59	80	19	51	24, 25, 30, 31	497	20
Rockhampton	30·12	78	61	83	1, 4, 6	55	25	315	12
Brisbane	30·21	72	58	77	10	54	25	166	11
Darling Downs.									
Dalby	30·19	71	48	78	7	40	10, 11	55	3
Stanthorpe	..	63	44	72	7	32	11	112	18
Toowoomba	..	66	48	70	1, 2, 3, 4, 5, 6	40	2	112	9
Mid-interior.									
Georgetown	29·97	86	65	93	21	57	24	14	2
Longreach	30·09	78	55	87	6, 7	48	1, 23, 25	289	5
Mitchell	30·17	71	47	81	7	38	11	190	7
Western.									
Burketown	29·99	85	65	90	10	55	24	8	2
Boulia	30·06	80	56	89	5	48	1, 2	175	4
Thargomindah	30·16	72	54	83	6	47	11, 24, 25	236	5

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF MAY, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING MAY, 1932, AND 1931 FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	May.	No. of Years' Records.	May, 1932.	May, 1931.		May.	No. of Years' Records.	May, 1932.	May, 1931.
North Coast.	In.		In.	In.	*South Coast*—continued:	In.		In.	In.
Atherton	1·95	31	6·65	2·05	Nambour	4·80	36	2·34	4·52
Cairns	4·35	50	11·76	4·04	Nanango	1·53	50	0·91	2·66
Cardwell	3·51	60	7·97	4·34	Rockhampton	1 49	45	3·15	2·05
Cooktown	2·85	56	3·68	1·56	Woodford	2·95	45	1·11	2·53
Herberton	1·59	45	4·97	1·54					
Ingham	3·37	40	10·97	3·99					
Innisfail	12·16	51	19·57	7·10					
Mossman Mill	3·44	19	10·53	2·29	*Darling Downs.*				
Townsville	1·30	61	2·25	0·49					
					Dalby	1·30	62	0·55	1·25
					Emu Vale	1·20	36	0·83	3·46
Central Coast.					Jimbour	1·20	44	0·73	1·19
					Miles	1·50	47	1·04	1·35
Ayr	1·10	45	3·04	1·31	Stanthorpe	1·88	59	1·12	3·61
Bowen	1·31	61	2·16	0·80	Toowoomba	2·20	60	1·12	2·84
Charters Towers	0·78	50	1·61	0·09	Warwick	1·57	67	0·85	3·48
Mackay	3·72	61	5·33	2·56					
Proserpine	4·23	29	6·95	2·84					
St. Lawrence	1·76	61	3·21	0·67					
					Maranoa.				
South Coast.									
					Roma	1·42	58	2·16	1·37
Biggenden	1·73	33	1·23	2·04					
Bundaberg	2·66	49	2·09	4·39					
Brisbane	2·81	81	1·66	2·20	*State Farms, &c.*				
Caboolture	2·91	45	1·23	3·44					
Childers	2·16	37	1·14	3·20	Bungeworgorai	0·86	18	2·44	1.42
Crohamhurst	5·00	39	2·38	4·34	Gatton College	1·58	33	0·52	1·07
Esk	2·00	45	0·77	1·36	Gindie	0·92	33	1·32	0
Gayndah	1·57	61	1·11	1·93	Hermitage	1·26	26	0·66	3·56
Gympie	2·88	62	1·36	3·12	Kairi	1·80	18	0·70	1·13
Kilkivan	1·85	53	0·56	2.29	Mackay Sugar Experiment Station	3·24	35	4·52	1·66
Maryborough	3·08	60	1·17	2·46					

J. H HARTSHORN, Acting Divisional Meteorologist.

Answers to Correspondents.

Poison Peach.

W.B. (Mackay)—

The specimen is the Peach-leaf Poison Bush or Poison Peach, *Trema aspera*, a shrub very common in coastal Queensland and New South Wales, and generally regarded as poisonous to stock. It develops at times a prussic acid yielding glucoside, and at these times if eaten in quantity should cause death. The occurrence of this poisonous principle, however, is very erratic, and what controls its formation it is impossible to say. Though regarded by many people as a plant poisonous to stock, nevertheless we have often seen stock eating very large quantities of it without any ill-effects following.

Valuable Tropical Legume.

INQUIRER (Brisbane)—

The specimen of legume from the Daintree River is *Desmodium scorpiurus*, a species of Tick Trefoil. It is a common legume in many tropical countries, and is supposed to have been introduced into North Queensland from Samoa many years ago. Where it grows it is regarded as a very valuable tropical legume for fodder purposes.

Glycine tabacina.

W.G.C. (Coominya)—

The specimen is *Glycine tabacina*, a native legume very common in the average native mixed pasture and generally regarded as a good fodder. Though it is common, we have not heard a local name given to the plant. Rape is not a legume, but a member of the cabbage and turnip family.

Chenopodium carinatum.

W.R.H. (Townsville)—

The specimen is *Chenopodium carinatum*, a strongly scented weed with a very wide range in Australia. We have not heard a common name for it, but it is very closely allied to the Worm Seed and the oil from the seeds would probably have similar properties as a vermifuge. It occurs commonly as a weed in cultivation, and is also found on plains and along watercourses in the West. We think it is a native of North Queensland, though stock carry the plant from one place to another. We collected it many years ago as far north as the Flinders River, not very far from Julia Creek.

Fodder Crops.

W.S. (Oakey).—Mr. C. J. McKeon, Instructor in Agriculture, advises as follows:—

Feterita is grown for grain purposes and is not of much value for fodder. Like all members of the sorghum family it cannot be fed with safety when at an immature stage. When frosted it would be of very little value as stock food. It cannot be compared with Sudan grass or any of the panicum as a fodder. You would be well advised if you want to grow sorghum to try saccaline or Sudan grass, the latter being very suitable for your district. Cultivation required is only the same as that for crops such as maize. Land should be well worked up to a depth of 8 or 9 inches.

Sorghum should be sown in drills 3 feet 6 inches apart. It is easier to harvest and will not lodge so readily when sown in this way. The quantity of seed required is from 4 to 5 lb. an acre.

Sudan grass can be sown in drills about 2 feet 6 inches apart, or broadcast, 3 to 4 lb. an acre in drills and about 12 lb. broadcast.

Nut grass cannot be eradicated if the area is badly infested. If only small patches are present these can be destroyed by digging a hole 2 or 3 feet deep and greater in circumference than that of the nut grass patch and filling the hole with wood and burning. The heat thrown off will destroy any nuts which have not been removed during digging.

Usually when lucerne is fit to cut the crop is roughly two-thirds in flower. A fresh growth will also be noticed at the base of the plant. When this occurs the lucerne should be cut.

General Notes.

Staff Changes and Appointments.

Messrs. F. G. Collins, W. C. Mayson, and W. T. Parker have been appointed honorary rangers under the Animals and Birds Acts, the firstmentioned in respect of Rosedale Station and the lastnamed for sanctuaries in the Toowoomba district.

Constable F. Dornbusch, of Goomeri, has been appointed also an Inspector under the Slaughtering Act.

Mr. A. F. S. Obman, Government Veterinary Surgeon, Department of Agriculture and Stock, Brisbane, has been appointed also a Veterinary Inspector under and for the purposes of "*The Diseases in Stock Acts,* 1915 *to* 1931," "*The Slaughtering Act of* 1898," and "*The Dairy Produce Act of* 1920."

Messrs. J. Sallatina and C. Lafferty have been appointed Honorary Rangers under the Acts in respect of the Hughenden Golf Club sanctuary, and Mr. W. H. Edwards for the Boyne Island sanctuary.

