ANNUAL RATES OF SUBSCRIPTION.

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

VOL. XLIV. 1 OCTOBER, 1935. PART 4

Event and Comment.

Pioneers of the Sugar Industry—The Governor's Fine Tribute.

"IN paying tribute to the achievements of modern technological development, we should not be unmindful of the honour due to those courageous men who, in the face of great difficulties, laid the foundations of what has become the major agricultural industry of this State. I feel sure, therefore, that you all will agree that this important occasion—important, at any rate, to us here—should be commemorated by a cairn, dedicated to the memory of the pioneers of the Queensland sugar industry, and erected on the site where, in 1865, Captain the Hon. Louis Hope, built and operated the first sugar mill in Queensland."

The Governor of Queensland, Sir Leslie Orme Wilson, spoke thus when welcoming the delegates from twelve countries to the Fifth Triennial Congress of the International Society of Sugar Cane Technologists in the City Hall, Brisbane, on 27th August.

His Excellency, saying he considered it a great privilege to open the Congress, offered a warm welcome to all present, and particularly to the delegates from the twelve countries represented in the overseas delegation.

The occasion of the Fifth Congress of the International Society of Sugar Cane Technologists was unique inasmuch as he believed it to be the first International Conference held in Queensland, or in the British Empire, and their State was therefore especially honoured in being allotted this International Conference of Sugar Cane Technologists, added His Excellency.

Continuing, the Governor said:—

> The cane sugar industry is the only industry which is technically organised on an international basis. In this period of increasing national isolation, it is refreshing and reassuring to contemplate the existence of an organisation under the auspices of which there is a periodic international pooling and interchange of technical information, the results of research, and a frank discussion of technical problems in which racial, national, or geographic boundaries play no part.
>
> Among the delegates here assembled from twelve visiting countries are noted scientists, whose names will be for ever honoured in the annals of scientific cane sugar production. By researches in laboratory and field, they have played their part in advancing the technical status of the sugar industry to the proud position which it now holds. We, here in Queensland, deem it a great privilege to welcome such men, and are deeply sensible of the benefits which will be derived from their close personal contact with the problems confronting our young State.
>
> To all of us in Queensland, this meeting here in Brisbane of the Congress, is an event of very great importance and significance. Here, our distinguished visitors will find conditions in sugar producing which are unique and different from those of any other part of the world. I feel sure that they will appreciate the research work undertaken by the Colonial Sugar Refining Company and the Bureau of Sugar Experiment Stations.
>
> We have looked forward to this visit with the keenest anticipation—not only because we hope to increase our technical knowledge and unitedly may be guided to a forward step in technical advance in one of the greatest industries in the world, but because we hope to initiate—and in some cases to renew—friendships in other lands, and it has been so truly said that to desire the same things and to reject the same things constitutes true friendship.
>
> I trust that when we say a regretful farewell to you delegates when you leave our shores, it will be with a feeling, shared both by your and our selves, that we are friends in the very best interests—interests that we all are met in this Congress to promote.

The Romance of the Sugar Industry—The Premier's High Tribute to the Early Producers.

ON the occasion of the unveiling of a memorial cairn at Ormiston, near Brisbane, on 1st September, the Premier of Queensland, Hon. W. Forgan Smith, LL.D., paid a high tribute to the memory of the pioneers of the Queensland sugar industry. The large gathering present included members of the International Society of Sugar Cane Technologists from twelve sugar-producing countries besides Australia, and on the very site on which they were assembled began the manufacture of sugar in this State some seventy years ago.

It was indeed a high tribute, the Premier said, to the pioneers of the industry that so many of the leading sugar technologists of the world should gather together to pay honour to the memory of the late Louis Hope and others who had been associated with him in the cultivation and manufacture of the first sugar in Queensland.

In 1865, only six years after Queensland's separation from New South Wales, Louis Hope had erected the first sugar mill in Queensland at Ormiston, having cultivated 20 acres of sugar-cane a year or so before.

It was in response to an offer by the London Society of Arts of a medal for the first ton of sugar manufactured in Queensland that Louis Hope set up a mill, crushed his own sugar, and won the honour! As a result of his enterprise there were 2,000 acres of land under sugar-cane the next year, and three years later twenty-eight mills were operating in Queensland, manufacturing more than 2,000 tons of sugar. These were the first chapters in the romantic story of sugar in Queensland. In those early days the methods were necessarily crude. Both cane production and sugar manufacture were in their infancy, and the industry had not as yet the benefit of the knowledge and the research of the sugar technologists who had lifted the industry from primitive conditions of culture to high-grade efficiency. Queenslanders might well pay tribute to those pioneers—first for their enterprise and next for their courage, and last, but not least, for their achievement, the Premier said.

It was difficult for them to-day to appreciate the immensity of the task of the pioneers. Faced as they were with obstruction on every hand, they applied those well-known qualities of determination and endurance to a task and achieved success. It was very doubtful whether in recent years many Australian industries had improved their efficiency as much as had the Queensland sugar industry. That was something of which the men and women of the industry had reason to be proud.

In the year 1900, 10 tons of cane were required to manufacture one ton of sugar. In 1910, the tonnage was reduced to 8·73, and in 1920 to 8, in 1929 to 6·91. The brains of technologists had been available also in the increase of production of cane per acre. In 1900 an average of 11 tons per acre were crushed for a yield of 1·20 tons of sugar. In 1929 the

crushing was 16 tons per acre for a yield of 2·41 tons of sugar—double the former quantity. But efficiency had not been limited to production and to crushing. In the refinery section, Australian refineries were working with lower process losses than those elsewhere, and it was claimed that in the matter of fuel value and economy there was no greater efficiency in other countries than in Australia. Those results had come because of the efforts of the pioneer chemists and engineers, and were part of the technologists' contribution to the welfare and progress of the industry.

Queensland had a big stake in sugar. The sugar belt extended for over 1,200 miles from Mossman in North Queensland to the banks of the Tweed River, and every ton of sugar was produced entirely by their own labour. The sugar industry was a lesson to the world in organisation. Every stage of sugar production was efficiently organised. The interests of the grower, the worker, the miller, the refiner were aligned, and each was assured of sufficient remuneration to enable all to live according to the best Australian standards. Queensland was the only country in the world handling tropical production with such success.

Speaking of the technical advance of the industry, Mr. Forgan Smith said that in 1878 the sugar mills increased to 68. In 1885 the genesis of the central mill system led to the erection of the Racecourse and North Eton mills. In 1893 was passed the Sugar Workers' Guarantee Acts. In 1898 it was decided to establish a sugar experiment station at Mackay. In 1904 the Bureau of Central Sugar Mills was set up. In 1907 the Australian Sugar Producers' Association was launched. In 1913 the Excise and Bounty Act was repealed. In 1915 the first Sugar Cane Prices Act was passed. In 1920 the sugar agreement fixed the price to £30 6s. 8d. per ton. In 1929 the Queensland Society of Sugar Cane Technologists was inaugurated, and that day the Fifth Triennial Congress of the International Technologists was being held in Brisbane, concurrently with the dedication of the memorial cairn. The same foresight which had marked the general control of the sugar industry had gone to the setting up of that cairn, which was to be a memorial to all the sugar pioneers of Queensland.

The granite, of which it was constructed, had been taken from two of the important sugar-growing centres—Giru and Herbert River—and the building of the cairn was in itself interesting. The base was of unworked stone, typifying the pioneer days. Rising to the base of the shaft, they found the stone partially dressed, typifying progress, whilst the capping stone was machined, symbolising the present efficiency of the industry.

To-day they were being told to produce less. That was paradoxical in a world where there was a clamor for food for the hungry. He trusted that something of the same efficiency which had been the guiding star in the sugar industry would eventually find its way into the economic councils of the world, and that ultimately men and women would be

permitted to enjoy to the full the fruits of the soil, and to share in the bountifulness of nature and the full production of industry, such as the sugar industry. If they did that they would fulfil the great destiny which was theirs. They would be true to the heritage of those early pioneers who pointed to them the way to success.

Concluding, the Premier said he thanked the International Society of Sugar Cane Technologists for the invitation to unveil that memorial cairn. He desired to pay tribute to the organisation, which aimed at promoting production in both field and factory, and which so enthusiastically and efficiently had set about improving conditions in the sugar industry; and it gave him great pleasure to unveil that memorial cairn, and pay his humble tribute to the memory of those sugar pioneers who built so nobly and well.

Science in Agriculture.

THE value which science was playing in agriculture was emphasised by Hon. Frank W. Bulcock, Minister for Agriculture and Stock, while proposing a toast to the International Society of Sugar Cane Technologists, at a luncheon tendered to the society by the Premier and the State Cabinet. Mr. Bulcock acknowledged the debt of gratitude which Queensland owed to technologists of other countries, who had been prepared to impart their knowledge to scientific workers in the sugar industry of this State. Queensland was endeavouring to discharge that debt, he said, by making available data collated in this country, and the benefits of experience gained here. To-day, added Mr. Bulcock, the farmer recognised that the principle of science constituted a sheet anchor, which made all the difference between bankruptcy and prosperity, and if there was one society which stood out above all others in this direction it was the International Society of Sugar Cane Technologists.

In reply, the general chairman of the Society (Dr. A. J. Gibson, of Bingera, Bundaberg) said that the advance made on the technical side of the industry in Queensland had been phenomenal, and was largely due to the sympathetic attitude of the State Government and the executives engaged in the industry. As an ex-public servant over a period of about ten years, Dr. Gibson said he was well acquainted with the splendid co-operation that had always come from the Government and others, so far as sugar was concerned.

Pink Wax Scale.*

By W. A. T. SUMMERVILLE, M.Sc., Assistant Entomologist.

THE pink wax scale is abundant throughout the coastal districts of Queensland, and the blackening of the foliage of many trees both in orchards and bush, which is so commonly observed, is, for the most part, due indirectly to the presence of this insect. Though the pest (Plate 130) finds its greatest development in coastal regions, it is by no means confined to those parts, but may be found, sometimes in large colonies, more than 200 miles inland.

It attacks a very large number of plant species, including citrus, mango, fig, banana, guava, pomergranate, river cherries, pepperina, maiden-hair, and other species of ferns. It is, in fact, never surprising to find pink wax on any species of tree except perhaps those typical of very dry climates. It is, however, only as a pest of citrus that the insect becomes of real economic importance, and the control measures given below are designed specifically for use by citrus growers.

Description.

The young pink wax are more easily observed than is the case with most species of scale insects found on citrus. They are minute reddish-coloured creatures, which can frequently be seen running actively about amongst the old scales on the leaves and twigs. Soon after settling down and commencing to feed, these crawlers secrete a white covering. As development proceeds a band of red or pink wax appears below this white cap, and this band gradually increases in size. In a short time the white cap has increased in dimensions, particularly in height, and below this and all round is a red margin broken by eight white prominences, three on each side, and one at each end, forming a series of rays. By the time the adult stage is reached the scale is almost globular in shape and smooth except at the top where a small depression is found and towards the margins where there are two lobes on each side, the anterior one of which is well defined and prominent. Towards the base the wax may be produced to form a well-defined flange. The colour is deep pink except at the apex, where the white dot persists somewhat, and at the sides, where the narrow white bands mark the position of the openings of the breathing organs. In crowded colonies the outline may be considerably modified by the pressure of one scale against another.

The adult female insect is very soft-bodied and difficult to remove entire from the wax. It is hemispherical in shape, pink to reddish-brown in colour, and possesses very small legs. The female scale measures from one-eighth to one-sixth of an inch in length. The male scale has not been observed in this State.

Habits and Life History.

Pink wax is not native to Australia, but was probably introduced from Ceylon or some neighbouring part of Asia. As has been recorded, however, the insect attacks a large number of trees, and indigenous

* *Ceroplastes rubens* Mask.

PLATE 130.
Pink Wax Scale, *Ceroplastes rubens* Maskell, showing infestation of leaves and twigs.

species, particularly river cherries, constitute a constant source of infestation, from which the pest spreads to orchard and other cultivated trees.

The female lays her eggs in a cavity beneath her body, and the young, on emerging, crawl around for several days before settling down to feed. During this crawling period they are comparatively easily dislodged from the twigs and foliage, and many are blown about by winds. It is by this means that the greatest distribution of the pest takes place, and as the young are thus brought in from outside sources to the orchard, it is impossible in most cases to establish any very lasting control.

Pink wax attacks the softest parts of the tree, and woody parts are never found to carry infestations; hence twigs and leaves carry practically the whole pink wax population on any tree. The scale is not itself very destructive, but it so weakens the attacked parts that the entry of fungi, such as melanose, and the incidence of other pests are greatly facilitated.

Though all varieties of citrus grown commercially in this State are attacked, the scale shows definite preferences in this regard. By far the most favoured variety is the Emperor of Canton mandarin, but other varieties of mandarins are also much favoured. Oranges as a rule harbour less of the pest than comparable mandarins, except in the case of Washington navels, which frequently carry very heavy infestations. Grapefruit and lemons seldom carry appreciable numbers of pink wax, and with these species it is very unusual to find the pest on trees more than four or five years old.

A colony of pink wax is almost invariably accompanied by a copious growth of sooty mould or fumagine. Though this sooty mould does not directly attack the tree, it is to some extent harmful, and when, as commonly happens, it covers the fruit, it is most objectionable.

There are two complete broods of pink wax each year, the first brood of the season appearing early in the summer. The breeding is, of course, largely dependent on climatic and other related conditions, and no definite time of appearance of the young can be stated. Generally, however, the first young make their appearance towards the end of November, and early in December large numbers of crawlers may be found. These complete their development in approximately three months, and towards the end of February, or, more typically, early in March, the second generation commences. Each female may take as long as a month to produce her progeny, and as there is sometimes a considerable difference in the times at which egglaying is commenced by the various females, the first hatched young may be of appreciable size and age before the last eggs are hatched. Fortunately this is not often the case, but when the times of emergences are widely separated, good control is most difficult.

Control.

The most essential point in the control of pink wax is to apply the scalicide at the correct time. As the young are commonly brought into the orchard by the wind from outside sources, it is essential to wait until this migration is as near completion as possible. For practical purposes it may be taken that when the typical young in the orchard are about the size of the head of an ordinary pin (Plate 131), it is time to apply the spray. On account of the heavy migration which is liable

to occur at the commencement of each generation, it is always better to be a little late with the application rather than early. In fact an early application which actually kills practically every young scale in the orchard, may be rendered valueless by the subsequent arrival of young from surrounding scrub and forest trees.

For general use the most satisfactory spray is one consisting of 24 cakes of Sunlight soap, 12-14 lb. of clean fresh washing soda, and 75 gallons of water. Other soap may be used, but in experimental work the best results were obtained with Sunlight. It may be necessary to heat some of the water to dissolve all the soap.

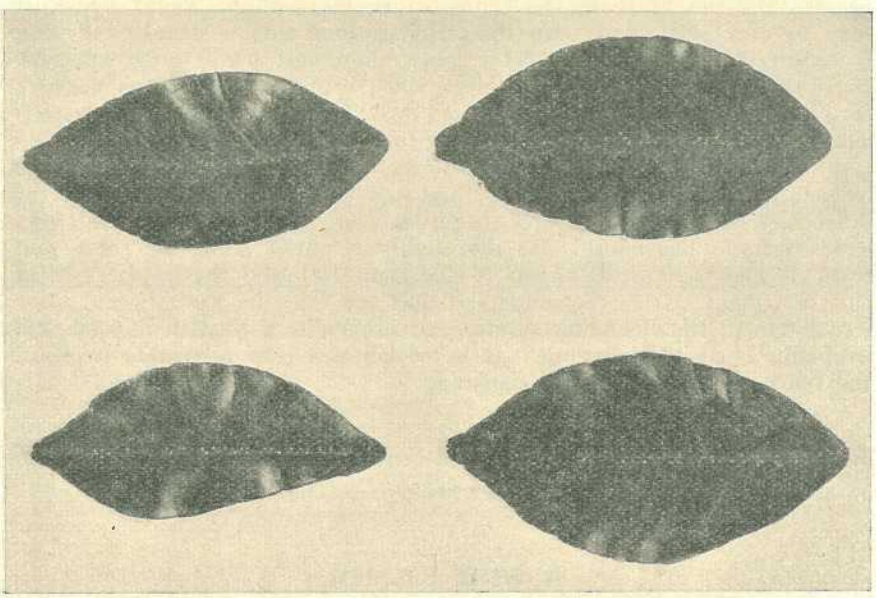


PLATE 131.

Pink Wax Scale, *Ceroplastes rubens* Maskell, showing young in correct stage for spraying.

A washing soda wash containing 1½ lb. of clean fresh washing soda to each four gallons of water may be used. This scalicide is effective but rather drastic on the trees in certain circumstances, particularly during hot weather.

A resin—caustic soda—fish oil mixture may also be used effectively against pink wax. It is particularly useful at those times when the emergence of the brood is rather protracted, as it is effective against much older individuals than either of the two first-mentioned sprays. The formula of the mixture is 10 lb. resin, 3 lb. caustic soda of good commercial quality, 1½ lb. fish oil, preferably herring oil, and 40 gallons of water. Details of the manner of preparation of this mixture are available in other departmental entomological publications.

Fumigation with hydrocyanic acid gas is also effective against pink wax, though the kill of this species is rather less than that obtained in most other species of scale insects found on citrus in this State.

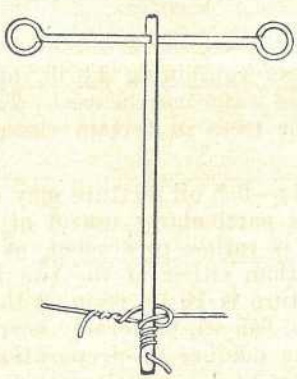
The control of pink wax is by no means easily accomplished, and commercial growers with large numbers of trees affected by the pest are advised to consult Bulletin No. 10 of the Division of Entomology and Plant Pathology in which fuller information on the subject is to be found.

Removal of Sooty Mould.

It must always be remembered that sooty mould cannot exist without the presence of pink wax or some such insect which will provide it with food material. Therefore the best method of coping with the sooty mould is to combat the insect pest. There are, however, times when this is impracticable, and then it generally becomes necessary to remove the mould from the fruit before marketing. Light brushing may be employed, and with light infestations this is usually all that is required; washing the fruit may, however, have to be adopted. Recently Mr. J. L. Smith, of Palmwoods, brought to notice a method, the details of which were published in "Farming in South Africa." This consists in immersing the fruit for approximately one minute in a solution containing ¼ lb. of boracic acid and ¼ lb. of chloride of lime to each gallon of water. This method has been employed largely in the Maroochy district during the present season, and has been found very satisfactory. The mould was thoroughly removed from the fruit, and tests showed that no ill effects to the fruit followed the application of this treatment. It is recommended that the fruit be well washed after immersion in the cleansing solution, as otherwise a whitish deposit will probably be left on drying. It is, of course, very advisable to allow the fruit to dry well before packing.

A WIRE SPLICER.

The illustration shows a wire stretcher and splicer, which has been used with success. Take a piece of ¾-inch rod 18 inches long, and drill a ¼-inch hole 1 inch from one end to receive the wire to be stretched. Flatten the other end and drill



a $\frac{7}{16}$-inch hole to receive a $\frac{5}{8}$-inch by 18-inch rod for a handle. Put it through and turn the loops on each end. The illustration shows how to use when repairing a broken wire. It can also be used as an ordinary stretcher.—"The New Zealand Farmer."

Our Present Knowledge of the Association of Insects with Disease.

By F. H. S. ROBERTS, D.Sc., Animal Health Station, Yeerongpilly.

ALTHOUGH the part played by insects in the spread of disease is of comparatively modern determination, the suggestion that insects and disease may be intimately associated is centuries old. As early as 1577, Mercurialis, an Italian physician, suggested that plague, which was then ravishing Europe, may be carried by flies feeding on the dead and dying and later depositing contaminated fæcal matter on the food consumed by healthy persons. In the literature of the 18th century, various theories appeared as to the association of insects with disease. Edward Bancroft, in 1796, contended that yaws was transmitted by flies, which fed on diseased persons and spread the infection by settling on open wounds and abrasions on healthy persons. In 1848, Josiah Nott, of Alabama, published a remarkable article in which he gave reasons for supposing that yellow fever was an insect-borne disease, and although he mentioned many insects he did not specify any one as the particular vector. The connection between the mosquito and malaria had long been held, it is said, by the Italian and Tyrolese peasants, and even by the natives of East Africa, but the first charge to be brought against the mosquito by scientific authority was in connection with yellow fever, when in 1881 the transmission of this disease was attributed to a definite species. Three years later the first well-formulated theory of the mosquito and malaria was advanced, and in 1898, Ross, in India, demonstrated beyond doubt the important role played by mosquitoes in the dissemination of this disease. In 1894, Smith and Kilborne showed that the redwater organism in cattle, *Babesia bigeminum,* was carried by the tick *Boophilus annulatus,* and epoch making in the history of the association of insects with those diseases brought about by infestation with helminths or worms was Manson's discovery that mosquitoes were the vectors of *Waucheria bancrofti,* which causes filariasis in man.

During and immediately subsequent to the period of the Great War, lice were discovered to be the vectors of trench fever, and the role of the house fly in the dissemination of disease organisms was proven beyond doubt. These discoveries provided the necessary recognition of the importance of insects in the spread of disease, and during the past twenty-five years the evidence brought to light has been so outstanding that entomology must now take its place as an invaluable branch of preventive medicine.

Only what are considered the more important insect-borne diseases are dealt with in these notes. It is proposed to divide the discussion into six sections according as the diseases are directly attributable to insects; or are of unknown origin; or of virus origin; or of bacterial origin; or of protozoan origin; or, finally, of helminthal origin. The term insect has been used in its broad sense to include the mites and ticks, for the omission of these on the grounds that they are not true insects, would, it is considered, seriously impair any value which may otherwise be attached to these notes.

How Insects Carry Disease.

The part played by insects in the transmission of disease may be either mechanical or biological. Mechanical transmission concerns those organisms which are taken up by the insect when feeding on excretionary substances and later deposited on food. The organism may pass through the insect's body to be later excreted in the fæces, or simpler still, may be transported per medium of the hairs, etc., of the insect's legs and body to which it adheres.