The following have been appointed Cane Testers for the forthcoming sugar season at the mills mentioned in each case:—Miss A. Walsh (Babinda), Miss E. Christen (Cattle Creek), Miss A. L. Lovy (Inkerman), Mr. L. G. F. Helbach (Invicta), Mr. W. Ahern (Farleigh), Mr. H. Jensen (Kalamia), Mr. J. C. D. Casey (Marian), Mr. T. Herbert (Mossman), Miss J. Orr (Mourilyan), Mr. F. W. Trulson (Mulgrave), Mr. V. F. Worthington (Pioneer), Miss Ivy Palmer (Plane Creek), Mr. T. P. Brown (Pleystowe), Miss J. O'Flynn (Proserpine), Mr. T. V. Breen (Racecourse), Mr. W. J. Richardson (South Johnstone), Miss M. T. Smith (Tully), and Mr. G. Tait (North Eton).

The following have been appointed Assistant Cane Testers for the forthcoming sugar season at the mills mentioned in each case:—Miss D. Alldridge (Pleystowe), Miss D. Bowder (Pioneer), Mr. T. F. Corbett (Kalamia), Mr. St. C. G. Fanning (Marian), Mr. C. H. Humphreys (South Johnstone), Miss C. Humphreys (Tully), Miss M. A. Lyle (Invicta), Miss M. A. Morris (Babinda), Mrs. M. Nally (Inkerman), Miss M. Orr (Proserpine), Miss V. Page (Marian), Miss E. Rowe (Racecourse), Miss M. Thorburn (Farleigh), Mr. D. Walton (North Eton), Mr. H. T. Whitcher (Plane Creek), Mr. R. D. Woolcock (Pleystowe).

Police Constables C. Wagner (Talwood), B. Nolan (Marlborough), R. L. Beahan (Baralaba), W. S. Osborne (Prairie), E. H. Kowaltzke (Ewan), and J. E. Carroll (Stonehenge) have been appointed also Inspectors under the Slaughtering Act.

Toowoomba Sanctuary.

Horn Park, Toowoomba, has been declared a sanctuary under the Animals and Birds Acts, and it will now be unlawful for any person to take or kill any animal or bird thereon.

Arrowroot Board.

The poll to decide whether the ownership of arrowroot bulbs and arrowroot flour should be vested in the Arrowroot Board was conducted by the Department of Agriculture and Stock on 15th June, when both of these questions were answered in the affirmative. Results:—

	Votes.
For the acquisition of Arrowroot Bulbs	81
Against	44
For the acquisition of Arrowroot Flour	82
Against	45

The necessary three-fifths majority having been obtained on both of these questions the proposals have therefore been carried.

Rosedale Sanctuary.

Executive approval has been given to the issue of an Order in Council under the Animals and Birds Acts declaring Rosedale Station, Rosedale, the property of Mr. F. G. Collins, as a sanctuary under the abovementioned Acts. It will now be unlawful for any person to take or kill any animal or bird within the boundaries of Rosedale Station.

Dairy Produce Act Examinations.

The date for the holding of the annual examinations in the theory of Milk and Cream Testing, Milk Grading, Cream Grading, Butter Making, and Cheese Making, is 30th July. Applications must be lodged with the Department before 12th July.

A.I.F. Members' Addresses.

The A.I.F. Historian (Dr. C. E. W. Bean), Victoria Barracks, Paddington (N.S.W.), is anxious to get in touch with the following ex-members of the A.I.F., and would be grateful for any help in this direction from readers:—George Robert Barclay, Lieut (24th Batt.); Meredith George Blackman, D.C.M., M.M., 3007 C.Q.M.S. (12th Batt.); Roy Henry Brown, M.C., Lieut. (9th Batt.); William Franklin Comrie, M.M., 1533, Driver (4th D.A.C.); George Collingwood Dodd, Lieut. (4th M.G. Coy.); Charles Telfer Emerson, M.M., 2361, C.S.M. (15th Batt.); William Greaves, D.C.M., 793, Sgt. (9th Batt.); Frederick Hallam, M.C., Captain (49th Batt.); William Alexander Porter, D.C.M., 5448, C.S.M. (9th Batt.); Granville Pritchard, M.C., Lieut. (15th Field Coy.); Charles Henry Roberson, M.M., 1700, Sergeant (26th Batt.).

Maturity Standards for Citrus Fruits.

Representatives of the States concerned, the Federal Citrus Council of Australia, and the Committee of Direction of Fruit Marketing have agreed to a higher maturity standard for citrus fruits, and in accordance with their recommendation, "The Fruit and Vegetable Grading and Packing Regulations of 1928" issued under "*The Fruit and Vegetables Act of* 1927," have to-day been amended to provide for the new standards.

"Matured fruit" in the meaning of the original regulation in the case of oranges and mandarins, meant fruit in which the citric acid content shall not exceed one and one-half per centum, and the weight of the hand-pressed juice of the fruit shall be not less than fifteen per centum of the total weight of the orange or mandarin.

The amendment now provides that "matured fruit" shall mean in the case of oranges, grape fruit, and mandarins, fruit in which the weight of the hand-pressed juice is not less than thirty per centum of the total weight of the fruit, and—

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

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

Uniformity in the size of cases used for marketing citrus in this State has also been provided for grape fruit and oranges shall be packed only in the following cases:—

One bushel case, the inside measurements of which are 18 inches long by 14¼ inches deep by 8⅝ inches wide, and the capacity of which is not less than one imperial bushel or cubical content of 2,223 cubic inches;

Canadian standard case, the inside measurements of which are 18 inches long by 10½ inches wide by 11¼ inches deep, and the capacity of which is not less than 2,173½ cubic inches. A further amendment provides that the Canadian citrus case shall comply with the measurements of the standard citrus export case recently adopted by the Federal authorities.

Sanctuary Proclaimed.

Executive approval has been given to-day to the issue of an Order in Council under the Animals and Birds Acts, declaring Boyne Island (Benaraby), the property of the Hughenden Golf Club, and the property of R. A Childs, Burpengary, to be sanctuaries under and for the purposes of the abovementioned Acts. It will be unlawful to take or kill any animal or bird on the abovementioned properties.

Disposal of Pineapple Tops.

Approval has to-day been given to the issue of a Proclamation under the Diseases in Plants Acts, declaring the area comprised within the boundaries of the City of Brisbane to be a quarantine area under the abovenamed Acts, and determining the nature of the quarantine to be imposed therein, namely, the prohibition of the removal, except for the purpose of destruction, of any pineapple tops, detached from the fruit, within the area in question. An exception is made in that an inspector may allow such removal, but only in accordance with the terms and conditions of a permit issued by him. The object of the Proclamation is to ensure supervision over any pineapple tops that may be used for planting purposes.

Canary Seed Board.

The Governor in Council has approved of the issue of an Order in Council under the Primary Producers' Organisation and Marketing Acts, giving notice of the intention of the Governor in Council to provide and declare that the commodity known as canary seed shall be divested from the growers and become vested in and be the property of the Canary Seed Board as the owners thereof.

A representative petition was received from canary seed growers asking that the Board be given the ownership of canary seed, and the Order in Council issued to-day accordingly provides for a petition to be lodged on or before 25th July, 1932, signed by not less than twenty-five growers who have grown or have been growing canary seed for sale within the past two years, requiring that a vote of growers be taken on the question of whether the ownership of canary seed shall be vested in the Board.

No Open Season for Opossums and Bears.

The Minister for Agriculture and Stock (Mr. Frank W. Bulcock) announced to-day that it was not proposed to declare an open season for the trapping of opossums or native bears during the present year.

In arriving at this decision the Government was actuated by a desire to permit of the conservation and propagation of these animals. The numbers of opossums were largely depleted during the past four open seasons in 1926, 1927, 1929, and 1931, when a total of approximately 7,250,000 opossum skins were sold in this State. These figures emphasise the necessity for protective measures for a reasonable period, and reports from departmental officers support this policy, as a reduction in numbers in comparison with previous years has been noted in the principal breeding districts of the State.

Mr. Bulcock also drew attention to the necessity for protecting the trapper against loss in his operations. Owing to depressed continental conditions, the over-sea market values for skins have depreciated to such an extent that there is at present no reasonable margin of profit for the trapper. As an instance of the fall in value, the Minister pointed out the disparity in the prices obtained in the 1929 and 1931 sales, when prices dropped from 60s. per dozen in the former year to 18s. 5d. per dozen in the latter. In addition, from latest oversea advices, 500,000 opossum skins still remain unsold on the London market.

Mr. Bulcock expressed a definite opinion that a fair proportion of the revenue from royalty payments and licenses, which had hithereto been a charge against the trapper and had been paid into a Trust Fund for expenditure in the conservation, propagation, and protection of native fauna, should be expended for these purposes. He had now under consideration certain proposals to give effect to this policy.

Process for Tanning Small Furred Skins.

Opossum, native bear, and other small furred skins can be successfully tanned by the following process:—Mix three heaped tablespoons of powdered alum, one of borax, and one of salt, with enough water to make a thin paste. Spread on skin till well covered, but not too thick, and then fold, flesh side inwards, and roll up. Put away in a cool place. In twenty-four hours repeat the application, and in another twenty-four hours sprinkle the skin thoroughly with water and take in both hands and work and rub well to make pliable. Be careful, as it will tear easily.

After rubbing, put on some more mixture, and in a few hours work it again. The more it is worked the quicker and better it will tan.

If the skin does not seem soft enough, sprinkle some borax on it and wet well with water. In a few hours work it till it is dry, when it should be ready to use. The alum is to whiten and tan, the borax to soften, and the salt to keep the pelt moist while tanning. If it dries out between times, sprinkle with water.

Care of the Separator.

The operation of the separator and the care devoted to its cleansing have a material effect on the quality of cream produced. On no account should the separator be left overnight without being dismantled, and all parts thoroughly cleansed and scalded. After separating, all utensils and separator parts with which milk has come in contact, including the vats, buckets, and strainer, should be washed with slightly warmed water and then submerged in boiling water and placed on racks to drain. The practice of wiping over the utensils with a cloth after scalding only serves to undo the work of sterilisation and to reinfect with bacterial organisms.

Milk should not be left lying about on the floor or under the separator block, and the surroundings should be kept sweet and clean, and the drains free to carry away the floor washings.

Rural Topics.

Bacon from Frozen Pork.

An experiment of considerable interest to pig producers in New Zealand (and also in Australia, and in Queensland in particular) and to consumers in Great Britain was recently organised in London by the New Zealand Association of Bacon Curers. The object of the experiment was to demonstrate that is is possible to manufacture good quality bacon from frozen pork. This is well known to a few, but it was desired to bring home to the whole body of interested producers and consumers by actual demonstration that bacon of a certain quality can be produced when efficiently cured.

Frozen pork of New Zealand production has been cured and made into bacon for several years past in Great Britain, and curers who have used it have always spoken very highly of the quality. The bacon produced in this experiment was subjected to examination, the results being regarded as extremely satisfactory. The subject is one of considerable value also to producers in each of the producing States of the Commonwealth, and is worthy of special investigation by those responsible for organising the trade. Its value should be given wide publicity.

Stud Pig Registrations in New Zealand.

It is of interest to note that the Berkshire breed is still the most popular and most liberally catered for stud pig in New Zealand, despite the competition of more recently introduced breeds.

For volume thirteen of the Herd-book to be published shortly the following applications for registration have been received:—

Berkshires	218
Tamworths	94
Large Yorkshires	73
Large Blacks	15
Middle Yorkshires	4
Duroc-Jerseys	3

or a total of 407 registrations.

The Pig's Temperature.

The normal bodily temperature of the pig is 102.6 degrees Fahr. as taken by the ordinary clinical thermometer inserted for three minutes in the rectum or uterus and read immediately it is withdrawn. Very young pigs have a slightly higher temperature, 103 degrees Fahr.; while pigs that have been driven about and have become excited and hot will probably register 103 or 103.5 degrees. It is not always an easy task taking the temperature, but the occasions where such is necessary are few and far between, and when a pig is really sick, and there is need to take the temperature, it usually is less difficult.

A temperature above normal indicates the presence of fever, while a lower bodily temperature is indicative of weaker action of the heart and of kidney complaints—i.e., inflammation of the kidneys or retention of the urine in an inflamed bladder. Rest and careful handling are essential in both cases, plus the treatment necessary for the complaint if the pig is suffering from disease. No attempt should be made to take the temperature in the mouth, and in all cases be sure the mercury in the thermometer is below 102.6 before attempting to insert the instrument in the animal's body.

Good Cooks and Bacon.

Now that bacon is so cheap, housewives will be using it in many ways other than just the popular bacon and eggs or tomatoes for breakfast. Good cooks have found that the addition of a small amount of bacon makes other dishes look and taste better. They always serve a little bacon with cutlets, sausages, &c. They cut bacon fine and add it to the stuffing of fowls and other meats. They add diced bacon to lettuce salad dressings. Here is a more ambitious bacon omelet: Beat four eggs without separating the yolks and the whites to a light froth, adding four tablespoonfuls of water, half a teaspoonful of salt, pepper to taste. Meantime cut six thin slices of bacon into the dice and fry a golden brown. Remove the bacon from the fat and keep it warm; then pour off all the fat from the pan but just enough to keep the omelet from sticking. Turn in the egg mixture. Cook the omelet carefully, and just before folding sprinkle with crisply cooked bacon. Fold and serve at once on a hot platter garnished with parsley.

Turning Frozen Pork Into Bacon—New Experiments at Cambridge.

Recent advices from London state that scientific experiments in progress at the Low Temperature Research Station at Cambridge, under the Department of Scientific and Industrial Research have proved that frozen pork which had been stored for a longer period than would be necessary to send it to Great Britain from Australia and New Zealand can still be made into very good bacon. It was with the object of finding out exactly how far frozen pig meat is liable to deterioration in cold storage during transport, and the best ways of bringing it over from the Dominions, that an investigation was started. It was carried out at Cambridge, where there is one of the best equipped low-temperature laboratories in the world. This is Government-owned, and is supported partly by grants from the Empire Marketing Board. A staff of experts is continually at work here studying the behaviour in cold storage of many sorts of foodstuffs, from pears to pork, and finding methods of improving storage and transport conditions which will help the oversea producer.

There are two ways of putting Australian and New Zealand bacon on the market. One is to send it over ready cured. The other is to export it as frozen pork and have it cured in Britain.

It has been definitely shown by scientific work that mild-cured bacon cannot yet be satisfactorily transported over long distances. So far, no simple way has been found of preventing the fat turning rancid after about six to eight weeks' storage. The alternative, however, gives satisfactory results. Bacon fully as good as the Dutch, and very little inferior to the Danish, can be made in Britain from meat sent from Australia and New Zealand as frozen pork. There is no reason, moreover, why the quality should not be improved by more care at each stage of pig production and of transport and storage of frozen carcases.