Biological transmission on the other hand occurs when the organism must pass part of its life cycle in the insect before it reaches the stage in which it is ready to infect the host. In this case the insect is known as the intermediate or secondary host.

When insects carry disease germs to food and water the method of transmission is called contamination. This is the simplest form of transmission and occurs also, of course, when the disease organism gains access into the body through the presence of wounds.

There are also diseases which have their origin through the insect carrier biting the body and sucking blood. Such a disease is transmitted by inoculation.

Insect-borne Diseases of Unknown Origin.

Of the insect-borne diseases of unknown origin probably the most important is dengue fever of man. This is typically a disease of Australia, though it has been reported from India, Africa, and other places. The insect concerned in its transmission is the day-biting house mosquito, *Aedes aegypti.*

Paralysis of man and the domesticated animals through infestation with ticks is known from Australia, South Africa, and North America, the species concerned being *Ixodes holocyclus, Ixodes pilosus,* and *Dermacentor andersoni,* respectively. This paralysis is considered to be due to the injection of a toxin which is secreted in the salivary glands of the female tick at the period when it is approaching engorgement.

Insect-borne Diseases of Virus Origin.

Yellow fever of man, which occurs in South and Central America and West Africa, is mosquito-borne, and is transmitted by *Aedes aegypti.* It is a remarkable fact that the mechanism of transmission of yellow fever by this species of mosquito was discovered long before the cause of the disease, and the knowledge thus gained has been so successfully applied that the disease has to a large extent been eradicated. It was the application of this knowledge that made the Panama Canal a possibility. Louping ill, a serious disease of sheep, and sometimes man, is transmitted in England by the tick *Ixodes ricinus,* and in South Africa (Kenya) by the species *Rhipicephalus appendiculatus.* Rift Valley fever of sheep, cattle, and man has recently been demonstrated to be spread by three species of mosquitoes of the genus Mansonia. Nairobi sheep disease is carried by the ticks *Rhipicephalus appendiculatus* and *Amblyomma variegatum.* Fowl pox, a cosmopolitan disease of fowls which is contagious, may also be carried by mosquitoes, whilst a species of this family, *Aedes lineatopennis,* may transmit the African disease of sheep known as blue tongue.

Insect-borne Diseases of Protozoan Origin.

The most important vectors of diseases of this type are the biting insects, the disease being usually transmitted through the act of sucking blood.

Of the many diseases of protozoan origin affecting man one of the most important and most widespread is malaria, the plasmodium of which is carried by various species of anopheline mosquitoes. Avian malaria is also mosquito-borne, *Culex fatigans, Cilex pipiens,* and two species of Aedes being concerned in its transmission.

To this group of diseases belong the various forms of diseases carried by the African tsetse flies. Human sleeping sickness caused by *Trypanosoma gambiense* is transmitted by the fly *Glossina palpalis,* while nagana of domestic animals caused by *T. vivax, T. brucei,* and *T. congolense,* may be transmitted by the same species. *Glossina morsitans* is also a carrier of the nagana trypanosomes, and also transmits *T. rhodiense,* which causes Rhodesian sleeping sickness. *Glossina pallidipes* may also transmit nagana. Soumaya, a disease of horses in the French Soudan, and also a trypanosome disease (*T. cazalboui*) is carried by tsetses. Surra (*T. evansi*), a serious disease of cattle and horses, may possibly be spread by any species of biting fly, but Tabanidae are the principal vectors. In South America the Trypanosome causing Chaga's disease of man, *T. cruzi,* is transmitted by species of the bug Triatoma.

Several diseases associated with Rickettsias are also carried by biting insects. Sandfly fever, or Mediterranean fever, is transmitted by the sand fly, *Phlebotomus papatasii.* The body louse, *Pediculus humanus corporis,* is the insect concerned with epidemics of trench and typhus fevers. Japanese river fever, endemic typhus, and Sumatran paratyphus are all transmitted by mites, the species concerned being *Trombicula akamuski, Liponyssus bacoti,* and *Trombicula deliensis,* respectively.

Three species of ticks, *Dermacentor andersoni, D. variabilis,* and *Haemaphysalis leporis-palustris* are responsible for the transmission of Rocky Mountain spotted fever, a disease of man occurring in the Rocky Mountain districts of the United States. African heartwater of cattle, sheep, and goats is also tick-borne, *Amblyomma hebraeum* and *A. variegatum* acting as transmitters.

Of the human spirochaete diseases, relapsing fever, caused by *Treponema recurrentis,* may be transmitted by either the head louse or the body louse. The tick *Argas moubata* transmits the African type of this disease caused by *T. duttoni.* The bed bug may also be concerned in the transmission of relapsing fevers, as these have been successfully transmitted by crushing bugs on the skin near the bite. Fowl tick fever, *Treponema gallinarum,* is carried by the fowl tick, *Argas persicus.* Spirochaetosis of cattle and horses in South Africa is spread by *Boophilus decoloratus,* a tick very closely allied to our own cattle tick.

Red-water disease, or piroplasmosis of cattle, which is receiving considerable attention in Australia at the present time, is caused by an organism known as *Babesia bigeminum.* In Australia the only known carrier is the tick *Boophilus microplus,* which also transmits the disease in the United States, South America, and South Africa. In this latter country the ticks *B Boophilus decoloratus, Rhipicephalus appendiculatus, R. evertsi,* and *Haemaphysalis cinnabarina punctata* are

also known carriers. In the United States the principal intermediate host of this disease is *B. annulatus.* The English form of bovine tick fever, caused by *Babesia bovis,* is transmitted by *Ixodes ricinus.* An allied organism is found in dogs causing canine piroplasmosis, or malignant jaundice, and is transmitted by the ticks *Rhipicephalus sanguineus, Haemphysalis leachi,* and *Dermacentor reticulatus.* Ovine piroplasmosis is carried by *Rhipicephalus evertsi,* while the poultry piroplasm, *Aegyptianella pullorum,* is carried by the fowl tick *Argas persicus.* African gall sickness, or anaplasmosis of cattle, which occurs also in America and Australia, is said to be transmitted by various species of ticks, namely *Boophilus decoloratus, Rhipicephalus simus, R. sanguineus, Dermacentor variabilis,* and *Boophilus annulatus,* whilst American workers claim successful transmission of the organism of this disease with various species of Tabanidae and the stable fly, *Stomoxys calcitrans.* In Africa, east coast fever of cattle, caused by *Theileria parva,* is spread by no less than five ticks of the genus Rhipicephalus, of which *R. appendiculatus* is the most important, whilst biliary fever of horses (*Nuttallia equi*) is transmitted by two species of the same genus.

Sand flies of the genus Simulium, *S. venustum,* transmit Leucocytozoon of ducks, and while *Leishmania donovani,* the flagellate cause of Kala Azar, is able to undergo development in *Phlebotomus argentipes* and *P. chinensis,* no transmission experiments with man have yet been successful. Oriental sore, caused by *Leishmania tropica,* however, is probably transmitted by *P. papatasii.*

Among the non-biting flies the house fly, *Musca domestica,* is implicated as a vector of *Treponema pertenue,* which causes yaws, and the same species may act as a mechanical transmitter of the cystic forms of various protozoa which give rise to pathogenic conditions in man, such as amoebic dysentery.

The house fly and species of blowflies, Chrysomia and Sarcophaga, are also associated with the spread of murrina, a trypanosome disease of horses present in the United States and Central America.

Insect-borne Diseases of Bacterial Origin.

A brief survey of the data relating to the Muscid flies, particularly the house fly, *Musca domestica,* reveals that these flies are capable of transmitting a large number of diseases caused by bacterial infection. Some of the organisms are taken from sputum, some from infected wounds, and some from excreta. We find, for example, the organisms of conjunctivitis, infantile diarrhoea, enteritis, typhoid fever, food poisoning, tuberculosis, anthrax, erysipelas, bacillary dysentery, and cholera normally carried by flies which frequent our houses, visit our bodies, and pollute our food. There is also evidence that these flies may carry the organisms of other diseases, and it would seem as though such flies can carry any bacterial disease in which the organism is available to the insects in the sputum, on the body, or in the excreta.

Cockroaches may also play a part in the spread of bacterial diseases, for the germs of septicaemia have been shown to be carried on the feet of *Blatella germanica,* whilst *Blatta orientalis* has been demonstrated experimentally to transmit anthrax.

Biting flies are responsible for perhaps only one serious disease of bacterial origin, namely, anthrax, which may be transmitted by some species of Tabanidae and the stable fly, *Stomoxys calcitrans.*

Fleas are extremely important as being concerned with the transmission of *Bacillus pestis*, the cause of bubonic plague. *Ctenocephalides canis, C. felis, Leptopsylla segnis,* and *Pulex irritans* have been shown capable of transmitting this disease from rat to rat, but the only species yet implicated in its transmission to man are *Xenopsylla cheopsis, X. astia,* and perhaps *X. braziliensis,* of which *X. cheopsis* is the most adapted carrier. The organism is taken up with the blood of the host, and infection occurs through the scratching in of the flea fæces or of the regurgitated bacillus-laden blood. Fleas may also play some part in the transmission of other diseases the organisms of which occur in the blood, for it has recently been discovered that the cat flea, *Ctenocephalides felis,* may transmit *Pasturella boviseptica,* a cause of haemorrhagic septicaemia in cattle.

Tularaemia, a disease of wild rodents in North America, and transmissible to man in whom it takes the form of a slow fever accompanied by considerable emaciation, may be spread by a number of biting insects and ticks, and of the latter the following species have been proved carriers:—*Haemaphysalis leporis-palustris, Dermacentor variabilis, D. andersoni, Rhipicephalus sanguineus,* and *Amblyomma americanum.* Ticks may possibly be concerned in the mechanical transmission of many bacterial diseases, for their bite is usually severe, and constitutes a ready access for many bacteria into the body.

Insect-borne Diseases of Helminthal Origin.

The part that insects usually play in the propagation of the worm parasites of the higher animals is that of intermediate hosts in which certain larval stages of the parasites are passed before they are ready to enter their final hosts in which they develop to maturity. The eggs of certain roundworms and tapeworms may also be mechanically carried by certain excreta feeding insects such as flies and cockroaches, but the importance of insects as transmitters in this role is generally conceded to be comparatively slight.

Insects may become infected and act as intermediate hosts in various ways. The eggs of worms which inhabit the alimentary canal are discharged with the fæces, and here the coprophagous insects, if they are suitable, play their part. Certain parasites which in the adult stage live in relation with the blood stream have blood-sucking insects as intermediate hosts. The final host becomes infected when in some way or other it ingests the insect containing the larval stages or the larval stages gain ingress into its body through the insect sucking blood.

The order Diptera is one of the most important in the role of transmitters of helminth diseases of man and domestic animals. *Waucheria bancrofti,* the cause of filariasis in man, a disease widely spread throughout the world in tropical and subtropical regions, is transmitted by various anophelene and culicine mosquitoes, chief of which is the night-biting house mosquito, *Culex fatigans.* Loa loa, a somewhat similar disease is spread by species of flies belonging to the genus Chrysops. Sand flies play an important role as transmitters of allied worms, for *Simulium damnosum* transmits *Onchocerca volvulus, Culicoides austeni* transmits *Acanthocheilonema perstans,* and *C. furens* transmits *Filaria ozzardi,* all of which are parasites of man. The intermediate host of *Onchocerca cervicalis,* which is found in the neck ligament of the horse, and considered to be associated with poll evil, is also a sand fly,

Culicoides nebulosus. The heart worm of dogs,, *Dirofilaria immitis,* is spread through the agency of certain mosquitoes, Anopheles, Myzorrhynchus, *Culex fatigans* and *Aedes aegypti.* Habronemiasis of the horse, a disease associated with infestation by species of Habronema and a cause of debility in these animals, is spread by the house fly (*H. megastoma* and *H. muscae*) and the stable fly, *Stomoxys calcitrans* (*H. microstoma*) both of which intermediate hosts become infected in the larval stage through feeding in dung containing the eggs of these parasites. The house fly is also an intermediate host for certain species of tapeworms infesting poultry.

Certain species of fleas act as intermediate hosts for tapeworms also. *Ctenocephalides felis, C. canis,* and *Pulex irritans* have proved suitable for the development of the larval stage of *Dipylidium caninum,* a common tapeworm of the dog which is occasionally found in children. *Hymenolepis diminuta,* a tapeworm of rats and of frequent occurrence in man, has been recorded in the larval stage from *Ceratophyllus fasciatus, Xenopsylla cheopsis, Pulex irritans,* and *Ctenocephalides canis.*

Cockroaches are also concerned, for *Oxyspirura parvovum,* the eye worm of the domestic fowl, is spread by *Pycnoscelus surinamensis;* and *Blatella germanica* is the intermediate host of *Gongylonema pulchrum* of cattle and sheep. The tapeworm *Hymenolepis diminuta* may also be transmitted through the agency of species of this family.

There is a single record of a species acting as the intermediate host of an helminth parasite in each of the orders Anopleura or lice, Lepidoptera or butterflies and moths, and Isoptera or white ants, where we find the common biting louse of the dog, *Trichodectes canis,* an intermediate host of the tapeworm *Dypilidium caninum* of the dog; the lepidopteron *Asopia farinalis,* an intermediate host of *Hymenolepis diminuta* of the rat and man, and *Macrohodothermes mossambicus,* a termite concerned in the transmission of *Harteria gallinarum,* a nematode parasite of the fowl, respectively.

Grasshoppers belonging to the genus *Melanoplus* have been found suitable for the development of the intermediate stages of species of *Tetrameres* and *Acuaria hamulosa,* which occur in the glandular stomach and gizzard, respectively, of the domestic fowl. In this host, also, a fluke found in the oviducts, *Prosthogonimus* spp., is spread by various species of dragon flies.

It is not surprising that the order Coleoptera or beetles should contain numerous species acting as intermediate hosts for worm parasites, as this order includes a large number of dung-frequenting species. Many of the tapeworms of poultry and certain of the nematodes of the higher animals are spread in this manner. Two species of stomach worms of the pig are dependent upon species of Geotrupes and Scarabæus for their larval development, whilst larvæ of beetles of the genera Melalontha, Cetonia, Phyllophaga, and Diloboderus are required to complete the life cycle of the thorn-headed worm of pigs.

Diseases Directly Attributable to Insects.

All pathological conditions directly attributable to insects, whether of a serious nature or not, should be included in a complete survey. The fear of insects, the annoyance and worry they cause, are types of such conditions due to insect presence, and numerous instances may

be quoted of the injuries which may follow attempts to avoid the attacks of insects. The irritation and other ill effects caused by biting flies, such as sandflies and march flies, and by the myriads of bush flies which frequent the secretions of the mouth, eyes, and nostrils are generally recognised. Outstanding of all types of injuries directly due to insects is myiasis—i.e., the attack of living animals by fly larvae. Of the first form of myiasis we have an excellent example in the sheep maggot flies. Here we have a number of species of flies whose maggots are to be found infesting the living sheep and causing untold agony and loss. Fortunately, so far as we in Australia are concerned, this is the only example of myiasis we are likely to encounter at all frequently. In Europe, America, and Africa there are certain species of flesh flies and blowflies of the genera *Sacrophaga, Wohlfartia, Cochliomyia,* and *Chrysomyia,* whose larvae infest open wounds and abrasions in many animals, including man. Another type of myiasis is furnished by the warble flies, *Hypoderma* sp., which occur during part of their lives beneath the skin of cattle. In South America a very interesting type of subcutaneous myiasis occurs. The oestrid concerned is *Dermatobia hominis,* normally a parasite of cattle which has turned its attention to man. The eggs of this fly are deposited on the bodies of certain blood-sucking flies, especially the mosquito *Psorophora lutzi,* or attached to leaves frequented by these insects, whence they adhere to them. As soon as the insect bites, the heat of the animal or of the ingested blood causes the larvae to hatch and penetrate the skin.

The tumbu fly of Africa, *Cordylobia anthropophaga,* causes a similar type of injury to man and many domesticated and wild animals.

The outstanding species in intestinal myiasis are the bot flies of the genus *Gastrophilus,* whose larvae are to be found in the stomach of the horse and mule. Cases of intestinal and urinogenital myiasis, due to the larvae of *Fannia canicularis,* the latrine fly, *Piophila casei,* the cheese skipper, *Eristalis tenax,* the bee fly, and a few others, are fairly frequent, and worthy of inclusion as being of interest. Certain beetles of the genus *Onthophagus* have been recorded as infesting the intestinal tract of man and the domestic animals, and may at times have a harmful effect.

Of the blood-sucking forms of fly larvae the most important is the Congo floor maggot, *Auchmeromyia luteola,* which is closely associated with man. The larvae are nocturnal feeders, coming out at night and engorging with blood.

Finally we have the type of myiasis represented by the forms infesting the head passages, of which the sheep bot, *Oestrus ovis,* is the most typical. Other species of Oestridae are to be found in the nasal passages of deer, camels, &c.

The blood-sucking flies, of which the sand flies, march flies, mosquitos, stable fly, louse flies, buffalo, and horn flies are typical examples, and various species of ticks may, if very numerous, cause quite an appreciable loss of blood. Their bite is in some cases particularly severe, and it may also be the cause of a secondary and severe pathogenic disease.

The presence of lice is exceedingly annoying, and leads to a great deal of itching and scratching. Several skin diseases, such as urticaria, melanodermia, eczema, and pyodermia, may be a direct result of their

presence. Lice attack also, especially among the domesticated animals, may be so severe as to keep the animals poor and unthrifty, and may, in the case of young animals, result in death.

In the case of mite presence, various types of mange and scab result. The attack of the chigger mites of Europe and America is painful and difficult to relieve. Many of us are familiar with "scrub itch," which is caused by allied Trombidiid mites, and frequently our persons are subjected to an intense general and prolonged itching through the attacks of poultry mites which are carried into our houses by sparrows, pigeons, and starlings.

PLATE 132.

1935 SCHOOL OF INSTRUCTION IN PIG RAISING AT THE QUEENSLAND AGRICULTURAL COLLEGE, GATTON.

Sickness among Horses.

By J. A. RUDD, Director, Animal Health Station, Yeerongpilly.

RECENTLY cases of sickness among horses have been reported on the Western Darling Downs, beginning at Dulacca, and through Roma, Yeulba, and more recently at Mungallala, on the North Coastal region, in as far as Kilcoy. For years isolated cases of this trouble, which assumed the form of an epidemic, have been around Warwick and surrounding district.

The symptoms come on suddenly, and are usually noticed in the morning. They consist of the horse looking excessively dejected, as if he had been poisoned by some weed or mineral substance. He refuses food, and is in manifest pain, which comes on in spasms. His temperature is about 105 deg. F., respiration and pulse accelerated, with profuse diarrhoea and an insatiable thirst is gradually developed and lasts until the animal is prostated with sheer weakness, and death quickly follows.

Post mortem examination has proved that there is a marked relaxation of the pyloric phincter and a fluid condition of all contents of the alimentary tract, and, in some cases, marked enteritis in the peritoneal cavity, with a certain amount of pneumonia and congestion of the lungs in the pleural cavity. This latter condition depends largely on the ability of the animal to stand up to the attack for any length of time. The more emaciated or aged animal succumbs much sooner than those which are younger and stronger.

Treatment consists of bringing the animal into a warm, well-ventilated stable and rugging him, then the following ball or mixture should be administered:—

Aromatic spirits of ammonia	3 oz.
Tincture of opium	3 oz.
Raw linseed oil	7-8 oz.

This drench should be administered at once. Generally one drench is sufficient to bring about a marked improvement in the condition, provided it is administered as soon as the symptoms are first noticed.

A second drench may be given in about three hours. Water should be withheld for at least twenty-four hours, but a little straw or hay could be allowed if necessary as bulk. By far the better treatment is the following:—

Carbonate of ammonia	2 drachms
Powdered nux vomica	2 drachms

To be placed in a four-drachms gelatine capsule and administered as a ball.

The danger of this treatment must be apparent to all those who cannot efficiently administer a physic ball to a horse. If this ball breaks, the mouth is scalded, and water should be allowed so that the horse's mouth should be washed out. Usually two balls administered four hours apart are sufficient to effect a cure.

Animals which have not been under treatment, but have been on stable feed, have been known to recover, but only at the expense of a severe attack of laminitis or founder of the feet.

Horses affected out at grass, under paddock conditions, have also been known to make a good recovery without treatment, and an equal percentage, under similar conditions, have also died of the disease.

This ailment has been met with during the last ten years on the Darling Downs, but has never been reported in any other district in Queensland previous to this season.

TETANUS (LOCK JAW) AND ITS DANGERS.

Thus the medical correspondent of the "Sydney Morning Herald":—

Tetanus is a dangerous disease, and the mere mention of it has always caused fear because of its insidious method of attack and the high death-rate associated with it. It has attracted considerable attention of late years on account of the suggestion of the risk of its occurrence following surgical operations.

Tetanus, which is sometimes called "lockjaw," is caused by a germ which inhabits the soil and the intestinal canal of many kinds of animals. It has the capacity to form spores, which are very difficult to kill, and this is the great reason for the difficulty of guarding against infection. Bacteria or germs are easily killed by simple boiling, and in most cases by drying or the action of sunlight, and disease germs usually have a very brief capacity for life outside the body. Spores, on the other hand, can resist boiling for a considerable time. Fortunately, very few disease germs have the capacity for spore formation, but the tetanus bacillus is one of these.

In some countries, the soils are impregnated with tetanus germs. This is the case in many parts of America, and hundreds die every year from trivial scratches. The soil of France and Belgium in the war zone was crowded with tetanus germs, and the disease would, in all probability, have stopped the war by virtue of the almost inevitably fatal termination to all wounds, had it not been for the universal use of anti-tetanic serum. Fortunately the disease is relatively rare in Australia.

There is a popular belief that a wound at the base of the thumb is especially dangerous. There is no basis for this beyond the fact that any wound on the hand is more likely to be infected with tetanus germs which exist in soil than are wounds elsewhere.