Australia and New Zealand are now Britain's chief sources of supply of frozen pork. Exports from New Zealand in 1930 were valued at £540,000. Australia's export of frozen pork for the same period totalled £227,412. As the dairy industry expands in the two Dominions the disposal of surplus pigs will become increasingly important, for pigs are a by-product of dairying. The frozen pork trade is, therefore, likely to grow steadily. These experiments will help it to do so by eliminating the distance factor so that frozen pork could be sent to any country in the world.

Making Good Use of Beastings.

The first milk from the cow after calving is called beastings, and is not made the best use of on many farms. It is really the very essence of milk, and contains more nutriment than any other taken from the cow. It is especially provided for the calf's first meals, for being of a slightly purgative nature it clears off all abnormal or rather offensive lodgments from the stomach and bowels, and at the same time brings the internal organs into proper action, so that it should be the herdsman's first object to get the newly-born calf to take a free sup from the udder. It is, however, the general practice to wean the calves from their mothers immediately after parturition and deprive them of the beastings with which they should be served. Though ordinary new milk may, and likely will, contain a good percentage of butterfat or cream, it will not contain colostrums (beastings), hence it is that numbers of calves are lost in the early days of their existence from scour or some other disorder brought about by injudicious feeding.

Rearing calves may always have their ordinary meals improved with the rich first milk, and when it is used no cake or bought meals are needed. It may also be given to pigs to improve their ordinary meals.

The duration of the beastings state of the milk depends on whether the animal be a heifer or a more aged cow, and of a rich milking breed or otherwise. Cows that have had a number of calves, and never were famed for the richness of their milk, only give about one or two meals, while heifers of such high-class milking breeds as Channel Islanders continue to give the rich meals for two or three days. Naturally, the food and condition of the cow have something to do with the duration of this state of the milk. The cow highly fed on good milk-producing food will give beastings for a meal or two longer than if she were kept on poor food, just the same as the kine calving when fat have a tendency to give them for several meals longer than poor lean cows.

The beastings are not fit for panning, nor may they be set for skimming, because the cream does not rise. Many a dairymaid has longed to turn it into butter, but mixing beastings with ordinary new milk has spoiled the whole pan. The day after the beastings state has passed away the milk may be panned in the ordinary way, and will give the richest cream and the best of butter, other things being equal.—Larousse in the Live Stock Journal (England).

Composition of Milk—Factors in its Variation.

Variation in the composition of milk may result from any of the following causes or any combination of them:—

The cow—its breed, its individuality, health, and condition.
The period of lactation.
Time of milking—morning or evening.
The part of the milk tested (whether first part or the strippings).
The food and water consumed by the cow.

Fat is a normal constituent of cow's milk, usually ranging on a percentage basis from 2.8 to 6.5 per cent., but varying (*a*) with the breed, and (*b*) with individuals of the same breed. The following table shows the range and the average of the butter-fat content of the milk cow of the different breeds:—

Breed.	Range. Per cent.	Average. Per cent.
Australian Illawarra Shorthorn	2.8 to 5	4.0
Jersey	4.2 to 6.5	5.0
Guernsey		
Ayrshire	2.8 to 4.6	3.8
Friesian		

Several factors influence the variation in the fat content of milk given by the same cow. The more important of these are temperament, climate, physical condition, breed, and feed.—A. and P. Notes, N.S.W. Dept. of Agric.

Sheep Weights in the Argentine.

The Argentine Division of Control of the Meat Trade has issued a statistical table giving the average weights and prices of the different classes of sheep killed in the Argentine plants during 1929 and 1930. The average weight of the wethers in both years was the same, 25 kilos.—i.e., 55 lb. The average weight of the ewes in 1929 was 28 kilos., or 61.6 lb., while in 1930 the average weight was 26 kilos., or 57.2 lb. The average weight of lambs and hoggets in 1929 was 17 kilos., or 37.4 lb., and in 1930 the average weight was exactly the same. The average weight of the sheep killed in the five plants operating on the South Coast, and designated as Patagonian Freezers, was in 1929 20 kilos. for wethers, equal to 44 lb. The same average was also registered in 1930. Ewes, in 1929, averaged 18 kilos., equal to 39.6 lb., while in 1930 they averaged 17 kilos., equal to 37.4 lb. Lambs and hoggets averaged 13 kilos. both years, equal to 28.6 lb.

Points in Dairy Practice.

The quality of dairy produce is considerably depreciated because of objectionable flavours or odours, "taints" which usually may be traced to the original milk. Certain weeds and some foodstuffs consumed by cows impart a strong and characteristic flavour to milk. Milk will also absorb "stable" odours if exposed to such an environment.

Weed and food flavours may be avoided by keeping the cows off weed-infested pastures and by feeding strong-flavoured foods after rather than immediately before milking. When cows are grazed on crops coming in this category the animals should be removed a few hours before milking. Taints may be ameliorated to some extent by aerating the milk in a pure atmosphere immediately after milking. Milk and cream will readily contract taints if they are stored in the vicinity of fruit, vegetables, soap, leather, or anything that has a strong smell.

Other flavours result from the action of fermentative organisms, but the observance of the strictest cleanliness is the surest safeguard (points out a South African departmental publication). All vessels coming into contact with milk should be kept scrupulously clean and sweet, and scalded with boiling water prior to use. Dairy utensils should be washed immediately after use; they should not be left for several hours, or the milk and cream will dry on the surface of the tinware, requiring extra time and labour in the subsequent washing. Boiling water should only be used on them after they have been given a thorough preliminary cleansing with lukewarm water. A brush should be used—not a cloth. Most tin utensils, when the final washing is done in boiling water, will dry unaided when put out to air.

Immediately the cream cans arrive back from the factory their lids should be removed and the cans tilted in an inverted position for airing. They will subsequently require a thorough scalding before being used again.

Fodder on the Farm.

Good feed can be too precious for it ever to be justifiable to allow it to go to waste, and in districts where the growth of herbage in the spring is likely to be prolific, as in the west and north-west, pastoralists might well consider its conservation in the form of silage.

In a good year considerable quantities of valuable silage could be made from the profuse growth of clover burr, barley grass, mallow, variegated thistle, and other plants which are available in large quantities in many of our grazing districts. There are thousands of acres of pasture land, which are very free of fallen timber, stones, &c., on which mowing machines could be operated to cut this valuable feed. It can be stored in pits as a stand-by for dry times, instead of allowing it to dry off as in the majority of cases it does now, and simply provide fuel for bush fires. Clover burr hay is a very nutritious fodder, because the material contains large quantities of seed, and a few pastoralists are now recognising the wisdom of harvesting and stacking this hay as a stand-by for dry periods.

The enormous losses which periodically occur indicate the dangers that attend the carrying of stock without provision of reserves of feed to carry them through times of drought. But the figures compiled by the Government Statistician indicate only the decrease in numbers of sheep, cattle, and other farm animals; they do not show the losses which occur through a lighter and less marketable wool clip, the reduced flow of milk from dairy cows, and the reduced returns from beef and mutton. Neither do they indicate the loss which the stockowner experiences after the breaking of the drought owing to his holding being under stocked. There is no simpler and cheaper method of conserving fodder than by ensilage, and if it pays to grow crops especially for this purpose, as undoubtedly it does, how irrational is it to let suitable growth made available without the trouble of sowing go to waste.

Where silage is intended for sheep the pit method is undoubtedly the best, for by it silage can be made with the minimum amount of labour and with a minimum loss of material. The pit is not rivalled by even the most up-to-date silo, as with the latter the material must be chaffed, which means greater expense both in making the silage and also in feeding it to stock. In the case of the pit the crop is put in whole, and when taken out it needs only to be spread over clean ground for the stock, whereas the chaffed material that goes into an overhead silo must be put out in feeding troughs of some kind.