The germ of tetanus belongs to a variety of germs that are known as anaerobic, because they flourish in the absence of air better than when exposed to the air, Consequently, deep punctured wounds, where air cannot reach the depths, are more dangerous than shallow cuts or grazes. If tetanus germs are present on the skin a mere puncture with a pin can prove fatal.

In countries where tetanus is common, every wound, however trivial, should be treated by an injection of anti-tetanic serum, but this is quite unnecessary in this country. However, it is wise to give an injection even in Australia in the case of wounds where there is contamination with soil or stable manure, especially if the wound is of the punctured variety. It should certainly be given in serious street accidents, and in cases where a garden fork or spade has injured a foot.

Tetanus may not develop for weeks after the original injury, but as a rule the earlier the onset of symptoms the more severe the attack. The important point to remember is that while the disease is very difficult to cure, it is very easily prevented. The war proved that anti-tetanic serum is sufficient to protect in over 99 per cent. of cases, but the same serum is not very effective in the treatment of an established case after symptoms have commenced.

There has been considerable public fear of the possibility of post-operative tetanus. It is true that there have occurred several cases in the past two years. It is also true that the tetanus germ is a normal inhabitant of the intestines of the sheep, from which surgical catgut is made. But, on the other hand, there have been as many cases of post-operative tetanus following operations in which catgut has not been used at all. In these cases it is certain that the germ was either present in the patient before operation, or was blown into the wound from minute dust particles in the air.

BLOWFLY STRIKE IN SHEEP.

METHODS OF CONTROL.

By JAS. CAREW.

THE serious problem, although claiming the attention of practical men and scientists for years, is still causing considerable trouble and loss. Shearing the sheep gives a high percentage of protection during normal conditions for several weeks. As approximately 90 per cent. of strike takes place around the crutch, the method of crutching is practised to act as shearing does, that is to reduce the length of wool to allow the surface to dry out, and reduce the length of protective covering. Dipping, say, about six weeks after shearing, especially with those mixtures which carry 2 per cent. of arsenic, is another protective measure which is not fully appreciated.

As a result of experiments carried out over a period of several years, both at Gindie State Farm, Emerald, and Dalmally, near Roma, jetting an arsenical mixture containing ·7 per cent. of arsenic per 100 gallons of water through a jetting nozzle into the wool of the crutch, at from 60 to 160 lb. pressure per square inch, was found to give most satisfactory results.

Since then, arsenic has been included in practically all the most reliable dressings for protecting the sheep against strike. Other recommendations to render the sheep less susceptible to strike, are important, and include breeding to eliminate wrinkles and crutch folds. The removal of crutch folds as introduced by M. J. H. Mules, called "The Mules Treatment," which is a surgical but simple operation. By these methods, it is not claimed that they will prevent strike, but to minimise it to an appreciable extent. Usually flies become active about three weeks after the first spring rains, and if conditions are favourable, they come in waves, increasing in intensity until difficult to control with any of the methods yet introduced. Many blowfly specifics are now manufactured in Queensland, all of which carry instructions on the

labels. This Department published a formula about two years ago as follows:—

40 per cent. Shell Diselene Oil or Vacuum 28-38 Fuel Oil;
55 per cent. Herring or Cod Oil;
5 per cent. Cresylic Acid;
0·1 Sodium Arsenite, or 1 lb. to 100 gallons.

For the convenience of making 5 gallons of the mixture, take 22 pints cod oil, 16 pints fuel oil (not more than 875 specific gravity), 2 pints cresylic acid, and 1 oz. sodium arsenite.

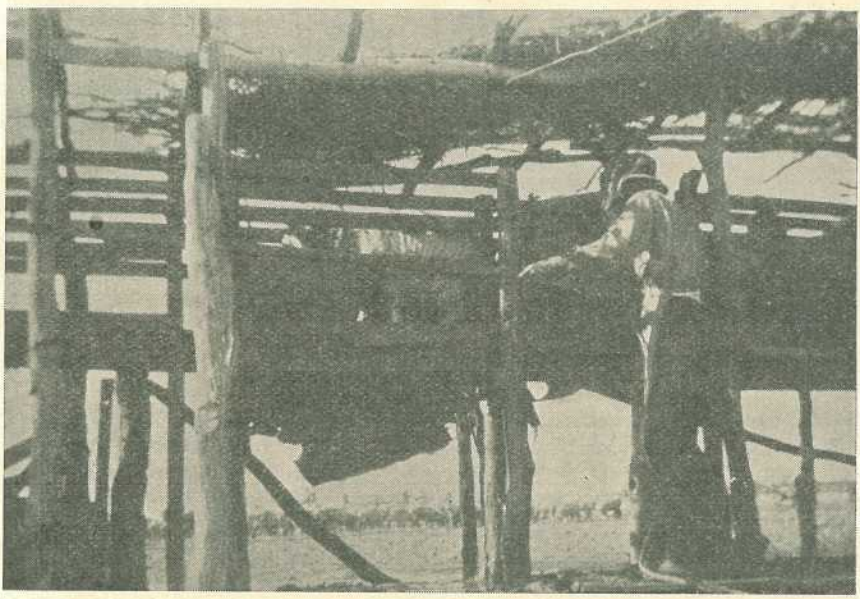


PLATE 133.
Elevated Jetting Race.

To Mix.

Place the 22 pints of cod oil in a 5 gallon drum and add the 1 oz. the sodium arsenite, shake well, and add the other ingredients as above. Should the weather be cold, heat at least some of the cod oil and add the sodium arsenite, shake well, and add the other ingredients as abvoe.

The mixture should be well shaken before using, and shaken up occasionally while in use, and applied with a brush or swab.

The conditions under which the ingredients were purchased allowed the specific to be sold, including the container and freight, at 3s. per gallon.

This mixture is meant for struck sheep only, but when used for lamb marking, it has under practical tests secured immunity from strike for some weeks. A preparation of this description should be an antiseptic as well as a healing agent, and afford some protection to sheep or lambs to prevent maggots developing from future strike.

If the specific applied cannot be scoured out successfully after being shorn, much trouble, inconvenience, and actual loss is incurred,

therefore the ingredients and quantities, as given, must be adhered to. When sheep are yarded for attention, those that have already been struck should be run off for special treatment.

It is also a most desirable safeguard to make a separate flock of all sheep that have been or are blown. Sheep should be kept free from parasites, and their general health maintained to the highest possible degree under existing conditions.

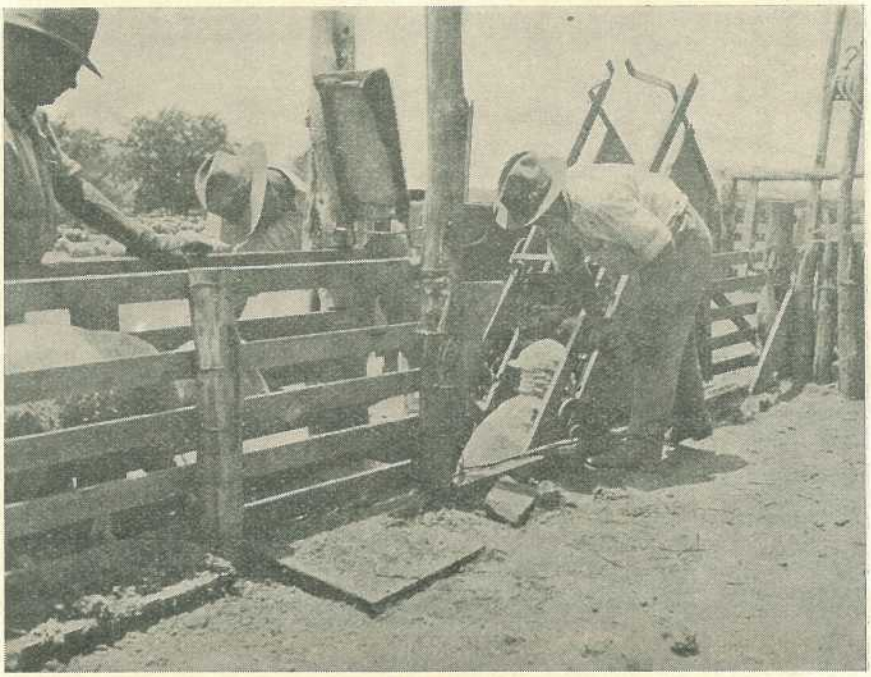


Plate 134.
The Shannon Tipping Dip.

During dry conditions, when grass is dry, healthy sheep should not be conducive to fly strike. If the grass is sufficiently good to maintain condition, the sheep should be healthy. If internal parasites are present in sufficiently large numbers to cause scouring, fly strike is likely to continue except under extreme hot or cold weather conditions.

It is a good policy to sum up seasonal conditions, watch for the first strike, and then, as soon as possible, adopt the method favoured and treat the whole flock, whether it be shearing, crutching, jetting, or dipping.

Recently the Council for Scientfic and Industrial Research introduced the Glycero-Boric Blowfly Dressing, which is as follows:—

1 gallon (13 lb.) glycerine, 3 lb. powdered boric acid.

A thick paste is formed, which is then heated and stirred until all the boric acid is dissolved. This results in the formation of various borates of glycerine. After cooling, the clear solution should be kept in well corked bottles or tins, and should be used without dilution. This

new dressing is described as a colourless, odourless, rather viscous fluid, which is easily rubbed into the shorn area of a strike, and adheres readily to the fleece and the skin. It reduces the unpleasant odour, but kills the maggots rather slowly, 24 to 30 hours often elapsing before all maggots are dead, but they cease to worry the sheep immediately the dressing is applied. At present prices, the cost of the dressing will be not less than 11s. per gallon, which works out at about 2d. per sheep dressed.

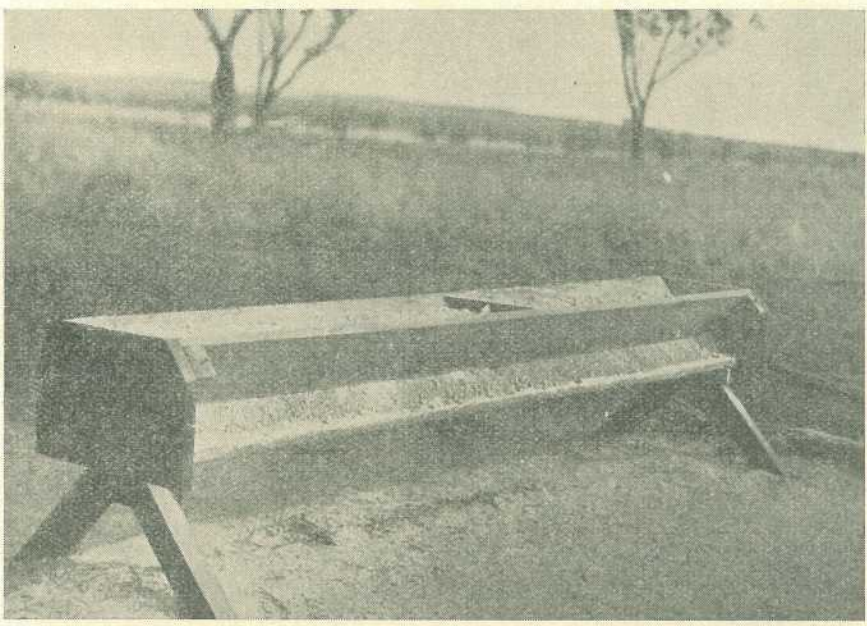


Plate 135.
Sheep Tick Trough Uncovered.

Small flocks, which are under close observation, can be handled successfully without much inconvenience or loss. In dealing with large flocks, it is most satisfactory, when the fly is first noticed, to treat all sheep in the flock.

Jetting, as Shown in Photograph.

Bringing the sheep together and dressing just those that are struck does not get over the difficulty, but rather causes an increase in the percentage of strikes. Dirty and struck sheep rubbing against those that are clean and free, only tends to increase susceptibility, therefore render all the sheep as proof against the fly as possible.

The latest addition to the method of treatment is that invented by Mr. J. Y. Shannon, Rodney Downs, Ilfracombe, and called a tipping dip. This consists of a tipping cage, which is fixed in a race over a dipping bath. As the sheep enter the cage, it is tipped by means of a man-powered lever (see photograph). The hind quarters of the sheep are dipped in the mixture, which carries from 3 to 4 lb. arsenic per 100 gallons of water, which is approximately half the strength used for jetting, and double the strength used for dipping. Mr. Shannon

claims for this, that not only does it kill the maggots on blown sheep, without removing the wool beforehand, but that it also kills large numbers of flies after dipping, and while still moist enough for flies to suck the poisonous moisture from the wool.

The Importance of Licks for Sheep.

The chief mineral requirements for sheep are salt, lime, and phosphoric acid, therefore any lick containing these ingredients in the correct proportion will be an advantage.

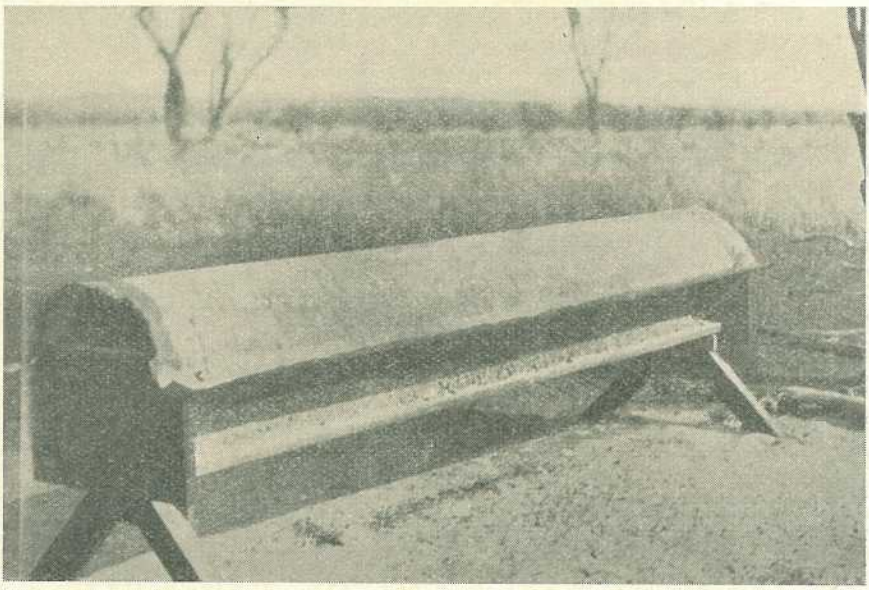


Plate 136.
Trough with Cover Adjusted.

The amount of salt or other mineral contained in the drinking water is an important factor when compounding a lick. The more salt in the water the less is necessary in a lick, even to eliminating it entirely, in which case meals can be added in order to induce the sheep to take their requirements of lime and phosphoric acid. Both of these ingredients are present in finely ground Nauru Phosphate in fairly even quantities, and also in bonemeal, which should be sterilised before being used in a stock lick. Bonemeal also contains a proportion of protein, which gives it an added advantage. No lick, however, should be expected to take the place of a food, but it is reasonable to expect it to give an added advantage to the food available. In supplying the mineral deficiency the lick will help to tone up the system, improve the digestive organs, create a better appetite, cause a greater amount of food to be consumed, and put it to better use.

The chief minerals must be supplied in fairly well balanced amounts, otherwise a craving still exists. The idea of salt or salt and lime supplying the deficiency and fully satisfying the craving is not correct, as phosphoric acid is just as important as other minerals under varying sets of circumstances. As phosphoric acid is one of the chief elements

deficient in our grasses when dry, and in shrubs and trees as proved by analysis, its inclusion in a lick is important, and it is the most economic way to supply it. In South African experiments it proved valuable in increasing the supply of milk, and caused an increased amount of roughage to be consumed. When sheep are on dry grass, or when feeding on scrub, a good lick should consist of the following:—

30 lb. coarse crude salt free from large lumps;
25 lb. finely ground Nauru Phosphate;
25 lb. Calphos or sterilised bone meal;
10 lb. wheat, maize or decorticated cotton seed meal;
5 lb. protein meal;
5 lb. Epsom Salts.

After mixing thoroughly, it should be moistened with molasses.

Many stock licks are manufactured in Queensland, all of which must be registered for sale here, and have the active ingredients stated on a label attached to the container. If an owner is acquainted with the analysis of the water the sheep are running on and the feeding value of the pasture, he should be able to form a fair idea of the suitability or otherwise of a lick.

When salt (sodium chloride) is needed, not more than 50 per cent. is necessary, while the phosphoric acid (P_2O_5) should show at from 10 to 15 per cent., and the lime (C_a O) at a little less, both of which can be supplied in the form of bone meals or phosphates.

An Automatic Lick Trough.

This lick trough has been designed by and used by Mr. Allan Campbell, Dalmally, Roma.

It is simple in construction, being composed of four pieces of 3 x 2 inch hardwood for legs and side supports, three pieces of 10 x 1¼ inch pine for sides and lick board and the short end pieces, which also help to brace the frame. The trough is about 7 feet 6 inches in length, and is capable of holding 1 cwt. mixed lick. The cover is a section of old water troughing, which was frayed at the joints, which fits down on the frame and is held in position by V slits fitting down on to stout, large-headed nails. When the troughing is pressed down it is secured by the reversed V gripping the nail.

Plate 135 shows the trough filled but not covered; Plate 136, the trough with the lid on.

PLATE 137.—YOUNG FARMERS AT THE DEPARTMENT OF AGRICULTURE AND STOCK.

This interesting group of farm boys and girls, who were guests of the Royal National Association at the Brisbane Show in August, included representatives of Project Clubs in the three Eastern States. At the invitation of the Minister, Hon. Frank W. Bulcock, they visited the Departmental laboratories in which they were given practical demonstrations of the value of science as applied to the primary industries. Included in the group are the teachers in charge:—Miss A. E. Bott, Messrs. A. G. Aitcheson, E. J. Andrews (Queensland); A. L. Nicod (New South Wales); and J. J. Keddie (Victoria). Mr. R. Wilson (Assistant Under Secretary, Department of Agriculture and Stock, Q.) is on the extreme right in the front row.

Chicken Raising Experiments.

WITH the object of confirming some results obtained in previous tests, and determining the most economic age at which the feeding of a high protein content could be discontinued, certain experiments were outlined by the Poultry Advisory Committee. These experiments were conducted at the Animal Health Station during the period 1933 to 1935, and embrace tests with light breeds and heavy breeds.

Experiments with White Leghorns.

Experiments conducted previously have shown that it is essential to feed a ration with a high protein content, to chicks in the early stages of growth, in order to obtain the maximum development. However, these experiments have also indicated that it might not be necessary to continue to feed the high protein ration after the chicks reach a certain age

An experiment was initiated on 11th September, 1933, with the object of determining at what stage in the rearing of chicks the high protein ration could be replaced by a ration with a lower protein content in order to minimise the rearing costs. The all-mash system of feeding was adopted for these experiments, as this system facilitates the accurate recording of food consumption, and allows a homogeneous sample of food to be kept before the birds at all times.

The birds were housed in brooder pens (20 feet by 5 feet) for the first six weeks, after which they were transferred to larger pens (20 feet by 10 feet). The colony brooder system was used to rear the chickens. Feeding was commenced thirty-six hours after hatching, the food being placed in shallow trays about 1 inch deep. The size of these trays was increased as the chicks grew, until at four weeks old the chicks were given their feed in trays 5 inches deep. The food in the trays was covered with wire-netting to prevent wastage due to scratching.

Rations.—When deciding upon the ration to be used in this experiment, experience gained in previous experiments was used as a guide. Liberal use was made of milk products for the first six weeks, after which they were replaced by cheaper protein foods. The rations used were as follows:—

—	High Protein Ration (A).	High Protein Ration (B).	Low Protein Ration.
	Lb.	Lb.	Lb.
Maizemeal	56	56	63
Bran	12	12	13·5
Pollard	12	12	13·5
Dried buttermilk	14	5	2·5
Mebo meal	6	10	5·0
Lucerne meal	0	5	2·5
Cod liver oil	1	1	1
Salt	1	1	1
Cost per 100 lb.	9s. 8d.	8s. 4d.	7s. 9d.

Three hundred and twenty White Leghorn chicks were obtained at day old, were divided into four lots, each lot was weighed collectively, and placed in separate pens. The four pens were all fed high protein

ration (A), up to six weeks old, and conditions were kept as even as possible. The birds in each pen were weighed collectively at three-weekly intervals, and food consumption was recorded for the same periods. At six weeks old, the cockerels were removed and the pullets were placed in larger pens (20 feet by 10 feet). At this period definite changes were also made in rations fed. The lot in pen 1 were placed upon the low protein ration, while those in pens 2, 3, and 4 were supplied with ration high protein (B). At nine weeks of age the lot in pen 2 were placed on the low protein ration. Similar action was taken with those in pen 3 at twelve weeks and those in pen 4 at fifteen weeks. Consequently from this period onward all lots were being fed the low protein.

Table I. gives the average weights of pullets at the different ages, and the average total food consumption from the commencement of the test. The total food costs as well as the food costs per ounce gain in weight are also shown.

An examination of Table I. shows that there is no significant difference in the final weights of the birds reared under the different methods of feeding used in this experiment. When the live weight gains are considered in relation to the food costs, it is found that the birds, fed the high protein ration to six weeks only (pen 1), gave a slightly better result than the others. The differences, however, were not significant, as these differences were not greater than the experimental error which occurs under the group system of experimentation.

However, these experiments have indicated that there is no advantage to be gained by feeding the high protein ration after the chicks are six weeks old. There was no apparent difference in the general appearance of the birds in the different pens at maturity.

Due to the fact that no significant differences were observed in this experiment, it was necessary to duplicate this work in the following year. As a result, a similar experiment was initiated on 1st August, 1934, 300 day-old White Leghorn pullets being used in this case. The plan of the experiment was altered slightly, as experience obtained subsequent to the 1933 experiment had shown that the feeding of the high protein ration to 15 weeks was definitely of no advantage. The chickens were divided into three pens, each of which contained 100 birds. At six weeks old the birds in each pen were divided into two even lots, and each lot was placed in larger pens (20 feet by 10 feet). These, for reference, will be known as pens 1A and 1B, pens 2A and 2B, and pens 3A and 3B.