Hand versus Machine.

According to the "Farmer and Settler" (New South Wales), advocates of milking machines had a great victory in a debate on hand versus machine milking at the Agricultural Bureau conference at Hawkesbury College last week.

Mr. A. S. Pankhurst, of Singleton, held that the modern milking machine had removed the drudgery that was the bugbear of dairying, and advanced three points in support of his argument in favour of machine milking: (1) The machine solved the problem of obtaining suitable labour; (2) It was the more sanitary method; and (3) Was more acceptable to the cow.

"Dairy farming to-day, with modern machinery, is a gentleman's life, compared with what it was previously," he said.

In addition, actual figures in bacteriological tests proved machine milking the most sanitary method.

As regards the third point, it was found that with heifers that had never been milked by hand, machine milking extended the milk production period dangerously near to the lactation. For this reason, care was needed in drying off the cows. Mr. Pankhurst contended that this was not a serious disability, and said that nature intended the cow to give her milk to her young by the suckling of the calf. The machine was the nearest approach to this method yet devised.

Referring to cows that had always been milked by hand and that objected to machines, Mr. Pankhurst said that in most cases such animals had outlived their usefulness. They should be got rid of, and the young stock broken in to machines.

Mr. F. J. Pankhurst, also of Singleton, said that it was hard to understand why, in this twentieth century, it was necessary to discuss this matter. With machines it was possible to milk thirty cows an hour, and one man with machines was as good as three hand-milkers.

Mr. W. Waddell, another Singleton dairy farmer, said that machines were better, cleaner, and quicker than hand milking. The cows were not so long in the yards, which was an advantage, because to get high production it was necessary

that the cows should be given ample time to make the milk. In New Zealand, 90 per cent. of the dairymen used milking machines, and he asked who got the better price for butter in London, New Zealand or Australia?

Supporters of hand milking stated that the chief objection to the machine was its initial cost and upkeep. Labour to-day (said Mr. R. H. Hudson) was plentiful and cheap, and milking could be done just as cheaply by hand as by machine. Machines were instrumental in spreading contagious mammitis, and he quoted instances in the Albion Park district where faulty cream had been received from farms using machines.

Mr. O. Guthrie declared that most of the second-grade cream in his district had been traced to holdings on which machines were used, and said that on his own farm he had found machines so unsatisfactory that he had disposed of them.

Mr. Lindsay Evans, of Dapto, speaking in favour of hand milking, said that three aspects were involved: (1) National (2) individual; and (3) animal. The use of machines would accentuate unemployment, and if machines and fuel were imported, it would increase the present adverse trade balance. He pointed out that the State's best purebred herds were hand milked.

The adjudicator, Mr. Balhousen, of the Department of Agriculture, declared in favour of the Singleton team.

Value of Bacon for Children.

Although bacon is usually thought of as a food for adults, it has a valued place in the diet of growing children. Now that bacon is at the lowest price of recent years, many mothers will recognise its use as a food for children and serve it more often.

School children, particularly, need the nutrition that bacon provides. By feeding a child two or three rashers of crisply cooked bacon, sufficient body warmth and energy will be created to maintain vitality until the next meal. Bacon prevents that let down of physical and mental energy and the desire for sweets of poorly fed children because much of its digestion is done in the stomach, while fruits, cereal foods, and toast rapidly liquify and are passed into the intestines. Bacon also continues to pass a steady influx of energy into the blood stream over a period of hours to meet the demands of muscle and brain cells, while other foods are rapidly used up.

Cheap Cow Rug for Winter.

Where proper shelter is not provided for stock not only is their resistance to disease reduced, but much food material is wasted in "warming the wind," or in other words meeting the increased demands of an exposed body. This fact has important application for dairy farmers. A cow's food is only devoted to production after the animal has satisfied its needs for nourishment and heat. In assisting the cow to conserve the last-mentioned, shelter belts in the form of trees and hedges have considerable utility on the dairy farm, especially in colder districts and situations, and for the same reason the rugging of the animals during at any rate a portion of the winter is well worth while.

Many farmers would like to rug their cows, but cannot afford to purchase the market article. The farmer can, however, make his own cow rugs for little more than the cost of two or three cornsacks or other heavy bags, a ball of twine, and a sewing needle, plus his own ingenuity. Two bags, or three for larger cows, will make an effective rug if utilised as follows:—

Split the bags down the seams and join together, and place on the cow. Next cut off a strip from 10 to 18 inches wide so that the rug will not hang too low. This need not be wasted: it is folded, and when sewn to the rug provides the strap for the thighs, this being the only strap used. The front is now fitted by turning up the front corners and sewing them to the sides of the rug. This strengthens the rug and obviates the necessity for cutting off the spare portion which the cow would tread on. The two turned-back portions are then measured and sewn to fit fairly tightly to the cow's neck. The back strap is fitted 12 to 15 inches below the rump level, and the rug is complete.

This home-made rug will keep the cow warm, and after a few days' wear, when the oil, &c., from the cow's body has worked into the rug, it will also be waterproof. The rug can quite easily be slipped off and on over the cow's head, and it is advisable to remove it daily except on rainy or very bleak days. The cow's name painted on the rug over the rump with tar prevents confusion in replacing the rugs.

A trial on one or two cows will prove the efficacy of these rugs, the animals soon showing their appreciation in a practical way.

Grass Silage.

As the best quality silage is produced in the heart of the stack, care must be exercised when opening to expose as small an area as possible to the air, because moulds form rapidly and the silage deteriorates in consequence. Remove the boards or bags and the soil from one portion of the stack, taking care to see that the remaining protective covering is not unduly disturbed, and cut the silage out in a face right down to the ground level before commencing on another section of the stack. The area worked on will depend on the size of the herd to be fed, but only enough should be cut out each day to supply the animals with sufficient feed for that period. An old squaring axe is one of the handiest implements for this purpose, or a special silage knife or an ordinary chopping axe can be used.

Grass silage can be used in from eight to ten weeks from the time of stacking, although if left for a longer period a more matured product will be obtained.

Graziers as well as dairy farmers are rapidly realising that ensiling surplus pasturage is a valuable method of conserving fodder, observes the Agrostologist of the New South Wales Department of Agriculture in a recent "Agricultural Gazette." An advantage of this method of conservation is that inclement weather conditions do not interfere with the operations to any considerable degree. To cure and store grass hay it is necessary, in order to produce a high quality product, that optimum drying conditions be experienced during the hay-making operations, whereas a few showers of rain falling on green material which is to be ensiled does not unduly reduce the feeding value of the cured silage.

Though there is more wastage in the stack than in the pit silo, the method is particularly useful where the sinking of a pit or trench is made difficult through the intrusion of stony outcrops, or where an impervious substratum exists, or the land is subject to seepage. Although the outer layer of a stack may dry out to some extent this material is not wasted; stock at Wollongbar and Berry Experiment Farms (N.S.W.) last season cleaned it up readily. In this dry form it resembles a fair-quality grass hay.

Cutting of surplus growth, particularly if it is too tall to be satisfactorily grazed by stock (as is frequently the case with paspalum in a good season) is an important point in intensive pasture management, the winter grasses and clovers being thereby given an opportunity to become well established and persist in the sward, thus providing a good balance of succulent feed throughout the year.

When an Amateur Goes Buying.