From this period onward, the birds in each pair of pens were treated in all respects similarly. The birds in pens 1A and 1B were changed to the low protein ration, whilst the birds in 2A and 2B and 3A and 3B were fed high protein ration B. At the age of nine weeks the birds in pens 2A and 2B were placed on the low protein ration, and similar action was taken with pens 3A and 3B at the age of twelve weeks; therefore, from the age of twelve weeks, all groups were being fed upon the low protein ration.

The duplication of the treatments was adopted in this experiment in order to determine the differences which might occur in two pens under the same conditions, due to experimental error. The birds in this experiment were reared in exactly the same manner and under the same conditions as the birds in the 1933 experiment, so that the results of the two experiments would be comparable.

TABLE I.

—	Pen 1.		Pen 2.		Pen 3.		Pen 4.	
	Weight.	Food Consumed.	Weight.	Food Consumed.	Weight.	Food Consumed.	Weight.	Food Consumed.
	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.
Day old	1·25	..	1·25	..	1·25	..	1·24	..
At 3 weeks old	6·88	11·78	6·80	12·16	7·08	12·39	6·84	12·47
At 6 weeks old	15·37	40·71	16·20	42·00	16·00	42·18	15·89	42·76
At 9 weeks old	24·21	78·71	25·64	80·66	27·50	81·78	27·16	81·71
At 12 weeks old	31·60	122·41	30·21	125·56	33·00	132·48	32·84	126·61
At 15 weeks old	38·20	168·01	38·40	173·86	40·70	176·18	40·95	177·71
At 18 weeks old	43·90	220·41	43·60	233·36	44·50	228·68	46·30	231·11
At 21 weeks old	52·50	279·31	52·00	297·06	53·50	285·38	53·50	289·01
Total food costs	16·71d.		17·76d.		17·37d.		17·77d.	
Food costs per oz. gain in weight	·326d.		·350d.		·333d.		·340d.	

Table II. gives the average weights of pullets at the different ages, and the average total food consumption from the commencement of the test. The total food costs, as well as the food costs per ounce gain in weight, are also shown:—

TABLE II.

	Pen 1.		Pen 2.		Pen 3.	
	Weight.	Food Consumed.	Weight.	Food Consumed.	Weight.	Food Consumed.
	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.
Day old	1·32	..	1·31	..	1·34	..
At 3 weeks old	6·08	11·36	6·00	10·84	6·02	11·82
At 6 weeks old	14·49	37·85	14·35	37·79	14·97	37·31
At 9 weeks old	21·70	75·70	21·37	72·55	23·44	74·18
At 12 weeks old	31·42	122·92	30·85	117·54	33·61	122·90
At 15 weeks old	38·86	173·69	38·62	172·26	41·46	175·70
At 18 weeks old	46·32	225·53	43·33	223·46	45·78	227·63
At 21 weeks old	52·60	283·49	51·77	280·60	54·87	286·91
Total food costs ..	17·30d.		17·25d.		17·85d.	
Food costs per oz. gain in weight	·338d.		·342d.		·334d.	

Table II. confirms the results obtained in the previous experiment—namely, that there is no definite advantage in the feeding of a high protein ration after chickens of the Leghorn variety reach the age of six weeks.

Table III. has been prepared to indicate the differences in weight that may occur among pens of birds reared and fed under similar conditions.

TABLE III.

Age.	Pen 1.		Pen 2.		Pen 3.	
	A.	B.	A.	B.	A.	B.
	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.
6 weeks	14·79	14·83	14·58	14·67	15·39	15·15
9 weeks	22·04	21·36	21·41	21·33	23·13	23·75
12 weeks	31·50	31·33	30·91	30·79	33·83	33·39
15 weeks	39·00	38·72	38·73	38·51	42·35	40·37
18 weeks	43·87	43·36	43·27	43·40	46·00	45·57
21 weeks	53·04	52·17	51·82	51·72	54·87	54·87

Experiments with Heavy Breeds.

Previous experiments with heavy breeds indicated that it would be advantageous to feed a high protein ration to such birds for a longer period than Leghorns. With the object of determining if such were so, two tests were conducted during 1934-35, with two different breeds.

The general system of brooding, housing, and feeding was in all respects similar to the tests already outlined.

Australorps.

For this test, 275 day-old chickens were purchased. They were divided into three lots, as equal as possible in every respect, and placed in separate pens.

All pens were fed the high protein ration A until they were six weeks of age. At this period the males were removed, and the test continued with pullets only.

Pen 1 was at six weeks placed upon the low protein ration, and pens 2 and 3 upon the high protein ration B. At nine weeks, pen 2 was placed upon the low protein ration, and at twelve weeks pen 3 was treated similarly.

Table IV. gives the average weights of the pullets at different ages, and the average total weight of food consumption from the commencement of the test. The total food costs, as well as the food costs per ounce gain in weight, are also shown:—

TABLE IV.

	Pen 1.		Pen 2.		Pen 3.	
	Weight.	Food Consumed.	Weight.	Food Consumed.	Weight.	Food Consumed.
	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.
Day old	1·30	..	1·29	..	1·30	..
3 weeks	6·25	10·81	5·98	10·48	6·07	10·69
6 weeks	16·84	44·21	16·76	43·73	16·11	42·34
9 weeks	28·87	90·32	27·36	85·81	28·43	84·89
12 weeks	37·60	141·06	39·92	141·23	39·92	136·59
15 weeks	49·53	204·32	49·88	201·9	50·47	196·63
18 weeks	55·18	264·85	57·28	261·02	57·36	256·78
21 weeks	65·06	327·64	64·00	324·02	64·09	319·33
Total food costs	20·01d.		19·93d.		19·87d.	
Food costs per oz. gain in weight	·314d.		·318d.		·317d.	

From Table IV. the only conclusion possible to arrive at is that there is no advantage to be gained by feeding a ration of a high protein content for a period any longer than six weeks. It must, however, be pointed out that the Australorp used in this test was of a small type. The standard weight of a pullet of this breed is 5 lb. There was an outbreak of coccidiosis in this test, and the lack of size may be attributed to this.

Light Sussex.

In this test 200 day-old chickens were procured. They were culled down upon receipt to 196, and then divided into two lots as equal as possible.

Each lot was placed in a separate pen, and the general system of management and the rations used for the test were similar to the tests already referred to.

Both lots were placed upon the high protein ration A for the first six weeks. The cockerels were then removed and the pullets in pen 1 placed upon the low protein ration and those in pen 2 upon the high protein ration B. At twelve weeks of age the pullets in pen 2 were placed upon the low protein ration.

Table V. gives the average weight of the pullets at different ages and the average total weight of food consumption from the commencement of the test. The total food costs, as well as the food costs per ounce gain in weight, are also shown:—

TABLE V.

—	Pen 1.		Pen 2.	
	Weight.	Food Consumed.	Weight.	Food Consumed.
	Oz.	Oz.	Oz.	Oz.
Day old	1·23	..	1·23	..
3 weeks	6·54	10·17	6·54	10·58
6 weeks	14·35	40·70	14·91	40·92
9 weeks	26·12	85·88	25·71	81·78
12 weeks	36·32	135·15	41·14	139·38
15 weeks	47·39	191·33	52·31	203·51
18 weeks	54·73	258·54	57·69	266·28
21 weeks	62·42	331·99	67·49	336·54
Total food costs	20·22d.		20·89d.	
Food costs per oz. gain in weight ..	·331d.		·315d.	

This experiment was also interfered with by an outbreak of coccidiosis, but from a study of the table there appears to be an advantage to be gained by extending the period of supply of a high protein ration for a longer period than six weeks.

Summary.

From these and preceding tests the following conclusions can be drawn:—

1. That a ration with a crude protein content of 18 to 19 per cent. (based upon average analyses of food stuffs) should be fed to—

   (*a*) Leghorn and light breed chickens for the first six weeks.

   (*b*) Heavy breeds for a slightly longer period (according to the size of the bird).

2. That the crude protein content of ration after the foregoing periods should be reduced to from 14 to 15 per cent.

3. That although no comparison test has been made, it has been noted in tests conducted that the inclusion of milk foods has a beneficial effect, and should be included in all rations fed to chickens in the early stages of development.

Cost of Production (White Leghorns).

In the conducting of experiments at the Animal Health Station, records have been kept of the cost of production as well as production. From these records, it is now possible to indicate the costs of rearing pullets, the profit over feed costs during the first year of production, and the profits over costs from second-year birds.

The Rearing of Pullets.

	£ s. d.	£ s. d.
Purchase of 313 day-old chickens	12 15 0	
Fodder costs for five months	14 3 0	
		26 18 0
Sale of cockerels—		
112 at 2d.; 47 at 6d.	2 2 2	
Sale—19 culled pullets at 2s. each	1 18 0	
		4 0 2
Total cost of rearing, exclusive of labour and plant, 116 pullets to laying age		22 17 10

Cost per pullet, 3s. 11.4d.

Profit Over Cost, First Year Production.

116 Birds.

1,783 dozen eggs, less allowance of 2 per cent. of production from breakages.	
Net return from sales	72 16 8
Food costs	35 15 0
Net return over feed costs	37 1 8

Net return per bird, 6s. 4.7d.

Profit Over Cost, Second Year Production.

85 Birds.

1,052 dozen eggs, less allowance for breakages of 2 per cent.	
Net return from sales	39 6 2
Food costs	24 14 0
Net return over feed costs	14 12 2

Net return per bird, 3s. 5.2d.

NOTE.—At the end of the first year's production, thirteen hens were culled, and at the end of the second year's lay, deaths had reduced the flock of 85 birds to 75. The market value of culled hens is in the vicinity of 3s. per pair, therefore the initial cost of the chickens should be credited with the sale of 44 pair of hens at 3s., a total of £6 12s.

The mortality in both years was greater than it normally should have been, primarily due to vent picking.

Costs of Producing Eggs Per Dozen.

	£ s. d.
Raising costs of pullets	22 17 10
Feed costs, first year	35 15 0
Feed costs, second year	24 14 0
	83 6 10
Less sales of hens	6 12 0
	76 14 10

£76 14s. 10d. produced 2,778 dozen marketable eggs.

6.6d. produced 1 dozen marketable eggs.

Manures and Fertilizers.

By E. H. GURNEY, A.A.C.I., Agricultural Chemist.*

BEFORE making a few statements concerning manures and fertilizers, it will be useful to make mention of some facts concerning plant life. Even casual observation of the growth in their natural state undisturbed by man, of the many and varied species of plant life, from giant tree to low-growing herbage, will yield information in connection with requirements of cultivated crops. It will be noticed, for instance, that particular trees thrive best on certain soil types, and under certain particular climatic conditions. Also, that some trees will flourish in soils of an extremely acid nature, and which soils may be more or less saturated with water, for long periods of time; the common ti-trees of our bush may be quoted in illustration.

Now, turning to plants cultivated by man, there are certain soil types and climatic conditions which are more suited than others for the successful growth of some of these cultivated crops. Thus on a somewhat acid soil, other soil conditions being favourable, successful crops of oats may be obtained, whereas good barley crops could not be grown on soil of the same degree of acidity. Again, as is well known, soils well supplied with lime, and not soils of an acid nature, are favourable to good lucerne growth, whilst maize will flourish on somewhat acid soils, other soil conditions being favourable.

Again, the root systems of the different crops have considerable variation. Thus lucerne has a particularly deep-rooted system when compared with maize, and mangolds are deeper rooted than turnips, and mangolds are thus enabled to obtain more plant-food from a soil than turnips. That different crops have varying power of assimilating soil plant-food is known, thus cereals and grass have a greater power of assimilating plant-food than root crops and potatoes.

From these briefly mentioned facts it will be understood the most successful returns of some crops result when certain soil conditions are present, but it must be also recognised that some soil conditions are essential for good crop growth, and that without such conditions satisfactory response to the applications of fertilizers will not be possible.

The essential factors above mentioned are good mechanical and biological soil condition.

A soil in good mechanical condition means a soil that remains in a more or less friable tilth after cultivation and rain, and has a good capacity for absorbing and retaining water. A soil in good biological condition refers to a soil that is well supplied with suitable bacteria.

Now, one of the most effective means of improving both these soil conditions is by increasing the humus content of the soil, and the mention of humus introduces the subject of manures.

When manures are spoken of it is generally understood that farmyard manure and bulky vegetable matter are referred to. These

* In a radio broadcast from A.B.C. National Stations 4QG, Brisbane, and 4RK, Rockhampton.

materials are composed mostly of organic matter containing nitrogen, together with a certain amount of mineral plant-foods. The organic matter of manures when ploughed into the soil is ultimately converted into humus by fermentation and bacterial agencies. The organic matter enables an increased bacterial population to exist in the soil, and also by increasing the humus of the soil, improves both the tilth and water-holding capacity of the soil.

Again, the humus, by inducing increased bacterial growth, increases the beneficial action of any fertilizer applied to the soil, as bacterial action aids in making more quickly available the fertilizing ingredients of the fertilizers, and also makes available for plants some of the otherwise unavailable plant food of the soil. For this reason, it is advisable to apply farmyard manure together with fertilizers, even if only a small amount of farmyard manure is available.

It is considered that one of the most important subjects confronting the cultivator of soil in Queensland at the present time is the maintenance or increasing of the humus content of the soil. The low humus content of a number of the soils forwarded by farmers to the Department of Agriculture and Stock for analysis, who state they cannot now raise successful crops, is one definite cause of their present poor crops.

The means by which the humus content of the soil may be supplemented are by returning all available farmyard manure to the soil, by ploughing in green manure crops and all plant waste material. Such means are, of course, well known, but can it be said that they are regularly and consistently adopted?

Animal manure is certainly now receiving more attention by the cultivator than in the past, as is evidenced by the increased use of sheep-manure by orchardists of Stanthorpe and other districts, and the dairy farmer is paying more attention to the collection and application of cow-manure to the soil for improvement in fodder crop returns, though there is considerable quantity of cow-manure allowed to waste in the grazing paddock. It would pay to collect this manure, as laying in the paddocks exposed to the weather most of its value as manure is lost.

Green manuring, as a means of returning humus to the soil, should exist consistently as a regular crop in any crop rotation system.

Waste or plant refuse is to a certain extent utilised by ploughing under any that happens to be laying on the land to be cultivated, but considerable amounts are wasted by not being collected, or by burning. A method of dealing with waste plant material that is being followed in some countries should prove valuable here. Briefly, the method is to put the plant material in a pit together with some nitrogenous and phosphatic fertilizing substance (for use by fermenting bacteria) and keeping the mass moist until it is well broken down by fermentation agencies; and in this form the vegetable matter is in a particularly suitable state to be applied to the soil.

Before speaking about fertilizers, a few remarks should be made in connection with lime. Though lime is present in all plant growth, usually applications of lime to the soil are not made for the purpose of lime, as plant food, as in most soils there is a sufficiency of lime

for plant requirement. Lime is applied for the following purposes:—Converting stiff, sticky soils into more friable tilth, neutralising a too acid soil condition, and making available some otherwise unavailable soil plant-food.

In connection with fertilizers, there are three plant-foods supplied commonly applied to the soil by means of fertilizers, and they are nitrogen, phosphoric acid and potash, as usually other plant food requirements are present in soils in sufficient amount. The three mentioned ingredients are declared in a fertilizer when sold in the order mentioned, thus a fertilizer declared as containing 4-12-10 means the fertilizer contains 4 per cent. nitrogen, 12 per cent. phosphoric acid, and 10 per cent. potash.

Nitrogen.

Nitrogen exists in a complexed combined form in plants. Different plants contain different amounts of nitrogen, thus lucerne has a higher nitrogen content than sugar-cane. Notwithstanding this fact, nitrogenous fertilizers are not required by lucerne, and sugar-cane frequently requires a nitrogen fertilizer for most successful growth. This apparent anomaly is due to the fact that lucerne obtains its nitrogen from air in the soil by means of bacteria that exist in the nodules attached to the roots of this plant. Again, the amount of nitrogen varies in the different portions of the plant, and also in the different stages of the plant's growth. Thus more nitrogen is found in the leaves than in the stem of the plant, and at later growth more in the seed than elsewhere. Further, in young plant-growth there is much more nitrogen than there is in matured plant-growth, and this is one of the reasons young grass-growth is so much more nutritious to stock than old matured grass.

Nitrogen stimulates the growth of stems and foliage, and for this reason fertilizers containing nitrogen in a quickly acting form are applied as top dressings during the growth of plants. Nitrate of soda and ammonium sulphate are fertilizers in which the nitrogen is quickly available to plants. The nitrogen in dried blood is not so quick acting as in the previously mentioned fertilizers, though its nitrogen is more quickly available to plants than the nitrogen of bone dust.

It has been mentioned that nitrogen stimulates the growth of stems and foliage; it is necessary to consider the effect desired to be obtained from the application of a fertilizer. In fodder crops plentiful growth of succulent stem and leafage is desired, therefore for such growth the crops must have, with other favourable conditions, a sufficient supply of nitrogen. A deep green colour in the leaf is an indication of sufficient nitrogen supply, though a more or less yellow colouring of the leaf is not always due to an inefficient nitrogen supply. In another case it may be that fruit trees are not showing sufficient growth; this would indicate the need for supplying nitrogen, but care must be taken that an excessive amount of nitrogen is not given, particularly if the trees at the time are not supplied with a phosphoric acid and potash sufficiency, for the nitrogen will increase tree growth, but development of flowers and fruit will be decreased.

Only the more commonly used nitrogenous fertilizers have been mentioned, and before speaking of other fertilizers it may be mentioned

that the ploughing in of green manure crops, particularly leguminous crops, supplies a considerable amount of nitrogen to the soil.

Phosphoric Acid.

The most commonly used fertilizers in Queensland containing phosphoric acid are superphosphate and bonedust. Superphosphate contains from 20 to 21 per cent. of phosphoric acid, which is in a water soluble form, and is therefore very quick acting. Bonedust contains from 20 to 25 per cent. phosphoric acid, which is not immediately available to plants, as this material is slowly decomposed in the soil. Frequently the most effect from the application of bonedust is noticeable in the year after application.

The effect upon plant growth of phosphoric acid is that it induces root-growth, increases crop-growth, and accelerates the ripening and maturity of crops.

It is to be stated that in some of our districts the soils, both cultivated and grazing, are deficient in phosphoric acid. In some cases good returns have been obtained with lucerne from the application of from 2 to 3 cwt. of superphosphate per acre, and big increase in clover growth in some pastures by the application of 2 cwt. of superphosphate per acre.

The good effect of superphosphate upon leguminous crops is stated to be caused by the soluble calcium phosphate of the superphosphate acting upon the nodule organism and increasing the chance of their getting to the roots of the legume and forming nodules necessary for good growth.

Potash.

This ingredient is obtained in Queensland in the fertilizers potassium sulphate and potassium muriate. Potassium sulphate contains 48 per cent. potash and potassium muriate 50 per cent. potash—the potash in both cases being water soluble, these fertilizers are quick acting. Potash seems to be connected with the formation of starch and sugar in plants, and in some cases with increased crop yield. Crops grown on soils deficient in potash are less resistant to the attacks of disease. The response to application of potash fertilizers is more noticeable on crops grown on light soils than in crops grown on heavier soil types.

COTTON PLANTING.

By R. W. PETERS, Cotton Experimentalist.

ONE of the most important operations of cotton-growing is the planting of the crop, yet it is surprising how little attention is given to it by many farmers. Unless the maximum stand is secured which is required for the variety or the soil type, the grower is handicapped in obtaining the fullest possible yield that the soil and seasonal conditions are capable of producing. Not only is it necessary to have a properly prepared seed bed to obtain a satisfactory stand of cotton but other factors have to be taken into consideration, and it is proposed to touch upon the most important of them in this discussion.

Time of Planting.

The general experiences of growers, and the results that have been obtained in Time of Planting Experiments at the Cotton Research Station in the Callide Valley, all indicate that planting as soon as conditions are favourable for obtaining and maintaining a good strike is advisable. Soil type also plays an important part, however. On old cultivations of fertile alluvial loams and clay loams and the average of the scrub soils, the best results over a series of seasons have been obtained from plantings made during late September and the first half of October in the Central district, and the latter half of October in the Southern districts. On old cultivations on the heavier clay loam slopes of the forest series, plantings up to mid-November can be made with good prospects of obtaining highly profitable yields. Likewise, plantings can be made later on new cultivations on all soil types; some instances of early December planting have been reported as yielding excellently. No advantage appears to be obtained by planting in August or early in September, even if climatic conditions are favourable, for the low soil temperatures generally retard germination to such an extent that usually early October plantings catch up with them, and often have a much better stand, especially if cold rains occur before the emergence of the early plantings. In some

seasons very heavy loss of terminals is experienced in the early September plantings through insect attacks, while later plantings suffer much less damage.

Methods of Planting.

Although there are several methods of planting which may produce good strikes under favourable conditions, it is believed that over a series of seasons the practice of waiting for a planting rain and then thoroughly harrowing the seed bed into a mellow condition before planting will give the most satisfactory results. This is particularly true if the ploughing has been done in time to conserve the winter rainfall. The harrowing after the planting rain leaves a surface that will warm up quickly, and also a better packing of the soil around the seed is obtained, which thus ensures ample moisture to effect germination. The harrowing also destroys early growth of any ordinary weed or grass seedlings in the properly prepared seed bed, and thus allows the cotton to come up in clean land and become thoroughly established without any competition from other growths.