When an amateur goes to market to buy a dairy cow he is up against a most perplexing problem. Even skilled stockmen have some difficulty in selecting a good, useful cow. It must always be borne in mind that cowkeepers are not selling their very best cows, as a rule, unless when they begin to turn over in years and it may be a loss to keep them much longer. For this reason there is often a keen run on first-calf heifers. Being untried, these heifers are generally dear to buy, especially if they are well grown and present all the signs of becoming good milkers. Second-calf heifers can often be bought at pounds less per head than the most likely first-calf heifers. The idea is entertained that the second-calf heifers are, perhaps, being sold for some fault. A second-calf heifer is generally thin and looking her worst. She has lost the flesh and bloom she may have exhibited a year previous. She may be all right, nevertheless, and the owner's reason for selling may be because of his having too many cows. One never knows.—"Live Stock Journal" (England).

When Cows Kick.

Young cows which may have suckled their first calves, as well as the calving heifers, are sometimes not very amenable to hand-milking at the outset. A little patience and kindness must be exercised until they settle down, which they usually do after the udder assumes its normal condition. Some of the most nervous of young cows will kick when the udder is swollen hard, and the teats, perhaps, may be chapped and sore. But with kind handling they may be got to stand moderately still while being milked. Nervousness seems to be common to many cows of deep-milking qualities, hence it is advisable to soothe them and to let them eat or drink while the milking proceeds. It is not a bad plan to give a cow, old or young, a pail of water with the chill off and a handful of meal or bran and a little salt stirred into it, at milking time. This answers the twofold purpose of distracting the cow's attention from the milking and inducing her to let down her milk. Vicious kickers are hard to combat. One plan is to pass a band round both hind legs; another is to tie the tail to the hock of the near leg. Cows which are persistent kickers, and are but moderate or rather poor milkers, are best turned over to the butcher as soon as they are fat enough.

Milk That is Unsuitable.

The "colostrum," or beastings, contains an abnormally high percentage of albumen and broken-down cells from the udder, which form a most suitable food for the type of bacteria which putrefy milk and the products made therefrom. The milk of newly-calved cows should be given to the calf or used for the feeding of pigs until such time as it will boil without coagulating. It is the duty of the person in charge of the cows to keep this kind of bad milk out of the dairy, or nothing but inferior quality products can result, hence the importance of having a responsible cowman who thoroughly understands his duties.

Milk is often unfit for the successful manufacture of butter or cheese when the milking is not conducted in a cleanly manner. When the cow's udders are not cleaned previous to milking a great deal of dung and dust containing various species of bacteria falls into the milk pail at the time of milking. Another source of contamination is the milker's hands, which, if not well washed before commencing to milk, or after milking a cow with a diseased udder, will contaminate the milk drawn from the next cow. The milker should keep apart from the general supply all milk which he considers as likely to spoil the bulk if mixed with it.

Cows drink a lot of water, which it is most important should be clean, and as pure as possible. If dirty or stagnant water is supplied to cows it may have a very deleterious effect upon the milk. The water supply is of great importance on the dairy farm, and is the thing which should be given first consideration when questioning the suitability for dairying purposes. Cows should not be allowed to wade in ponds of stagnant water.—Live Stock Journal (England).

To Protect Haystacks against Mice.

Building the stack upon a raised platform answers the purpose, if the blocks upon which the platform is built are capped with galvanised-iron guards or inverted petrol tins so as to prevent the mice reaching the platform boards. Another successful method of keeping mice out is to enclose the stack with a fence of galvanised iron, either plain or corrugated, about 2 ft. high. Let the iron into the ground to a depth of 4 in., and place it in a slanting position, leaning outwards, all round the stack; take care to leave no open space at the corners. To ensure that mice do not enter a stack thus protected, care should be taken that straws, bags, or other articles are not allowed to hang from the iron fence or from the raised platform. If it should be found that mice are troublesome in the stack, poison with arsenic dissolved in water. Place dishes of the solution all round the stack; if it will not entirely eradicate the pest, this method will help to keep it in check.

Do You Know?

That the ash of young wood is especially rich in potash, and, generally speaking, the ash of young and small wood, such as young boughs, twigs, &c., is more valuable than that obtained from the trunk or heart of an old tree.

* * * * * *

That every gallon of milk a cow produces contains the equivalent of 1¼ oz. of phosphoric acid. Thus, a cow yielding 500 gallons of milk gives out the equivalent of 625 oz. of phosphoric acid, which is the amount contained in 200 lb. weight of superphosphate.

* * * * * *

That to make good concrete the sand must be clean—free from vegetable material (such as leaves, grass, &c.) and any other foreign matter. The best sand is that which has been washed. To make a rough test of the amount of dirt contained in it, rub it between the hands, when, if it is clean, there will be little or no stain.

* * * * * *

That the keeping quality of fruit depends more upon the skin being kept in a sound, unbroken condition than upon any other factor. When the skin is injured, common rot organisms gain entrance and quickly decompose it, and the rot spreads from one fruit to another. The consequences of carelessness in handling fruit are only evident to the orchardist when he learns of the low price that it has brought.

* * * * * *

That when trucking fat lambs, it is a good idea to leave them with their mothers till they arrive at the yards. The lambs then enter the trucks full and contented. In any case some of the ewes should be left with the lambs till they arrive at the trucking yards, otherwise the lambs will be very hard to drive and may knock themselves about unduly.—A. and P. Notes, N.S.W. Department of Agriculture.

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.

GOOD HEALTH NEEDS GOOD FOOD.

RECENTLY some important experiments have been made in India to test the effects on health of diets sufficient in quantity but deficient in quality. They were made on that hardy little animal the rat. About 1,000 rats were kept under ideal conditions of shelter, cleanliness, fresh air, and good water. They were fed on the diet eaten by certain peoples of Northern India. It consisted of whole wheat, fresh butter, milk, sprouted peas, carrots, cabbage, with once a week a small ration of meat and bone. The rats were kept alive to the age of two years, which would correspond roughly to the age of forty years in man. These rats were remarkably healthy. There were among them no deaths except from accident, and no disease was discovered even on post-mortem examination. They had large litters and the mothers always reared all their young ones.

Many thousand rats were kept under the same conditions but fed on deficient diets, and the results were very different. Of all the faulty diets used one of the worst was composed of white bread, margarine, tea, sugar, jam, preserved meat, and scanty overcooked vegetables—a diet in common use in England. On these deficient diets the rats developed a large number of diseases. We can mention only a few of them—pneumonia, suppuration of ear and nose, inflammation of the bowels, stone in the kidney, abscesses of the skin, anæmia, inflammation of lymphatic glands, heart disease, premature births, deaths during pregnancy and delivery. In short, these rats were unhealthy, they showed little resistance to disease, and the diseases from which they suffered are familiar to us in the human being. Similar experiments were made on a smaller scale with guinea pigs, rabbits, pigeons, and monkeys with the same results.

Without knowing it, many Queensland mothers are making the same experiments on their own children and on themselves. The same diseased conditions follow in them as in the rats fed on a common deficient English diet. This is also a common Australian diet if we substitute butter (a better food) for the margarine. Good health needs good food, and children badly fed, though they may look well, cannot resist disease. There is no need to adopt an Indian diet. The right foods are here, if we only knew them. The principal mistakes of many of our mothers are very simple.

(1) They give too little milk. Each child should have one pint daily in one form or another.

(2) Their children eat very few vegetables and these are badly cooked.

(3) They eat too much white bread and biscuits, scones, &c., made of white flour, also white rice, sago, tapioca, cornflour, &c. These should be given only in moderation.

(4) They eat too much sugar at and between meals, but too little fruit, and that not at meals nor every day, but irregularly.

The question is not quite so simple as this, and we shall return to it next month.

BREAD-MAKING.

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

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

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

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

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

Troubles in Bread-making.

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

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

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

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

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

Recipes for Yeast.