It is appreciated, however, that in a dry spring a farmer with only limited planting equipment may have difficulty in planting a large acreage in good time if he waits for rain before planting. A useful method in such cases is—just before the usual sowing season, plant all the acreage in the dry surface soil except what can be planted in three days, which is frequently the length of period following the early storms in which there is sufficient moisture for good germination. As soon as a good rain occurs the portion not seeded is harrowed and planted, and then the dry planted area is harrowed as quickly as possible to break any crust forming before the seedlings start pushing up through the soil. Many growers have found this a satisfactory method, but an undesirable feature of planting in the dry soil is the danger of light showers occurring that will just start germination of the seed, and then if no more rain occurs a complete loss of seed results. Dry planting of valuable pure seed increase plots is, therefore, strongly advised against. Where dry planting of bulk stocks is done, it is recommended that at least 20 lb. per acre of undelinted seed be used, so that there will be ample to break through any crusts that may form with the first good rains. It can thus be seen that while dry planting has advantages, there are also serious disadvantages. The growers of larger areas are recognising this, and are tending to increase the efficiency of planting equipment to overcome the problem of getting their crop planted in good time.

Many growers planting only three to five acres adopt the practice of ploughing out shallow furrows before the planting period, sowing the seed by hand following the first good rain, and then covering it. The latter is done by either harrowing across the furrows to drag the soil in, or narrowing a walking scuffler so that it will fit in the furrow, and thus drag down the sides on to the seed. Either method will give a strike under favourable conditions, but it is doubtful if such a loose covering of the seed conserves the moisture sufficiently. As the occurrence of drying winds following the planting rains is frequently experienced, it can be seen that any planting method which does not assist in conserving the moisture around the seed is not to be recommended. For this reason the ploughing of shallow furrows following the planting rains, sowing the seed by hand and then cross-harrowing or scuffling

to cover the seed, is likewise not recommended. It certainly pays to adopt every practice that will assist in keeping the moisture to the seed and young seedlings.

Planting Equipment.

Undoubtedly for Queensland conditions the split-rim wheel two-row machine equipped with disc openers just in front of the planting spouts and wheels is the most suitable type of cotton planter. The discs push aside any clods and open up a firm, moist bed for the seed, while the big split rims of the main wheels, carrying the weight of the machine and driver, press the moist, mellow soil against the sides of the seed, but leaves a loose mulch on top of them. This is an ideal combination, for the pressed firm soil against the sides of the seed insures moisture from the subsoil coming up to them, while the loose mulch on top of them allows the young seedlings to come through without hindrance. The track left by the split-rim wheel is also of advantage if a heavy storm occurs before the seedlings appear. The little ridge of loose soil does not set so hard as do the pressed sides, hence in the drying-out processes the bottoms of the depressions where the rim presses dry last, and thus tend to curl up the pressed soil. This leaves a crack in the soil over the top of the seed, which allows them to come through with little effort, although the surrounding soils may be well caked.

This type of machine has been used at the Cotton Research Station for the last ten years, and good stands have always been obtained. In some seasons it has been necessary to plant following only 60 points of rain, yet an excellent stand has resulted, which has been maintained through a month of hot dry weather. As these machines can also be adjusted to plant other crops, they are very suitable for the general farmer.

On many of the farms in the older settled districts the one-row press-wheel planter is used for sowing maize and other seed that will drop through the usual six or eight-hole plate with which it is equipped. These plates are not suitable for sowing undelinted cotton seed, but if a six-hole plate with holes around ½-inch in diameter is used, delinted seed can be sown satisfactorily if the cut-off plate is removed and a strip of ⅛-inch steel—1 inch wide—is inserted in its place. It is strongly recommended that this type of planter be used rather than plant by hand in a furrow opened up by a plough, with all the accompanying loss of moisture.

Depth of Sowing.

The depth of sowing that has been regularly used at the Cotton Research Station is 1½ to 2 inches, which has been found to give satisfactory germination under all conditions experienced. Where a two-row planter with split-rim wheels is used, it is believed that these depths will be satisfactory for most Queensland soils. In some of the very open crumbly heavy clay soils it may be advisable to plant 2½ inches deep during very drying weather, for such soils if dry do not pack so well around the seed as do the finer soils. For the average soil, however, it is strongly advised against too deep a planting or too shallow a one. In inspections of commercial plantings which have failed to give a stand, it has generally been found that the seed had been planted too deeply—sometimes as much as 5 inches. In warm soils seedlings may come through this depth of soil under favourable conditions, but the seed

leaves are so tender after such a period in the soil that they are a light yellowish-green and burn off easily if hot, dry weather is experienced. Undoubtedly a lot of faulty stands are obtained each season simply through planting too deeply, or planting on such a poorly prepared seed bed that the seed are covered at irregular depths, some being too deep and others hardly covered at all. Frequent testing of the depth of planting and also examination of the seed spouts of the machine to see that the seed are dropping through evenly is certainly advisable.

Advantages of Delinted Seed.

The necessity for treating the seed in some manner that would allow of the use of the "walking stick" hand maize planter in planting newly burned scrub areas, resulted in machinery being installed at the ginneries to remove the fuzz, or "delint" the seed, as the operation is termed. Experiments carried out at the Cotton Research Station have demonstrated that the use of delinted seed in the regular planting methods is highly advantageous. The results indicated that the use of delinted seed ensures quicker germination, more even distribution of seed, and better ultimate stands than are obtained where undelinted seed is sown under identical conditions. Many farmers have been sowing delinted seed for some seasons, but some growers still use undelinted seed, in some instances because of the cheaper price. It is recommended, however, that the extra cost of the delinted seed is well worth incurring, particularly when planting in a season of light rainfall, for a markedly quicker germination is obtained with it. It is not recommended, however, that delinted seed be used when planting in the dry soil. The fuzz of the undelinted seed is of advantage here in preventing germination following light showers which would not provide sufficient moisture to maintain the seedlings until they make contact with the moist subsoils.

It has also been demonstrated that soaking seed just before planting for four or five hours in as warm water as one can hold his hand, appreciably hastens germination. Gains of from twenty-four to forty-eight hours in the appearance of the seedlings above ground have been obtained in experiments over several seasons. It is recommended that where one is doubtful if the surface moisture will last long enough to germinate the seed, and allow the seed sprouts to make contact with the moist subsoils, that soaked seed be planted.

Rate of Planting.

The recommended rates of sowing per acre on the seed application cards issued to growers are for cultivations—20 lb. of undelinted and 15 lb. delinted, and 10 lb. for planting in the scrub burns. These rates may seem high to one who has used them under favourable conditions, for undoubtedly a very solid stand of seedlings may be obtained with them. On the other hand, even 20 lb. of delinted seed may barely give a final satisfactory commercial stand in a cold, wet spring, or in a season when false wireworms and cutworms are operating to any extent. One has only to try to obtain an even spacing of single plants 2 feet apart in a commercial field to appreciate how uneven a strike is obtained with the average planting. A fair number of farmers believe in planting at a light rate of seeding and not thinning out the plants. The practice is not recommended, however, not only because of the

unsatisfactory strike that is often obtained, but also because, so far, the evidence obtained in thinning tests indicates that spacing out the plants when they are 5 to 7 inches tall is of benefit not only to yields, but the quality of the fibre produced. It is easy to thin out a stand that is too thick, but generally impossible to make up for a skippy stand, and one should always sow heavily enough to make sure of obtaining sufficient plants. A rate of 12 lb. per acre of delinted seed appears to be the least amount that should be planted in most cultivations.

Spacing of Rows.

The spacing of 4½ feet between rows, which is in general use, appears to be a fairly satisfactory one for most soils in all districts. On some of the forest clay loam slopes, where rank plant growth seldom occurs, it may be possible that a spacing of 4 feet between the rows will be satisfactory, particularly where early ploughing has allowed of a good conservation of the winter rainfall. It is pointed out, however, that in dry seasons the large lateral roots of the cotton plant extend remarkable distances under the surface in search of moisture, so it may be advisable to space the rows wider on the poorer soils in order that the plants can obtain more moisture during stress conditions. Recent experiments in the United States have shown that in dry seasons greater yields of maize are obtained from the widely spaced rows—6-feet widths proving the best in some cases. Experiments testing the value of wide spacing of cotton rows are being carried out in Queensland, and it is suggested that every grower try out the idea on his own soils.

Direction of Rows.

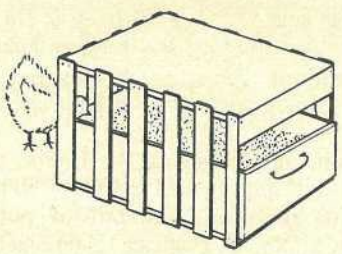
Experiments carried out for several seasons failed to demonstrate that there was any advantage to be gained by planting in any particular direction. It is recommended, therefore, that such points as planting so as to lessen soil erosion, and obtaining the longest rows to reduce loss of time in turning the cultivator at the ends of the rows, should be the main consideration in determining the direction of the rows. Undoubtedly serious loss of soil is occurring in many cotton fields through the rows being planted up and down the slopes instead of across them. Not only does the latter method retard the flow of water and save the surface soils, but the strain on horses during the cultivation operations is greatly lessened. Planting on excessive slopes should be avoided, for the types of soil and the moisture content of the different portions of the field are so varied that cottons of marked diversity of character and length of staple are produced. Where it is necessary to plant on a slope the rows should be planted across it at an angle that will give a fall down the row of about 4 inches for every 100 feet. This retards the flow of the water enough to prevent serious loss of soil except during very severe storms. As a further check on the run-off of storm waters, strips of permanent grasses or annually sown fodder crops should be grown at intervals of 200 or 300 feet in the cotton parallel to the rows. This greatly reduces the flow down the slope, and the thick crops trap the soils which would otherwise be washed away.

Conclusion.

The general position regarding planting cotton may be summarised as follows:—

1. The land should be ploughed in time to obtain full benefit of any winter rains—ample moisture in the subsoil allows of safe planting on relatively light rainfall.
2. Planting in the dry soil, while having advantages for a grower of a large acreage, has definite serious drawbacks, and should be avoided if possible.
3. Harrowing after the planting rain warms the surface, reduces evaporation, enables the seed to be planted in good tilth, and checks the early development of weed and grass seedlings.
4. Early planting is desirable but should not be done before the soil temperatures are sufficiently high to promote steady growth of the seedlings.
5. Planting following the first good rain occurring after the third week in September in the Central district, and after the first week in October in the districts south of there, appears to be a safe period in most seasons.
6. Planting delinted seed is advisable except where one has to plant in the dry.
7. An ample rate of seeding should be used—it is easy to thin out too thick a strike of seedlings, whereas a thin or skippy stand of plants is a handicap throughout the season.
8. The best depths of sowing are from 1½ to 2 inches in a mellow, moist seedbed, using a planter with disc openers, and split-rim wheels to press the soil around the seed.
9. The rows should be spaced 4½ feet apart for the bulk planting, but widths from 4 to 7 feet should also be tested.
10. Severe slopes should not be planted to cotton—they are more profitable under grass. On slight slopes the rows should run across at a slight angle rather than up and down the slope, as they will help to retard the flow of water and thus reduce loss of the valuable surface soils.

A DRINKING TROUGH.



Made from a kerosene tin and case, which will keep water for the chicks cool and clean.—"The New Zealand Farmer."

Pasture Improvement.

THE three-year term of the Pasture Improvement Committee which had operated since 1931, came to an end in June last, and a new committee was appointed to continue the work in progress, and to initiate fresh experiments.

The present Committee was formed too late in the year to enable it to embark during 1934 upon experiments directed towards the provision of winter pasturage, but a start was made in the autumn of 1935 with a number of winter pasture species and manurial trials. Certain trials with summer pastures were set in motion, and in the spring of 1934 a number of lucerne manurial trials were launched.

WINTER PASTURE TRIALS.

The Committee adopted a policy of laying down a number of experimental plots, each 2-5 acres in extent, on farms in the chief dairying and sheep raising centres of South-eastern Queensland. The object of the trials is to determine the most suitable introduced grasses and legumes for sown pastures for winter grazing, and the value of lime and/or fertilizer treatments of various kinds. The standard plan provides for the testing over a three-year period of the grasses and legumes which previous experience has indicated to be most suited to the particular districts of the trials. Most trials comprise replicated plots of each of three mixtures of a grass and a legume. Thus, on the coast the mixtures sown were:—

Phalaris tuberosa and lucerne;
Bromus marginatus and lucerne;
Italian rye grass and red clover,

while on the Downs and in sub-coastal areas the last mixture was replaced by a Wimmera ryegrass-lucerne mixture. The lime and fertilizer treatments comprised replications of plots treated as follows:—

Lime, 1 ton per acre ..	+ Superphosphate 2 cwt. per acre;
Lime, 1 ton per acre ..	+ Shirley's No. 9 Fertilizer, 3 cwt. per acre;
Superphosphate alone ..	— 2 cwt. per acre;
Shirley's No. 9 Fertilizer	— 3 cwt. per acre.

At the Farm Training School at St. Lucia, near Brisbane, a comprehensive winter pasture species and manurial trial has been laid down, the fertilizer treatments including muriate of potash as well as superphosphate and Shirley's No. 9 Pasture Fertilizer.

In addition to the major trials dealt with above, the Committee has laid down on each trial farm a number of plots of various grasses and clovers to serve as a demonstration of the possibilities of the different species in different parts.

PASPALUM RENOVATION AND MANURIAL TRIALS.

Two separate trials have been commenced at St. Lucia on old paspalum pastures. The trials are designed to determine the value of renovation and of liming and/or top-dressing of paspalum pasture, and the possibility of incorporating winter-growing legumes in renovated paspalum stands.

A further experiment involving the broadcasting of red clover seed on a renovated paspalum pasture is in progress in the Gympie district.

MISCELLANEOUS PASTURE IMPROVEMENT TRIALS.

(a) Plant Trial and Demonstration Gardens.

Material from the garden maintained at the Acclimatisation Society's Gardens at Lawnton by the previous Committee was transferred to the Farm Training School at St. Lucia, and to the 100 odd rows so transferred have been added rows of a number of pasture plants received for trial from various sources, including the Council for Scientific and Industrial Research, the Waite Agricultural Research Institute, Messrs. F. H. Brunning Pty., Ltd., A. L. Clothier, C. T. White, and F. B. Coleman.

The Toowoomba City Council made available at Toowoomba an area of about one-quarter of an acre to enable a pasture demonstration plot to be established, and Mr. N. A. R. Pollock, Senior Instructor in Agriculture, Toowoomba, to whose care the plot has been committed, has laid out a good variety of pasture plants. The value to the Darling Downs of this plot for demonstration and propagation purposes will undoubtedly be very appreciable.

The grass plots established at the Brisbane Showground by the former Committee, in co-operation with the Royal National Agricultural and Industrial Association, has been extended, and last year, as in previous years, provided an interesting display to a large number of farmers, pastoralists, &c.

(b) North Queensland Trials.

Applications to the Committee from two dairymen in the Daintree River district (Australia's northernmost dairying district) resulted in the laying down of trial plots of several grasses introduced from Africa at two centres. The progress made during the summer was very pleasing to one trialist particularly.

(c) Field Day.

In October a Field Day was held on Mrs. V. Andrew's property, "Drewendell," Nerang. A fair gathering of South Coast farmers attended and inspected with interest the work of pasture improvement accomplished on the property. Features of the farm included efficient subdivision of paddocks, renovated paspalum areas, top-dressed areas, winter pastures, and grass silage. Members of the Committee addressed those present on the subject of pasture improvement.

LUCERNE MANURIAL TRIALS.

Trials were instituted at Yangan, Harristown, Wellcamp, Goodger, Brooklands, Lanefield, and Toogoolawah, the layout in most instances providing for replications of eight treatments as follows:—

1. Lime, 1 ton per acre; Superphosphate, 2 cwt. per acre;
2. Lime, 1 ton per acre; Superphosphate, 1 cwt. per acre; Bonedust, 1 cwt. per acre;
3. Lime, 1 ton per acre; Shirley's No. 9 Mixture, 3 cwt. per acre;
4. Lime, 1 ton per acre;
5. Superphosphate, 2 cwt. per acre;
6. Superphosphate, 1 cwt. per acre; Bonedust, 1 cwt. per acre;
7. Shirley's No. 9 Mixture, 3 cwt. per acre;
8. Control.

At Lanefield muriate of potash treatment was included in the trial.

For the most part seasonal conditions were adverse to lucerne growing, and the greatest number of cuttings obtained under supervision from a single experiment was three, and this in the case of only one trial. As a consequence the data collected from the trials during the period under review are insufficient in themselves to provide any indication of the value of the various treatments. However, they will prove of use when taken in conjunction with results obtained during the remaining two years of the trials.

CO-OPERATION.

The Committee on a number of occasions during the past year made available to the Experimentation Committee of the Department of Agriculture and Stock the services of its Field Officer for field work in connection with pasture and fodder crop trials conducted under the aegis of the former body.

OBITUARY.

During the year the death occurred of Mr. F. F. Coleman, who was a member of the Committee and of the former Committee. The loss of such an enthusiastic and capable member was keenly felt by fellow members.

ACKNOWLEDGMENTS.

The thanks of the Committee were due to the following firms and persons for assistance during the year, viz.:—

Messrs. A. C. F. & Shirley's Fertilizers Ltd., Brisbane (Financial Grant.)

Messrs. Nitrogen Fertilizers Pty., Ltd., Sydney (Financial Grant.)

Messrs. Australian Fertilizers Ltd., Sydney (Services of Mr. F. H. Dalton.)

Messrs. H. V. McKay, Massey-Harris Ltd., Brisbane (Loan of Sunpalm Renovator.)

Messrs. Pacific Potash Ltd., Sydney (Free potash.)

Agricultural Chemist (Soil and pasture analyses.)

Toowoomba City Council (Lease of land.)

Mr. J. A. Kerr, Supervisor, Farm Training School, St. Lucia (Facilities and assistance for pasture trials at St. Lucia.)

Mrs. E. Andrews, Nerang (Field Day.)

THE ROTHAMSTED REPORT FOR 1934.

THE Rothamsted Experimental Station is our leading Institute for the study of soil science, plant nutrition, and plant disease. Its activities cover a wide field. There are the well-known experiments on the parent farms at Rothamsted and Woburn, amplified by similar trials at a number of outside centres. In addition the laboratory workers are applying the methods of chemistry, physics and biology to the many problems arising in crop production and utilisation. The appearance of the Annual Report for 1934 enables all interested in the land to obtain a clear view of the recent activities of the Station. Progressive farmers and their technical advisers will turn to the sections summarising the results of recent fertilizer investigations and continue with the detailed account of the field experiments of 1934. The scientific specialists, to whom the report needs no recommendation, will find a welcome feature in a series of review articles on the contribution of certain of the Departments to their respective branches of soil science. Dr. Keen writes on soil physics, Dr. Crowther on chemistry of soils and fertilizers, Dr. Thornton on soil bacteriology, and Mr. Cutler on general biology. From a publication so full of information as the present report, it is possible in a brief notice to mention only a few sections of immediate practical importance. Sugar beet growers will find much of interest in the results of the extensive fertilizer tests carried out in conjunction with the factories; nitrogeneous manures were the most important in improving sugar per acre in 1934. Accurate information on the effects of organic manures, and in particular of dried poultry manure, is now beginning to accumulate. Neither in 1933 nor in 1934 was the activity of nitrogen of dried poultry manure as great as that of sulphate of ammonia. Recent work on basic slags tends to show that their solubilities, as measured by the old citric acid test, is a good guide to their agricultural availability. Work on the maintenance of organic matter by ploughing in straw, or manures made from straw, or green manures, still continues. This side of the work, in conjunction with the continuous cereal plots testing the effects of bare fallowing, is of special bearing on soil fertility under mechanised cereal farming.

In addition to fertilizer tests, problems in general husbandry are being studied. For example, the preliminary results of comparisons of electric motors with oil engines for threshing are on record.

For the many field workers at home and overseas who are adopting the methods of field experimentation elaborated at Rothamsted, the report provides many examples of modern designs. There is also a useful statistical note on the construction and use of the summary tables relating to the field experiments. This section gives precision to such terms as "interaction of fertilizers," and indicates the correct use of standard errors.

The report contains a useful summary of the Rothamsted work on virus diseases. Virus is almost certainly particulate, and different viruses are of different sizes. The particular virus examined is not an invisible stage of a visible bacterium, but virus is probably a form of living material. It has further been found that the inoculation of a plant with one strain of virus may protect it against a later inoculation with another more virulent strain of the same virus. The part played by insects in the transmission of these diseases is discussed in the light of recent experiments.

The volume contains 259 pages; its price is 2s. 6d. (British); and it is obtainable from the Secretary, Rothamstead Experimental Station, Harpenden, England.

The Conquest of Climate in Relation to the Sugar Industry.

Subjoined is the full text of an address delivered by Sir Raphael Cilento, Director-General of Health and Medical Services, at the inaugural meeting of the Fifth Triennial Congress of the International Society of Sugar Cane Technologists, which commenced in Brisbane on 27th August and continued until 3rd September:—

AS previous speakers have said, it is a very great pleasure to find the Fifth Congress of the Sugar Cane Technologists of the World gathered here in Brisbane this winter. Though we are small enough in terms of actual sugar production, providing not more than 3 per cent. of the world's total sugar, yet even that quantity is sufficient to direct attention to an experiment of world-wide importance, that is to say, production of sugar by white labour—a unique phenomenon. His Excellency has already referred to the fact that the output per man is greater than that in any other part of the world—again a unique phenomenon.

Most unique of all is the fact that not so long ago it was regarded as quite impossible for white men to live and work in the tropics at all. If you could see the (Brisbane) Moreton Bay "Courier" of 1852, you would see there interesting evidence of the psychology of the time in a statement, repeated on several occasions during a discussion on the acute shortage of labour. It had been suggested that every attempt should be made to attract workers from every part of the world, and among others, it was suggested that an attempt should be made to procure labour from Ceylon and Java, preferably by offering attractive terms to Eurasians, who at that time had little future in those countries. This suggestion was absolutely scouted on the ground that, having *some white blood,* they would never be able to live and work in a sub-tropical climate like that of Brisbane (!) for it was in the neighbourhood of Brisbane that sugar was first contemplated as a possibility. To-day, in this city, there are 300,000 people, who would be astonished to learn that eighty years ago it was considered impossible that they should live and work here.

Brisbane, situated at 28 degrees South, is the capital of Queensland, which extends up to 10 degrees South, so that it corresponds to the area in North America from Florida through Mexico and Panama, and our best sugar areas lie over the latitudes of Cuba. In Asia, Queensland corresponds to South China, French Indo-China, Siam, Burma, and India, as far south as Pondicherry. The sugar area from Mackay to Mossman corresponds roughly to that from Calcutta to Madras, or from Hong Kong to Manila, and our best sugar-growing areas lie, for example, over the degrees of latitude covered by the north part of the Philippine Islands. In the Southern hemisphere, Queensland corresponds in Africa to the area from Natal to Lake Nyassa, and the sugar-growing areas correspond almost exactly to what was formerly German South-Western Africa. In South America they parallel the lower reaches of Peru through Bolivia and Paraguay, the southerly parts of Brazil and the northerly parts of the Argentine.

It was not at all surprising that people who thought of Australia in terms of latitude, decided that the white man had no future, in

countries which had been so fatal to him through disease as some I have mentioned. It was decided in that belief to use the labour of the South Sea Islanders—the experiment almost wrecked this State.

Large sugar and banana-growing areas were taken up along the coasts, and a considerable number of natives from the neighbouring Pacific Islands were indentured as labourers. Queensland began rapidly to assume, indeed, in so far as it was colonised, the appearance of a typical "tropical country," with white overseers and massed native labour, and great numbers of speculators, prospectors, miners, and all the migratory riffraff that infest a new land in the hope of some chance El Dorado.

Even more typical were the diseases. Malaria flourished, filariasis and hookworm disease undoubtedly then became endemic, and the records of mortality and morbidity made Queensland the "dreadful example" of the 'eighties. Had one been looking for proof that the settlement of a tropical country was impossible to white man, one need have gone no further to have found a rich store of confirmatory evidence, and most of our present-day critics hark back to these primitive days for their material. The unhappy kanakas died in great numbers, bequeathing their diseases to their masters; the expectation of life among white males at birth was only 41.3 years, a figure more than 12 per cent. less than that of the average for Australia; and the actual crude death rates for Queensland were enormously in excess of those of other States, in one year (1884) there being an excess of as much as 50 per cent.

With the gradual exhaustion of the mines there began a new era.

Thousands of that migratory horde that had swept into the country left it to follow their fortunes elsewhere. Thousands put what capital they had into pastoral or other pursuits, while thousands of others began to compete with the kanaka for a livelihood as unskilled labourers, and to demand that, in the land of their birth or adoption, they should have the right to earn a living without sacrificing that standard of living that distinguished them from their competitors.

Since the inauguration of the Commonwealth of Australia in 1901, the progress of settlement and development in tropical Queensland has been regular and extraordinarily rapid. The main mass of the population, in accordance with universal experience, is congregated most densely where communication facilities are greatest, and where the opportunities for the importing of necessities and the export of the produce won from the soil can be most readily effected.

The great advance such communications bring with them is nowhere better evidenced than in the sugar-growing areas between Ingham and Innisfail, where thousands of immigrants have established themselves since the opening of the line a few years ago that now connects them with the great railway system of Australia. (This line extends from Cairns in North Queensland to Geraldton in Western Australia, and touches every mainland State capital in Australia.)

Not only have the coastal areas benefited greatly, but this increase of population and facilities has permitted a great secondary development of the Atherton Plateau—a dairying and maize-growing area as large as the whole of the arable part of the State of Tasmania, pushed up half a mile above sea-level.

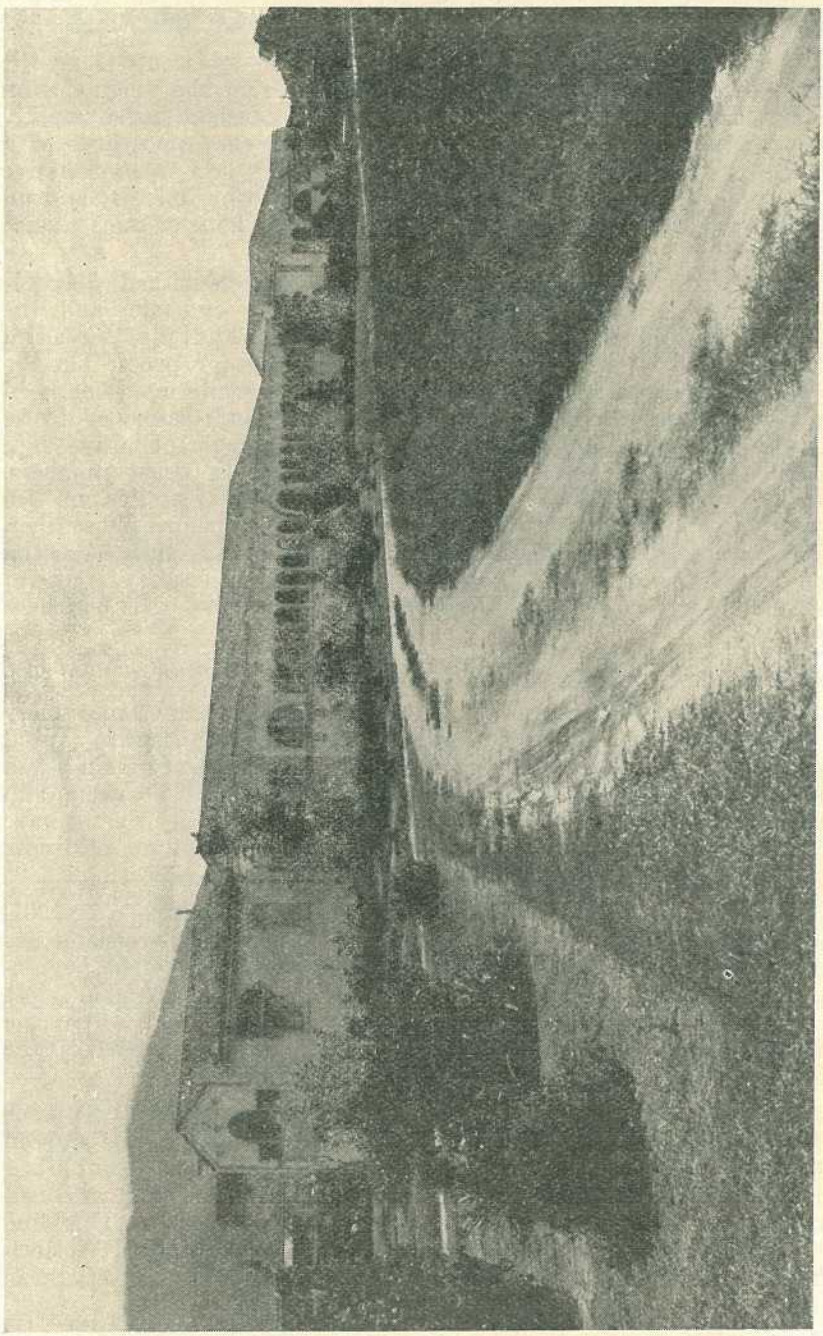


PLATE 138.
The District Hospital, Mossman, North Queensland.

It has been said above that in the 'eighties tropical Queensland was the "dreadful example." It is at present the premier State in statistical vitality, and with its remarkable natural resources, its recuperative powers after bad seasons, its fertility, good harbours, numerous rivers and streams, and its relatively small population with high wage rates and standards of living, it bids fair to become in time the premier in economic status.

How has this change been brought about? The climate has not changed, nor is the country any the less within the geographical tropics. There are but three factors which have been modified, but these factors are undoubtedly those which essentially control the ability or otherwise of a white race to thrive in the tropics. They are—(1) The successful institution of adequate measures of tropical hygiene; (2) the exclusion of races with lower standards of life and higher rates of disease and reproduction; and (3) the continual increase in locally born inhabitants.

This third aspect of the matter introduces an element which opponents of white settlement find it opportune to ignore, but which is so obvious to those who live in the country, and so in accord with all experiences of biology, that it needs little demonstration. This is the process of complete physical adaptation, which most certainly results as a response to the continued influence on the organism of the altered physical stimuli of these low latitudes.

Australia's quarter-million tropical residents are reassured by the fact that one of the only particulars in which tropical Queensland has a death-rate higher than that of any other part of Australia is *in respect of old age.*

If one considers certain of the figures upon which the vitality of nations is assessed—the death-rate of infants under one year in Queensland, for example, as compared with the same figure for Australia as a whole—we find that in only one year of the last fifteen (figures available up to 1928) has the rate of mortality in Queensland been higher than the Australian average, and that in a year of exceptional drought in the State (1919). In the whole period the Australian average infantile mortality rate was 7 per cent. higher than that for Queensland, and the Queensland rate for 1925 (of 45 per 1000 births) is the lowest ever recorded for an Australian State. Not only is this the case, but the death-rates up to age nine last birthday, for the year 1920, 1921, and 1922 (the last available) show that the rate for Queensland in this regard also is 3½ per cent. better than that for Australia as a whole, both for males and females; and for the five triennia ending with the year 1925, experience is constantly improving as one would hope and expect. This is better set out in the following table:—

TABLE I.

Improving Experience in respect of Failures per 1000 of Queensland Children to reach the age of 10 Years.

Period	Males.	Females.
1911-13	116	101
1914-16	112	96
1917-19	106	88
1920-22	102	84
1923-25	87	70

Moreover, the full expectation of life at date of birth, which in the "dreadful 'eighties" was 41.3 years for males, has improved consistently since, both absolutely and in relation to the Commonwealth as a whole, and was, in 1922, 56. For the period 1920-22, indeed, the Queensland expectation of life figure exceeds that for all Australia. When the figures for infantile mortality and death rates are compared with those of so-called "ideal" climates, extraordinary results are obtained, as may be seen from the table that follows:—

TABLE II.

Comparative Death Rates and Infantile Mortality Rates in Various Countries (1928).

Country.	Death Rate.	Infantile Mortality.
Queensland	8.8	46
Netherlands	9.6	52
Denmark	11.0	83*
Norway	10.6	51*
Sweden	12.0	62
England and Wales	11.7	65
United States of America (registered area)	12.1	68
Switzerland	12.0	54
Belgium	12.8	92*
Germany	11.6	89
Scotland	13.3	86
Ireland	14.1	70*

(Note: Figures marked with * are for the year 1927.)

It was formerly charged against Queensland—gratuitously—that the average issue of wives here resident must inevitably fall below the average for Australia, or, indeed, any desirable figure. Actual fact, however, indicates that wives in Queensland for the periods under review, as tested by the census of 1921, produced greater issue than any other series, and that the average issue for tropical Australia exceeded that for all Australia.

The suggested climatic barrier to health and fertility, therefore, is found on adequate examination to be merely a translation into popular terms of certain figures recorded in other tropical countries—figures which arise, not from any climatic factor *per se*, but from the ordinary causes incidental in those countries to the presence of large native populations and a gross disease prevalence. In Australia the best figures available—the authenticated figures produced by the Commonwealth Statistician, C. H. Wickens—demonstrate that white men can live and thrive in the tropical parts of Australia, and that white women can accompany them without any loss of fertility, mentality, or physique.

When the Kanakas were repatriated and the last of them went in 1905-1906, it was considered that the doom of sugar had been spoken. With the best will in the world, white men could not stand up to work in sugar. The yield that year was 152,259 tons. The yield in 1934 was almost four times that amount—every ton grown, cut and milled by white labour. While we regard this white grown sugar and our successful white colonisation as extraordinary achievements, we must admit with the late Dr. Andrew Balfour, that far too little credit has been given to the Spanish and Portuguese explorers and colonisers of Latin America for laying the foundation and the experience for many of the

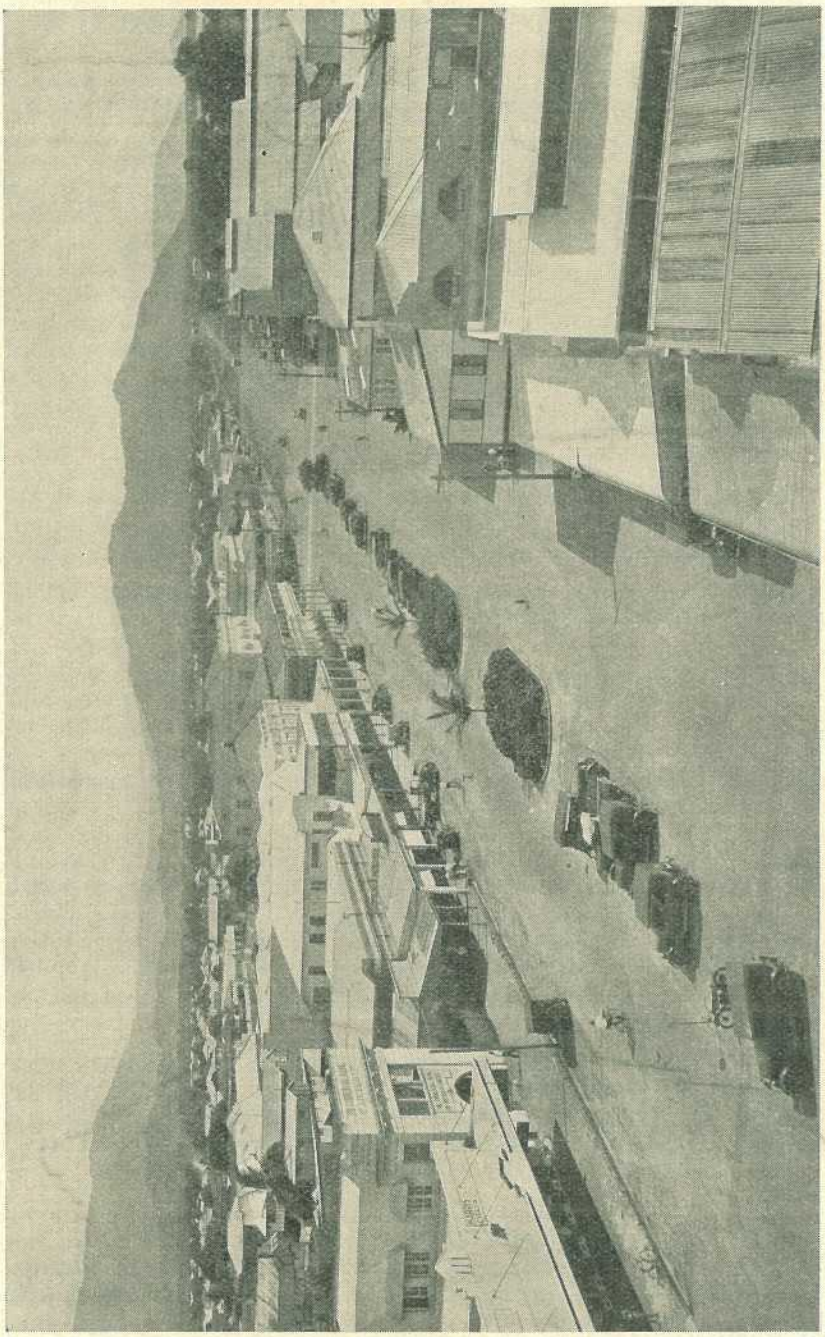


PLATE 139.

Cairns, the commercial centre of rich cane lands, North Queensland.

benefits which we enjoy to-day. One of the outstanding tributes to the capabilities of the white race in the tropics is provided in the province of Camaguey in Cuba, where, as Dr. Juan Guiteras pointed out in 1913, a long continued series of Spanish families have established themselves without any loss of physique, mentality or fertility. Hintze demonstrates the same thing to have occurred in some of the West Indian Islands, and in German colonies in the South of Brazil. Here in Queensland we have been far more favoured by Nature than these were. We have not had to contend either with a mass of disease, nor with a large native population working at cut rates, or forced into economic slavery. Upon the sugar industry in North Queensland, we depend to a large extent for its colonisation, and the justification for its retention, and this must be done, too, not by reducing the workers to the level of the cheapest paid labour, but with the preservation of a standard of living considerably higher than that obtaining among sugar workers anywhere else in the world—a standard perhaps unduly high because, to a large extent, it sets a higher ruling rate on every other kind of activity and labour in the North. This, however, is an economic question, with which I have no time nor occasion to deal in these few minutes.

It is only the relative absence of tropical diseases that has made our success so assured, and it is on the exclusion of disease that we depend for continued success.

Malaria, fortunately, stops just North of the main sugar growing districts. Hookworm is rife to an extent that has occasioned the Government much concern for many years, and hundreds of thousands of pounds have been spent upon providing facilities for the people. The short period fevers, Weil's disease, 7-day fever, endemic typhus, and so on, have been established in the North for two generations, but very rarely do they rise to epidemic proportions. In 1907 there was a big outbreak; and in years of heavy rainfall, since then the vegetation grows rankly, rats become numerous, and these diseases reach a fairly high level. The greatest of these outbreaks occurred last year, when 150 cases, diagnosed as Weil's disease (but probably not all Weil's disease) threw the whole area into a state of panic, from which it has not yet recovered. This year there have been only seven cases microscopically proved, and these were so mild that the patients had left hospital before their disorder had been proved; it was indeed the typical sort of "cane fever" of every other year. (One case occurred at Gordonvale and six (6) at Ingham.)

The Government has spent a considerable amount of money on a campaign for the eradication of rat harbourage, rat food, &c., and the most recent of our poison campaigns has distributed 2,500,000 effective baits, apart from those not taken by rats; and burnt the matted long-continued harbourage over 72 miles of roads.

I will conclude by saying that, for me personally, it is a great pleasure to meet countrymen of those interesting pioneers on the medical side—Juan Guiteras, of Cuba; Chamberlain, of the Phillippines, and Gorgas, of Panama; Fleming, of Rhodesia; and Hintze, Wagemann, and De Almeida, of South America; De Langen, Smut, and De Vogel, of the Dutch East Indies; and that long series of British and Indian scientists who have made the research activities of their laboratories famous. We hope to profit immensely from that enthusiasm that has brought you so far afield as Australia, and by that knowledge that has made your coming so epic an incident to us.

Economics of Sugar in Australia.

Following is an address delivered by Sir Philip Goldfinch at the inugural meeting of the Fifth Triennial Congress of the International Society of Sugar Cane Technologists in Brisbane:—

BEFORE plunging into the present-day economics, which so often neglect history, I propose to give a short history of sugar in this continent.

Sugar-cane was not indigenous to Australia. It is believed that it was first introduced in 1817, though raw sugar was not produced on a commercial scale until 1886, when Captain Louis Hope made small quantities at a mill near Brisbane, in Queensland. Prior to this date the sugar requirements of the country were imported. The first refinery was operating as early as the year 1840 and handled imported raw sugars. It was not until 1868 that cane growing and the manufacture of raw sugar were developed to an extent which justified them being called one of Australia's industries. In the ten years following 1868 over 100 sugar mills were built on the coastal belt of Queensland and New South Wales. Later, in the early 'eighties, there were probably 200 sugar mills at work, and it can be said that not one of these plants is in existence to-day.

The industry was developed, and in its early stages was carried on with black labour, but some years before the federation of the States of the Commonwealth, which took place in 1901, the people of this country determined for a "White Australia." Queensland came into Federation on the undertaking that her chief industry, sugar production, should be adequately protected fiscally against competition of sugar produced by black labour in other countries.

In 1901 import duties were imposed as follows:—

£6 per ton on cane sugar.
£10 per ton on beet sugar.

In 1902 an excise duty of £3 per ton was imposed and a bounty or rebate of £2 per ton was granted in respect of raw sugar produced wholly by white labour.

In 1907 the excise duty was increased to £4 per ton and the rebate or bounty was increased to £3. This increase sped up the change from black to white labour, and it can be said that by 1909 the coloured men had been repatriated to their island homes.

The excise and bounty were abolished in 1913, but the import duty were maintained.

Thus started the experiment of producing in tropical and subtropical Australia cane sugar wholly by white labour, with the undertaking from the rest of the Commonwealth to protect the industry and enable it to live under not only white labour conditions, but presumably under Australian white labour conditions, which provide a standard of living unquestionably higher than in any other part of the world.

The next important change in the economics and control of the industry occurred in 1915, the second year of the Great War.

Prior to 1915 the control of the industry had been virtually in the hands of the Colonial Sugar Refining Co., Ltd., and the production of raw sugar was kept within the requirements of local consumption. The deficiency, which occurred in most years, was covered by the importation of raws to be refined in Australia, but small quantities of white sugar also were at times imported by merchants and-or through brokers.

The wholesale price of refined sugar was then fixed by the Colonial Sugar Refining Company based on world's markets, and in 1914 and the early part of 1915 the wholesale price of 1A sugar (i.e., first-grade refined sugar) was £21 per ton, and the retail price was 3d. per lb. The Company in that year purchased under contract the raw sugar produced in Queensland on the basis of giving the mills £13 2s. 6d. per ton of 94 net titre sugar when the duty paid price of 1A was £19 per ton with an additional 18s. per ton for every 20s. that the duty paid price of 1A was raised over £19.

The mills purchased cane from farmers at prices arranged mutually, and wages in the industry were fixed by Arbitration Courts.

In 1915, due to the devastation of the beet areas in Europe, and the engagement in war of agriculturists on the Continent, sugar prices commenced to rise, and the Australian Commonwealth Government co-operating with the Queensland State Government took complete control of the industry, and the industry has, in fact, been under the most complete Government control ever since.

It will be interesting at this stage to set out the position as it it existed when the Government took control—

The wholesale price of 1A was £21 per ton.

The retail price was 3d. per lb.

The price payable to the millowner for his raw sugar was £14 18s. 6d. per ton 94 net titre.

The corresponding value of cane of average quality was say 23s. per ton, and the minimum wage fixed by the Arbitration Court was 9s. 2d. per day of eight hours.

The first step taken by the Commonwealth Government was to impose a prohibition of imports and exports of sugar, and the Government then assumed the responsibility of purchasing from abroad sugar supplies to complete local requirements.

In 1915 the Government raised the wholesale price of 1A to £25 10s. per ton and fixed the price of raw sugar at £18 per ton f.o.b. mill ports.

In 1916 the wholesale price of 1A was again raised to £29 5s. per ton and the price for raw sugar payable to the millowner was increased in 1917 from £18 to £21 per ton.