Yeast is a microscopic plant, which, when given food, air, warmth, and moisture multiplies very rapidly and produces carbon dioxide; this stretches the gluten and the dough rises. There are three main kinds of yeast. Compressed yeast comes in small damp cakes; it is ready to work immediately it is given the food and moisture, &c., and will keep in good condition two or three days. Dry yeast is a mass of yeast plants dried and mixed with some kind of meal. Although alive, it is inactive, and even after it has been given the food, warmth, and moisture it takes some hours to start working well. It is sold in tins and will keep some months. Liquid yeast may be made at home as follows:—

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

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

Neither of these yeasts requires bottling or cooking.

HOME-MADE OILSKINS AND TARPAULINS.

A WRITER in an agriculturists' journal recently said that a farmer's greatest personal comfort was to be found in an oilskin coat and a pair of waterproof boots. That is not so true in Australia as in lands where the skies are more "weepful," but there are few that will say an oilskin is not an essential to farm work.

Very few farmers make their own oilskin coats, yet they need them so constantly in wet weather, and give them such rough usage, that they would probably find it profitable to make rather than to buy. When they do go buying they ransack the stores in a fruitless search for something that will keep out the water, and at the same time remain whole with ordinary farm usage. But good oilskins cost money. The farmer who would make his own must not cut his coat according to his cloth, but procure plenty of the material, for an oilskin coat is none the worse for being too big for a close fit. He should secure the very best quality of calico procurable, for good material takes no longer to make up than poor stuff does, and it lasts more than twice as long.

The first step in the making is to rip up the seams of an old cast-off oilskin, to mark out on the new calico the corresponding measurements, and then to cut out the pieces required. When these have been seamed together, we have the new calico coat, which ultimately becomes the oilskin. If a light-coloured coat is desired, the coat should be oiled with a preparation made as follows:—Boiled linseed oil, one pint; raw linseed oil, half a pint and terebene a quarter of a pint. Another recipe is:—Boiled linseed oil, one quart, terebene, two tablespoonfuls. The raw oil makes the coat more supple than the boiled, but the boiled dries quicker, and the terebene is a liquid drier intended to hasten the process. The first of the two recipes will give a lighter colour than which is composed of boiled-oil and terebene only.

Oilskins are best made in the summer when a larger proportion of raw oil can be used. Made in the winter there should be more boiled oil and more terebene.

If it is desired to make a coat black, a quarter of a pound of dry vegetable black should be mixed with either of the above. The best way to mix it is to moisten the black with just enough of one of the oils to make a paste, either working it on a plate or a sheet of glass with a knife, or in a basin with a spoon or a piece of stick. The object of this is to break up the lumps. A black preparation such as this should also be strained through cheese-cloth, or some other coarse open fabric. The man with a taste for colour can have a green or a red or a blue oilskin by substituting for the black any dry colours to suit.

The method of applying the oils is as follows:—The coat is stretched on the floor and is painted with a brush, going carefully all over, and making sure that the oil penetrates right through at the seams and wherever the material is doubled. After painting, the coat should be hung over a line with the position occasionally changed until it dries. It may need a second coat, and as a good general rule two thin coats are always better than one thick one.

Some experimenters have adapted the tarpaulin method to suit their needs. That is, they first paint the coat all over inside; then, before it is dry, paint all over the outside.

Waterproofing Tarpaulins.

What is called the "railway" method of oiling tarpaulins is as follows:—Stretch the tarpaulin out on the floor, and paint each side once with a mixture of two parts of raw and one part of boiled linseed oil, to which enough vegetable black has been added to colour the tarpaulins as desired. The composition should be thoroughly worked in, and then allowed to dry. This dressing should be given twice. When thoroughly dry, still another coat should be given, consisting of two parts of boiled and one part of raw oil, with the amount of vegetable black desired. Care should be taken that the tarpaulin is perfectly dry before giving the last application. This is important.

The method of colouring is as given above for oilskin coats. In winter it is advisable to add to the Government recipe a little terebene, as this assists dying.

Besides the method of oiling detailed, there is a cheap method for temporary purposes that is worth knowing. Into one gallon of rain water stir 1 oz. of sugar of lead, and 1 oz. of powdered lime until they are quite dissolved. Let the solution stand until the sediment falls, then pour off the clear water into another vessel, and let the sheet soak in this for twenty-four hours. This is a very good and simple one-season waterproofing, which is as useful for coats as for tarpaulins, but it cannot be regarded as permanent.

Another temporary expedient for rendering tarpaulins resistant to rain is a coating of grease, one part of mutton suet to two parts of beeswax, melted together and applied while liquid with a brush or a piece of rag.—"The Farmer and Settler."

LANDSCAPE GARDENING.

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

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

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

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

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

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

TRANSPLANTING FRUIT TREES.

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

FLOWERING SHRUBS.

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

The plant stands severe trimming; in fact, it stands the knife so well that it can be grown almost any height by being cut back in July every year, like a grape

vine. One of the finest specimens of *L. Matthewsii* can be seen growing on the river side of the Customs House garden. Plants are easily raised from cuttings taken from the previous year's wood and planted during July and August. Also plants well established may be purchased at any of the nurserymen's stores.

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

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

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

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

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

FLOWER GARDEN.

All the roses should have been pruned some time ago, but do not forget to look over them occasionally, and encourage them in the way they should go by rubbing off any shoots which tend to grow towards the centre. Where there is a fine young shoot growing in the right direction, cut off the old parent branch which it will replace. If this work is done gradually, it will save a great deal of hacking and sawing, when next pruning season arrives. Trim and repair the lawns. Plant out antirrhinums (snapdragons), pansies, hollyhocks, verbenas, petunias, &c. Sow zinnias, amaranthus, balsam, chrysanthemum, marigolds, cosmos, coxcombs, phloxes, sweet peas, lupins; and plant gladiolus, tuberoses, amaryllis, pancratium, ismene, crinums, belladonna, lily, and other bulbs. In the case of dahlias, however, it will be better to place them in some warm, moist spot, where they will start gently and be ready to plant out in a month or two. It must be remembered that this is the driest of our months. During thirty-eight years the average number of rainy days in August was seven, and the mean average rainfall 2.63 in., and for September, 2.07, increasing gradually to a rainfall of 7.69 in. in February.

KITCHEN GARDEN.

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

Farm Notes for August.

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

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

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

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

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

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

Orchard Notes for August.

THE COASTAL DISTRICTS.

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

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

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

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

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

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

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

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

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

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

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

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

SEED MAIZE FOR SALE.

All previous lists are cancelled

To growers desirous of obtaining a pure and reliable strain of improved seed, the following varieties are being offered and represent limited stocks raised from selected strains of Departmental seed:—

Yellow.—Funk's 90-Day; Reid's Yellow Dent; Star Leaming; Improved Yellow Dent; Golden Beauty.

CONDITIONS OF SALE.

Applications for seed, with accompanying remittance (exchange added), should be addressed to the Under Secretary, Department of Agriculture and Stock, Brisbane. Postal address and name of railway station should be given, also date seed should be sent from Brisbane.

Advice will be sent when seed is despatched.

Purchasers are requested to write promptly after receipt of seed, should any matters require adjustment.

Should the variety asked for be out of stock, the Department may substitute another variety unless the applicant indicates a desire to the contrary.

Supplies of these stocks are limited, therefore applicants are advised to name a number of varieties in order of preference. Applicants will not be supplied with more than three bushels or with less than half a bushel of any one variety.

PRICES.

To enable applicants living at a distance to benefit, a flat rate of 9s. per bushel is being charged. This price includes all railage to the nearest railway station, but where steamer freight is necessary, this and any charges in relation thereto must be paid by the purchaser, and the cost thereof added to the remittance.

DESCRIPTION OF VARIETIES.

Funk's 90-Day.—Since the introduction of this variety to Queensland some years ago by the Department of Agriculture, a considerable amount of time has been devoted each year towards reducing the growing period and improving the type and yield. This is now a very popular variety, and is proving a good yielder, as well as being a good fodder corn. Yields of over 80 bushels per acre have been attained. At present it takes slightly over 100 days to mature. The ears are cylindrical in shape, and usually have sixteen to eighteen rows of very tightly packed grain. The grain is plump, of good depth, and slightly pointed; it has an amber-coloured base, with a rich yellow cap and a crease dent.

Reid's Yellow Dent.—Moderately tall-growing, medium-early variety—four months. The ears are cylindrical in shape, of good size, usually carrying from sixteen to eighteen tightly packed rows of medium-sized, slightly pointed, wedge-shaped grain, which is of a golden colour, with dark amber base and slightly rough crease dent. The stalks are light and leafy. It is suitable for the production of early crops, or for districts where there is a short growing season. It is also a good fodder corn. Special strains of this seed have yielded over 100 bushels per acre under field conditions.

Star Leaming.—This is a fairly short-growing, medium-early variety, taking about four months to mature. Ears carry from sixteen to twenty rows of grain, are borne fairly low on the stem, and are weighty and very compact. The grain is of medium size and blunt-wedge shape; bright amber in colour, with a distinct yellow cap and a rough crease dent. It is one of the best of the early varieties; is very suitable for early or catch crops, a heavy yielder, and a very popular variety.

Improved Yellow Dent.—A tall-growing, late-maturing variety—five to five and a-half months. The ears are cylindrical in shape, carrying sixteen to eighteen tightly packed rows. The grain is deep, wedge-shaped, of rich amber colour, with a yellow tip cap and rough crease dent. It is suitable for coastal districts and scrub lands, where there is a good rainfall. It is capable of giving heavy yields of grain and fodder. Special strains of this seed have yielded over 100 bushels per acre under field conditions.

Golden Beauty.—This is a tall-growing, medium-late variety—four and a-half to five months. The ears are long, with very small core, and usually twelve rows of grain. The husk covering is good. The grain is flat, of medium depth, with slightly rounded shoulders; bright amber in colour, with cream-coloured cap and long crease dent. It has a very high shelling percentage, is a very hardy variety, and a splendid yielder. It is also a good fodder corn.

ASTRONOMICAL DATA FOR QUEENSLAND.

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

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	July, 1932.		August, 1932.		July, 1932.	Aug., 1932.
					MOONRISE.	
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	a.m.
1	6.47	5.3	6.38	5.18	4.11	5.39
2	6.47	5.3	6.37	5.19	5.17	6.27
3	6.47	5.3	6.36	5.20	6.3	7.6
4	6.48	5.4	6 35	5.20	6.56	7.42
5	6.48	5.4	6.35	5.21	7.46	8.17
6	6.48	5.5	6.34	5.21	8.31	8.48
7	6.48	5 5	6 34	5.22	9.7	9.21
8	6.48	5.6	6 33	5.22	9.43	9.56
9	6.47	5.6	6.32	5.23	10.14	10.33
10	6.47	5.6	6 31	5.23	10.47	11.15
						p.m.
11	6.47	5.7	6 30	5.24	11.19	12.10
12	6.47	5.7	6.29	5.24	11.55	1.9
					p.m.	
13	6.46	5.8	6.28	5.25	12.37	2.13
14	6.46	5.8	6.27	5.25	1.22	3.17
15	6.46	5.9	6.26	5.26	2.19	4.21
16	6.46	5.9	6.26	5.26	3.22	5.25
17	6.45	5.10	6.25	5.27	4.26	6.23
18	6.45	5.10	6.24	5.27	5.31	7.19
19	6.45	5.11	6.23	5.28	6.35	8.12
20	6.44	5.11	6.22	5.28	7.37	9.5
21	6.44	5.12	6.21	5.29	8.35	10.0
22	6.44	5.12	6.20	5.29	9.30	10.54
23	6.43	5.13	6.19	5.30	10.23	11.52
24	6.43	5.13	6.18	5.30	11.17	...
						a.m.
25	6.43	5.14	6.17	5.30	...	12.45
					a.m.	
26	6.42	5.14	6.16	5.31	12.11	1.41
27	6.42	5.15	6.15	5.31	1.5	2.36
28	6.41	5.15	6.14	5.32	2.1	3.28
29	6.41	5.16	6.13	5.32	2.56	4.17
30	6.40	5.16	6.12	5.33	3.52	5.0
31	6.39	5.17	6.11	5.33	4.47	5.39

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

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

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

Phases of the Moon, Occultations, &c.

4 July	●	New Moon	8 20 a.m.
11 „	☾	First Quarter	1 7 p.m.
18 „	○	Full Moon	7 6 a.m.
25 „	☽	Last Quarter	11 41 p.m.

Perigee, 14th July, at 8.48 a.m.
Apogee, 26th July, 12.54 p.m.

The Moon will pass Mars at 2 p.m. on the 1st, when the planet will be 5 degrees southward of it. Two days later, at 6 p.m., Venus will be passed by the Moon at a distance of 9 degrees.

On the 4th the Earth will be at its greatest distance from the Sun.

When the Moon rises, 21 minutes after sunset on the 18th, Saturn will be only about 3 degrees northward of it.

Mercury will be at its greatest distance, 27 degrees east of the Sun, on the 20th, and will remain above the horizon 2 hours 5 minutes after sunset. The nearness of the two planets, Mercury and Jupiter (in the constellation Leo), will then be interesting, as they will be drawing nearer together till the 23rd and will be the principal objects in the western sky early in the evening.

Venus and Mars will be morning stars during the latter half of the month.

On the 24th Saturn will be in opposition to the Sun, rising as the Sun sets on that day.

On the 30th the Moon will pass about 5 degrees northward of Mars, about midday. At 7 p.m. the Moon will pass Venus at a distance of 11 degrees.

Mercury will set at 6.26 p.m. on the 1st, and at 7.10 p.m. on the 15th.

Venus will set 7 minutes before the Sun on the 1st; on the 15th it will rise at 5.1 a.m. and set at 3.38 p.m.

Mars will rise at 4.21 a.m. and set at 2.45 p.m. on the 1st. On the 15th it will rise at 4.11 a.m. and set at 2.30 p.m.

Jupiter will rise at 9.28 a.m. and set at 8.18 p.m. on the 1st; on the 15th it will rise at 8.43 a.m. and set at 7.36 p.m.

Saturn will rise at 6.50 p.m. and set at 8.23 p.m. on the 1st; on the 15th it will rise at 5.53 p.m. and set at 7.24 a.m.

The Southern Cross will be on the meridian, at its highest point, 57½ degrees above the horizon at Brisbane, but 4 degrees less at Rockhampton—at Cairns it will be only 46½ degrees high—at 6 p.m. on the 1st of July.

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2 Aug.	●	New Moon	7 41 p.m.
9 „	☾	First Quarter	5 40 p.m.
16 „	○	Full Moon	5 41 p.m.
24 „	☽	Last Quarter	5 21 p.m.

Perigee, 8th August, at 5.42 p.m.
Apogee, 23rd August, at 7.42 a.m.

The astronomical event of the month will be the grand total eclipse of the Sun on the 31st, visible, if weather conditions are favourable, at Montreal, Canada, and adjoining places, but unobservable in Queensland.

There will be an occultation of Spica by the Moon on the night of the 8th after they have set, but before 10 o'clock it will be interesting to notice the near approach of the Moon to the star.