In 1919 Australia's production fell, mainly through seasonal influences, to roundly 175,000 tons, and it was necessary to import approximately 117,000 tons at an average duty-free landed cost of £44 6s. 2d. per ton. This, of course, involved the Government in considerable loss, to recoup which in 1920 the Government raised the wholesale price of 1A to £49 per ton, and, shortly afterwards, to encourage greater production in Australia, the price to be paid to the Australian millowners for their raw sugar was raised from £21 to £30 6s. 8d. per ton. This price was reduced in 1923 to £27 per ton.

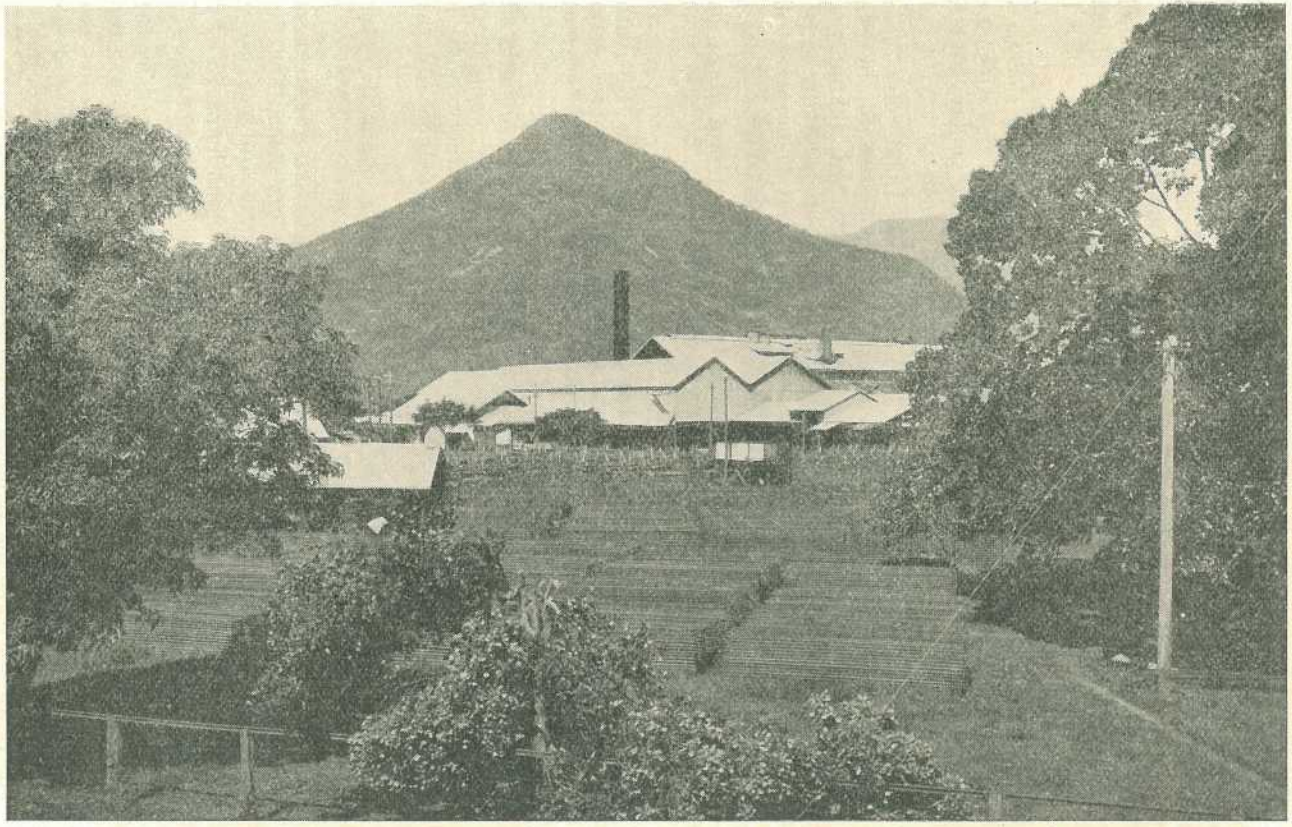


PLATE 140.
Mulgrave Sugar Mill at Gordonvale, North Queensland. Walsh's Pyramid in the background.

These conditions certainly encouraged the industry to expand, and by 1925 there was a surplus of over 200,000 tons to be exported.

Going back a little way, it should be said that in 1923 the Commonwealth Government handed over to the Queensland State Government the actual control of the industry, and with it the responsibility of maintaining adequate supplies of sugar for Australia. Since 1923 under agreements between the Commonwealth and Queensland Governments the former agreed to maintain the prohibition upon imports and exports provided the refined products were sold at prices agreed upon between the two Governments.

Coincident with the first substantial surplus in 1925, already referred to, the bottom fell out of the world's sugar prices, and the Australian sugar-producing industry found itself in difficulties through heavy losses on its exports. The condition is the same to-day, and I will now set out and explain the present economic position.

Sugar-cane is grown on the coastal belt stretching 1,000 miles from Port Douglas in North Queensland, latitude 16½ degrees S., to the Clarence River in New South Wales 29½ degrees S., but, taking the latest published figures 84 per cent. of the whole crop is produced in Mackay (latitude 21¼ degrees S.) and north thereof, and 47 per cent. of the whole is grown north of Townsville (latitude 19¼ degrees).

There are 33 sugar mills operating in Queensland and three in New South Wales, all making raw sugar only, and it can be said that the output in a normal campaign is 580,000 tons.

Except in the case of four mill-owning companies who cultivate their own estates in addition to purchasing supplies from farmers, cane is produced by growers numbering in round figures, 7,950, and the total area under cane cultivation is 325,000 acres.

The raw sugar industry plays an important role in the national life of Australia. It is the only medium for successfully populating that northern strip of tropical coastline which would otherwise be a source of weakness if not a vulnerable spot in the defence of the country.

Earlier in this paper it has been stated that the sugar industry is under Government control; the position is explained as follows:—

Wages in the industry are fixed by Arbitration Courts for workers in the field, mills, and refineries. Taking the rates prescribed for the Northern Division of Queensland, existing minimum rates of pay are—

(*a*) For field hands 16s. $8\frac{8}{11}$d. per day of eight hours.

(*b*) For mill hands 17s. $5\frac{5}{11}$d. per day of eight hours.

Cane harvesting is done at piecework or contract rates fixed by the same Arbitration Courts, and these rates range from 7s. 5d. per ton for cutting crops yielding 15 tons per acre and over to 15s. 4d. per ton for cutting crops yielding from five to six tons per acre. The work involved includes cutting, loading, and laying field tramlines.

The minimum rate for refinery in Queensland is 13s. 5 5-11d. per day of eight hours.

The prices for cane payable by the millowners to the growers are fixed by Boards appointed under the statutory authority of the Regulation of Sugar Cane Prices Acts. There has become established what

amounts to a standard scale of cane prices in Queensland, viz., 25s. 6d. per ton of cane of 13.5 per cent. c.c.s. with raw sugar at £14 per ton of 94 net titre, with increases and decreases of 1s. 8½d. per ton cane for each £1 above or below £14 per ton. This scale gives the grower approximately 71 per cent. of the value received by the millowner for his raw sugar.

Raw sugar, as it is manufactured, is acquired by and becomes the property of the Queensland Government, taken under further statutory authority and the millowner's equity in his raw sugar becomes a right to be paid for it at prices fixed and declared by Government proclamation, at present £23 per ton (reduced from £27 in 1931). The fact that there is a surplus production to be sold overseas creates complications in the determination of the price of raw sugar which can more conveniently be explained later.

There are no refineries owned by the Queensland Government (now the owners of all raw sugar) and the Government employs the services of the refining companies, first to take delivery of raw sugar on its behalf, to pay the millowners the proclaimed price, to transport such sugar to the refineries, to refine and sell the refined products at wholesale prices settled by the terms of an agreement between the Commonwealth Government of Australia and the Queensland State Government, wherein also the Commonwealth Government agrees, for the period of the agreement, to maintain a prohibition of imports of sugar from overseas.

For their services the refining companies are paid as follows:—

They receive payments to reimburse them for the out-of-pocket cost of freighting, insurance, &c., and of actual refining.

For management and to provide interest and depreciation on plant used they are paid 20s. per ton of raw sugar melted and refined.

For financing the whole undertaking they are paid rates per ton (varying with the crop circumstances) which provide a return somewhat less than bank rates of interest.

For selling refined products to the trade throughout the Commonwealth the refiners receive a commission of 7s. per ton of raw sugar melted.

The Queensland Government is represented in the above transaction by the Queensland Sugar Board, a board consisting of a chairman appointed by the Government, and three other appointees representing the mill-owning and cane-growing sections of the industry. Though the Corporation of the Treasurer of Queensland has the final responsibility, the Sugar Board has, as may be imagined, many onerous duties and many anxieties in its representation of the Government, particularly in connection with the sale of the surplus sugar, the details of which, however, are attended to by the Colonial Sugar Refining Company Limited.

In 1925 the chairman of the company said:—

> "As a contribution by the company to relieve the industry in its difficulties arising out of over-production, the company is willing to handle and finance the surplus sugar without charge for services and without interest."

This offer was readily accepted, and the company has continued to do this, and is doing so at the present time.

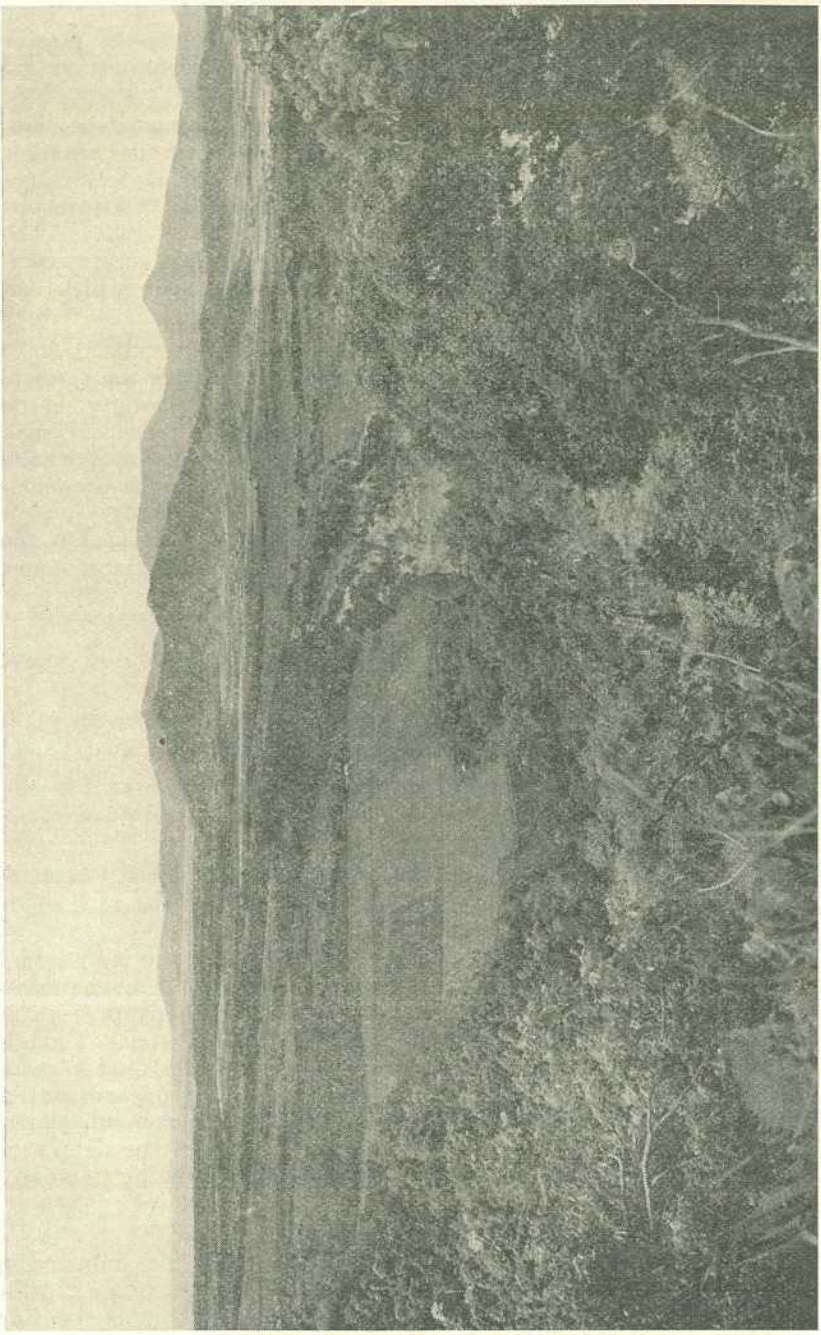


PLATE 141.

Cane Lands, Barron River Valley, Cairns District.

So much for the control of the industry, which it will now have been realised is reasonably complete, though there are many details of importance which cannot find space in such a paper of limited length.

Returning to raw sugar and the price complications referred to—

The Queensland Government is the owner, and therefore receives the proceeds of all sales in the Commonwealth of refined products, and to these total proceeds are debited the following:—

1. Discounts to wholesale merchants.
2. Rebates to manufacturers on sugar contained in products exported.
3. Substantial assistance to the industry engaged in processing fruit products.
4. Payments to refining companies as already described.

The balance, less the small administrative expenses of the Queensland Sugar Board, is available for payment for raw sugar.

It is most important to note here that this last paragraph applies only to the portion of the total production that is used and consumed in Australia amounting to between 50-60 per cent.

The remaining 40-50 per cent. is exported and a separate value per ton, i.e., proceeds less cost of freight, brokerage, &c., is established for this proportion of the production.

At the end of each campaign the exact proportions are calculated of the quantity consumed and used in Australia and the quantity sold overseas. Each sugar mill is credited with having delivered sugar for home consumption and export in the proportions thus calculated, and is paid for each proportion at the price determined as described.

There are six refineries in Australia—one at Bundaberg in Queensland, owned by the Millaquin Sugar Co. Ltd.—and the other five, one in each capital city on the mainland, are owned and operated by the Colonial Sugar Refining Company Ltd., who refine about 96 per cent. of the whole of the cane sugar consumed in Australia.

It has been said that the Australian Sugar Industry is uneconomic, but before any judgment at all can be passed there are several important related factors, some of which I have already touched on, which must be carefully weighed, and when all the facts are known and their significance appreciated, it becomes evident that the industry is playing a very important part in the general economic structure of Australian agriculture and industry, and that its economic basis is not widely different from that of the majority of the other sugar-producing countries in the world, and that this comparison applies particularly to such important countries as Cuba, U.S.A., Great Britain, Canada, South Africa, and practically the whole of Europe.

The stimulus afforded the industry in Australia by the embargo and price fixation is perhaps artificial, but many other Australian industries receive similar stimulus either directly or through the tariff. Moreover, the low export price for raw sugar which is so frequently quoted as an argument against the economy of the Australian system applies to only a small proportion of the world's sugar supply which

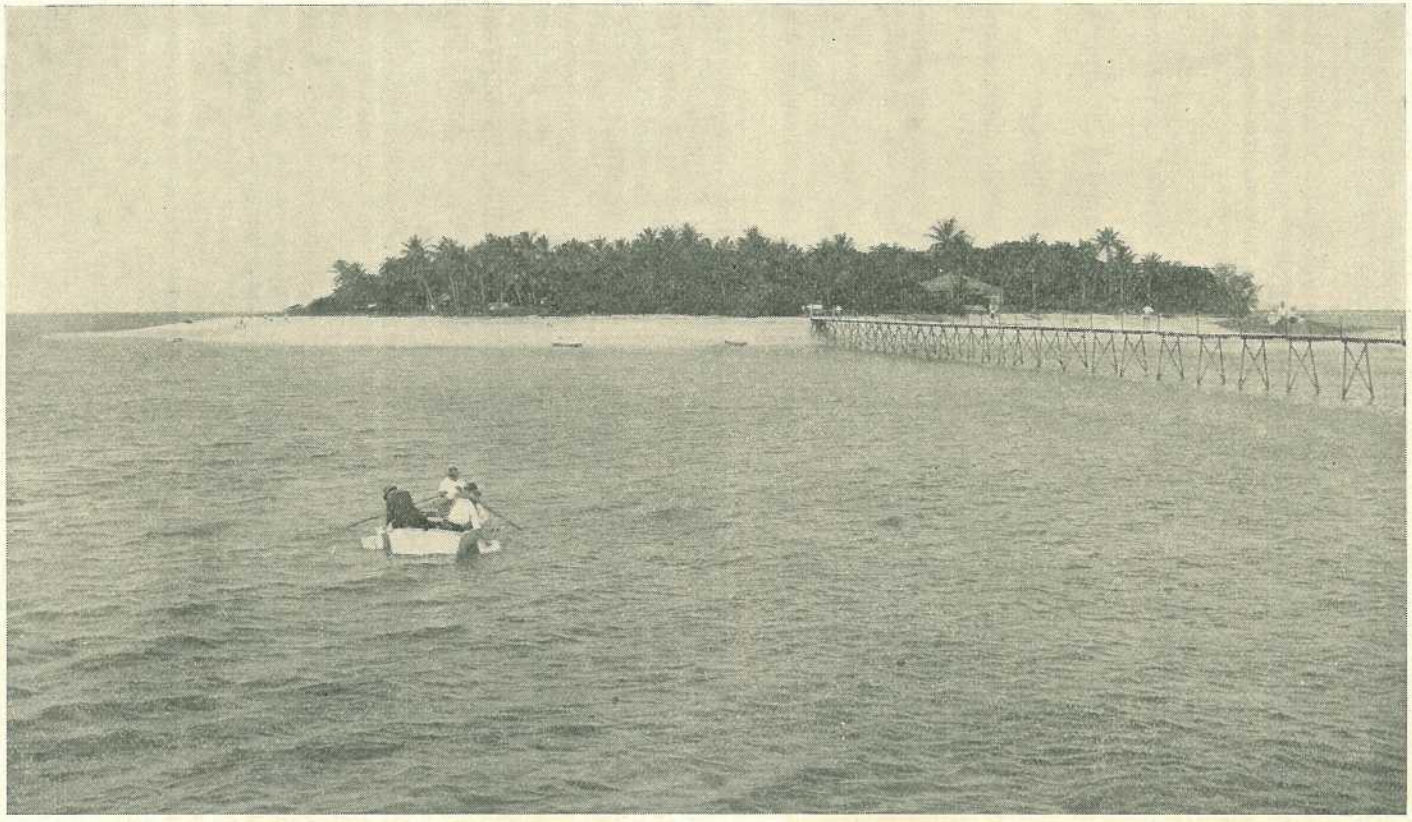


PLATE 142.
Green Island, Great Barrier Reef, near Cairns, Queensland.

is forced to seek an outlet in the open market. Actually only 8 per cent. of the world's sugar is sold at open market prices. The overwhelming proportion receives artificial assistance and is sold in its home market at prices much in excess of the open market price, and were all such measures of assistance to be removed there is no doubt at all that sugar would not be available at present open market prices. An economic level would be found, but simultaneously the production of sugar would pass to the most economic centres and the existing agricultural as well as economic balance of many countries at present producing sugar would be disorganised or modified; in certain cases to the decided detriment of the whole of the community concerned.

Australia does not differ largely from many other countries in this respect, and its policy with regard to sugar is not, after all, widely divergent from similar world-wide practices with relation not only to sugar, but to all commodities; in other words, all countries are absorbed in promoting means of livelihood for their populations, and the means provided must not only be suitable to the territory concerned, but if the country is dependent upon exports for its economic survival or for the maintenance of its standard of living, the product must be saleable in the desired markets.

Now in the case of sugar, to which the British Government has seen fit to give an Imperial preference over foreign sugar, there is at present a large unsatisfied market for Empire raw sugar in Great Britain, and subject to certain provisions the surplus sugar produced in Empire countries is assured of a market there. This has an important bearing on the general economy of the Australian balance of trade as the establishment of an assured credit of some £2,000,000 in London is a factor which cannot lightly be brushed aside. It may at once be asked why a similar procedure should not be adopted with other products from Australia, but in few instances can a parallel case be found in which (1) there is a certain market for the surplus at open preferential market prices; (2) the proportion of surplus to home consumption is such as to make the scheme practicable; (3) a substantial Imperial preference is granted by Great Britain and Canada; and (4) the surplus is saleable in preferential markets without displacing similar produce of Empire origin. Where the system *is* applicable it is already applied to other commodities not only in Australia but in almost all other important Empire or foreign countries, and if the Sugar Industry, either beet or cane, is to survive in Australia or in any other white labour country—or indeed in any country maintaining a decent standard of living—no other basis can in the face of world-wide practice at present be entertained. To answer fully the question of the economic soundness of Australia's sugar policy, which we have now seen is by no means unique or peculiar to Queensland, would involve a study of present-day world economics and politics which would be far beyond the scope of this address, but an endeavour has been made to indicate that the question cannot be dismissed by reference to and comparison with open market prices which can apply to only 8 per cent. of the world's sugar, and that there are many sound reasons why the present policy, while subject to modification with any alterations in the general economic position of the country, should be earnestly and unfalteringly pursued.

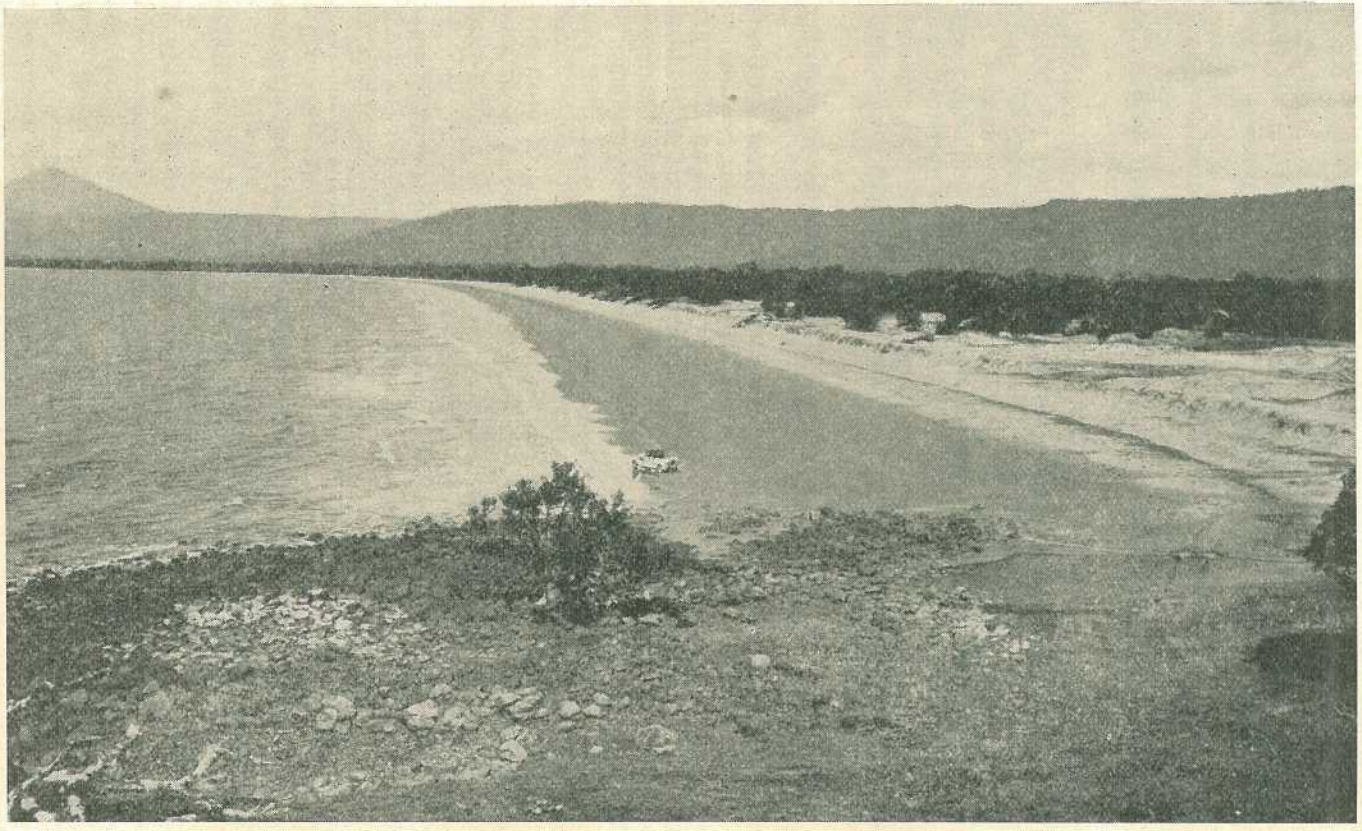


PLATE 143.
The Beach, near Port Douglas, Mossman District, North Queensland.

Is there over-production? Such a question seems absurd to ask because the answer is so obviously "Yes"—but a yes with several important qualifications. For instance, is Europe—is the world—consuming all the sugar it requires? The answer is just as assuredly "No." More than one country has by fiscal enactments made sugar a luxury that only a small percentage of the population can afford to buy, and again, lack of buying capacity owing to disturbances in currency and credit has no doubt limited the use of sugar in countries that might otherwise become large consumers. The attempts that have been made to raise the level of sugar prices by limiting or reducing production may seem the easiest and quickest means for obtaining relief, but the writer frequently wonders whether these are sound methods and whether the trouble is not deeper seated.

One thing is certain, the way out is not an easy one.

TREES ON THE FARM—THEIR AFTER CARE.

Any care exercised in planting trees is rendered ineffective unless they are protected from injury, and a degree of assistance is given to their proper development. The chief danger threatening young trees on the farm and pastoral areas is damage by stock, and it is useless making plantings unless the whole of the area is effectively fenced off from animal invasion. Stock not only destroy or injure young plants, but by trampling and packing the soil nullify the effect of preparatory cultivation.

The fence should be stock-proof, and either permanent in character or sufficiently well constructed to keep out stock until the trees are beyond the reach of the largest animals. As the trees grow older, stock can be admitted from time to time with advantage, as they serve to destroy weed growth and lessen the danger of fire by removing surface litter.

A permanent fence with a properly constructed gateway permits the regulation of such entry. Where it is only intended to protect the trees until sufficiently well grown to be proof against stock damage, a barbed wire fence is very effective. Where single shade or ornamental trees are planted out they should be protected by some form of tree guard. Protecting fences or tree guards should be provided for before the young trees are planted out.

The area under trees should be cultivated two or three times a year, especially for the first two or three years, in order to keep down weeds, prevent undue evaporation of moisture, and maintain good soil conditions. Weed growth in the early stages is particularly injurious, as it tends to suppress or completely destroy young tree growth, especially of the slower growing species. Weeds, moreover, increase the danger from fire, and reduce the available moisture supply. Under certain conditions, on the other hand, weed growth is of value in providing shelter for trees which are liable to injury by excessive heat, frost, &c., and on slopes and shifting sandy soil are of assistance in binding the soil. Generally speaking, however, the trees should be kept free from weeds as far as practicable.

Where a cultivator can be used, operations are simplified, but where it is not possible to employ a machine, the trees should be periodically hoed around with a mattock or similar implement. Cultivation is particularly desirable in dry areas, in order to conserve soil moisture, and besides resulting in more rapid and better growth, frequently makes the difference between success and failure. The soil round the trees should always be loosened after rain so as to restore the surface mulch. Cultivation may usually be discontinued as soon as the canopy of leaves offers protection to the soil, or when surface roots interfere with operations.

In rabbit-infested country the trees may have to be protected by netting.—A. and P. Notes, N.S.W. Dept. Agric.

BANANA GROWING.

THE ONE-BUNCH ONE-SUCKER SYSTEM.

By H. BARNES, Director of Fruit Culture, and J. H. MITCHELL, Inspector under the Diseases in Plants Acts.

This method of growing bananas was first suggested by the late Mr. J. Mitchell, senr., at one time manager of the Bribie Island State Nursery. During recent years, Mr. J. H. Mitchell, Banana Inspector at Yandina, induced growers in his district to try out the system with such success that it has been generally adopted in some localities as the best way to increase the quantity and quality of Cavendish, Gros Michel, and Mons Marie varieties of bananas and get the best possible results out of any plantation. The system can be applied to Sugar and Lady Finger varieties with alterations in the number of suckers left and distance apart of the stools.

THE great problem facing the banana grower at the present juncture is the production of first-class fruit. In most instances the sites for banana growing have shifted from the extremely fertile scrub soils to forest soils of varying fertility and aspect. The necessity of grubbing the forest soil and the use of fertilizers has considerably increased the cost of production, and unless a definite system of desuckering is carried out the production from this class of soil will not often be commercially profitable.

A system of desuckering, which has been tried and proved in the Eumundi and Yandina district area and is locally known as the one-bunch one-sucker system, has as adherents the principal growers. Growers who have carried out the system have had as much as 200 cases to the acre for the first cut off forest soil, and by the selection of the correct follower for the second and subsequent cuts have reached an average of 500 cases per acre during the life of the plantation.

The system really starts with the selection of the stock for planting, and in this connection well developed eyes with a portion of the corm adhering, and known as bits, are given first preference, and small healthy suckers of approximately 3 inches diameter are next best.

The bits or suckers are planted in a hole to a depth of 6 inches below the ground level of the sucker. It is advisable not to fill the hole more than three inches at the time of planting, thus preventing the corm from forming too near the surface. The distance apart should not be less than 10 feet x 10 feet.

Suckers seem to be the most popular form of stock used, and in placing these in the holes the followers for the second and succeeding crops can in a big percentage of cases be definitely ascertained. The side of the sucker furthest away from the parent usually produces the correct follower, and the sucker should be placed with the correct side facing the direction from which it is desired the follower should grow. (See Plate 144.) The usual method is to have the follower occur on the

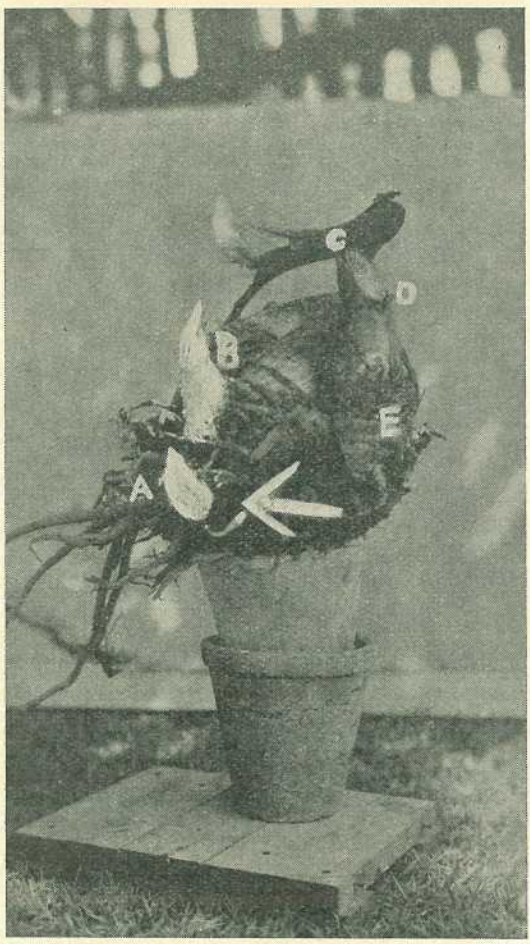


Plate 144.

"A"—also indicated by the arrow—shows the correct sucker well down which should be left to produce the follower. "B" is a "sitter" formed about ground level and should be destroyed.

"C" shows a sucker ready to be detached from the parent corm for planting. If the top is always severed with a sloping cut as shown, and the sucker planted with the lower point of the cut "D" facing up hill, the follower is nearly always certain to grow in the right position, shown approximately at "E."

top side, but on very steep slopes a follower at the side is preferred for the reason that if left directly behind, the old corm when rotting allows the young plant to sag forward, whereas if on the side the ground helps to stay it. The maiden plant must be regularly desuckered *as soon as the suckers appear above the ground,* this operation being most important, having, as it does, a direct influence on the size and quality of the expected bunch.

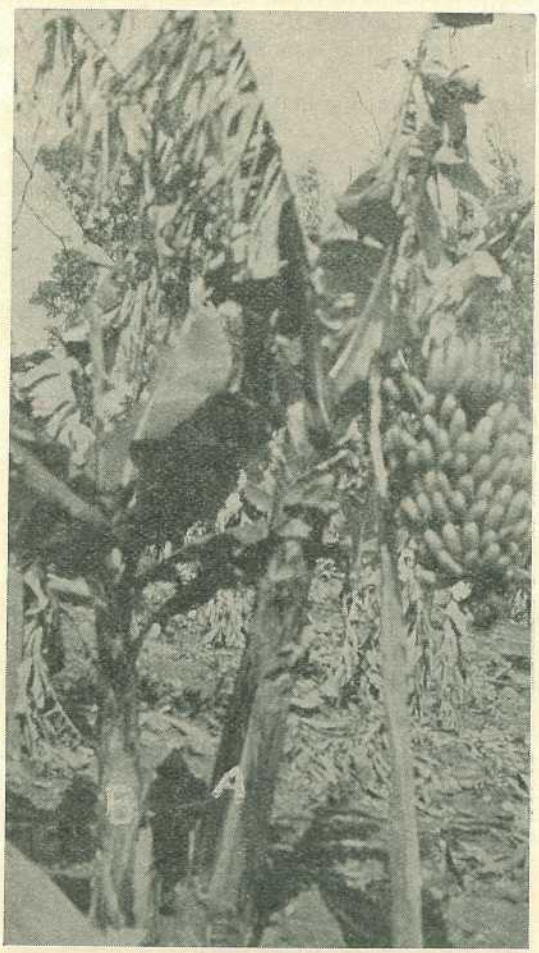


PLATE 145.

Shows the parent plant "A" with a matured bunch and a suker "B" of the correct size and in the correct position at the side for the following season.

Where a grower has had experience in a certain locality, the number of months required to throw a bunch can in most cases be used as a basis in determining the time when the follower is allowed to come. From observations of quite a number of seasons and other factors in north coast districts, it is believed a period of fourteen months is the usual time it takes from planting to bunching. Using this with local data, followers can be left to insure the avoidance of fruit being thrown during November, as such fruit, having been formed in the winter, is usually unprofitable.

The most important factor governing the system is the selection of the correct first follower, and although some seasons make it somewhat hard, a careful observant grower can get at least 95 per cent. correct. On examining a banana plant with a number of suckers surrounding the butt, it will be found that the majority, and in some cases the whole, of the suckers are growing from eyes or buds that are in a circle at or near the soil level. These suckers are referred to as "sitters," and when allowed to develop into matured plants are sitting more or less on the surface with a root action that is superficial. *Such suckers are to be avoided as followers.*

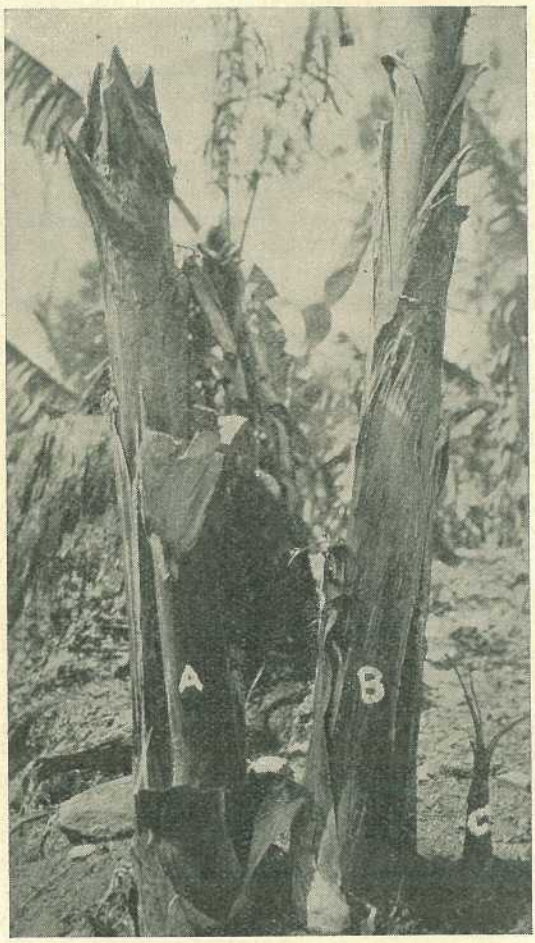


Plate 146.

Shows the third generation of plants. "A" is the original plant from which a bunch has been cut, "B" is the first follower ready to bunch the second season, and "C" is the follower for the third season. Note that "C" is in a direct line away from "A."

Usually after the plant has made good growth and has been regularly desuckered, it forms one or perhaps more suckers that come from buds or eyes directly *below* the top layer of eyes and at least 5

inches lower in the soil: *these are the correct followers,* and if the injunction to place the suckers the correct way when planting has been carried out, by the time the bunch is thrown on the parent plant the grower will have a nice sturdy spear-leaved follower of from 2 to 4 feet in height on the top of the side according to the contour of the plantation. It is of the utmost importance that the follower is above ground *when the bunch is thrown on the parent plant.*

Once a grower has reached the stage of having his next year's follower correctly placed as regards position and time his main troubles are over, as it has been proved definitely that the third and succeeding correct followers, to the extent of 95 per cent., are true follows through, *i.e.,* in a direct line with the original plant and the first follower. (See Plate 146.) The straight follow-through demands that the planter must ensure that the first follower does not grow on the down hill side or towards a fixed object such as a stump or a stone.

The objectives of this system are the same as are aimed for in every other line of fruit production where pruning is resorted to for definite results. A desuckered banana plant enjoys a maximum of sunlight, available food and moisture, and must, when these and other essential factors are present, produce a superior article. In addition, a one-bunch one-sucker plantation can be regularly and effectively baited for beetle and offers every facility for inspection for bunchy top and other diseases.

The one big idea that a grower has to keep in mind is that suckers other than those required only absorb plant food out of his bearing plants and his bank book as well, so his slogan must be—Desucker, Desucker, Desucker!

PACKING BANANAS FOR MARKET.

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

OWING to the great distances bananas have to be transported to various markets, and to the various kinds of weather conditions that are experienced during transport, many difficulties are encountered by those engaged in trying to build on a firm basis a banana trade of Australian-grown bananas. With the opening of the Kyogle Railway these difficulties were somewhat reduced through the elimination of the intensely cold journey over the New England Highlands being replaced by the more even temperatures of the coastal route. Between Sydney and Melbourne the same difficulties of extremes of heat and cold still exist, particularly the heat of summer, which causes much "boiling" of fruit at that time of the year. As science and better transport facilities are playing their parts in gradually overcoming transport and ripening difficulties, it is necessary for the growers to do their share.

Unfortunately, bananas are grown in many unsuitable places which do not always yield the best type of fruit for ripening into the luscious and healthful fruit the banana should be. We also find that many growers after producing good fruit do not always harvest and pack it to the best advantage. The publication of this article, besides showing the different methods recommended for use to ensure profitable marketing, is an appeal to all growers to endeavour to do the things necessary to show that we have nothing to fear from comparison when it comes to producing first-quality fruit.

In these days of intense and extensive competition, it is not profitable to produce or attempt to market any but first-quality fruit that will ripen fit to be eaten by the youngest child. Hard, "soapy," indigestible fruit will soon turn consumers to other fruits, with loss to the banana industry. The old axiom, "The Consumer is Always Right," still stands as the basic law of marketing.

MARKET CONDITIONS.

Bananas are at present packed by many individual growers, each grower adopting his own particular methods. As the plantations are not of a permanent nature, such as citrus or apple orchards, growers do not go to the trouble of putting up elaborate sheds and packing plants. Central packing-house or community systems could be used with advantage if a sufficient number of growers with co-operative spirit joined together to operate. Systems of this kind permit the advantages of a standard brand and product to be obtained, ensuring increased regular supplies, which is an advantage in creating stabilised marketing from both the distributor's and retailer's point of view. Another disadvantage of the present system is the great number of ripeners, each using his own system of ripening, some giving good results and some leaving much to be desired. This is gradually being overcome in the larger centres by the adoption of centralised methods.

At the present time the most extensively-used case, which contains 1½ bushels, leaves much to be desired from the retailer's point of view. A case containing 1 bushel has been evolved, and it is hoped that all sections will endeavour to assist in making the smaller case popular. All users of the smaller case have expressed the opinion that it will fill a long-felt want. It must be remembered that when making a change of any description in marketing methods, opposition will be met with in some directions due to small personal interests which forget the big principles of the industry at stake.

The main difficulty encountered on the markets to-day is not an over-supply of good fruit, but rather the over-marketing of too much poor-grade fruit, which is hard to shift, and creates an over-supply. If a steady and standardised output of bananas in grade and quality could be obtained, many of our troubles would disappear. These results would not be hard to achieve if all growers produced crops of the same quality and handled and marketed them in the same way. Unfortunately, owing to the individual opinions on grade standards and methods of growing that exist, there is a great barrier to surmount, and it will only be by the efforts of all in the industry working together that stabilised marketing will be created. Many growers send to market fruit of poor quality which they would never permit their families to buy for their own household supplies if they had to buy bananas, yet at the same time they feel they have profited if they can get fruit of this description on the market. They do not realise that the wholesaler will have difficulty in disposing of fruit of this kind, and that the retailer will probably lose on it. Poor types of fruit are often bought at a low price by barrowmen or hawkers who sell at a cheap rate. These cheap prices, both wholesale and retail, have a great tendency to lower the trend of market prices to the disadvantage of the better grades. It costs more to market small low-grade fruit, and any growers who send this fruit to market in order to, as they say, pay expenses,

must lose in the long run by a reduction in price of the fruit which more than pays expenses. Generally a closer application to cultural methods and the selection of suitable sites for growing will overcome largely the production of small low-grade fruit. Housewives buying low-grade fruit soon tire of that particular fruit and turn to something else, with a consequent decrease in the demand for the former. If retailers, when buying on a particular grade marking, find it unsatisfactory they promptly turn to another brand. Under these conditions a grower might possibly get a fair price for his first consignments, but it will not be long before prices below market values for good fruit will have to be accepted. It would seem reasonable that agents would refuse to handle inferior lines of fruit, but unfortunately owing to competition and lack of co-operation amongst themselves, they are unable to bring about reforms which they know would be desirable.

Before embarking on banana production, growers should have enough capital to properly equip the plantation. The following are necessities for easy handling:—

Economical wiring systems for bringing fruit from the plantation to the packing shed.

A suitable packing-shed, with benches and sorting tables.

A casemaking bench, hammers, a long, narrow-bladed dehanding knife, cane-knives for removing bunches from the stool.

Yokes to enable bunches to be carried to the wire-heads, stencils, brushes, and inking equipment.

These matters will all be dealt with as we go along, and as far as possible will be illustrated and described.

PREPARING TO CUT.

Before cutting growers should give careful consideration to the maturity of the fruit. Judgment must be exercised in selecting bunches at the right stage of maturity. It is difficult to lay down any set rules to govern maturity, as climatic conditions, location and cultivation all have a bearing on the particular type of fruit that can be produced. Conditions and type of fruit vary in different districts. As far as possible growers should cut well-filled fruit, avoiding the thin angular type. Sometimes, after a prolonged dry spell, fruit matures whilst still angular in shape. Bunches of this type often show they are ready to pick by the splitting of some of the fruit at the top of the bunch. More latitude to the extent of a few extra days can be given for the fruit to mature in winter, as during the cold weather there is not the same danger of fruit ripening in transit as during the hot summer months. Growers should take care to always shield the fruit from the risk of burning or bleaching by the direct rays of the sun; this can be done by bending a leaf near the bunch to lie over the fruit for protection from the sun. This also assists in allowing the fruit at the back of the bunch, which is sometimes backward in development, to develop the same condition as the more exposed front fruit.

HANDLING BEFORE PACKING.

Care in all handling operations, right up to the time the lid is placed on the case, must be stressed as it is during the period from cutting to packing that the risk of damage is greatest. The banana,

as with other fruits, must be handled so that no skin damage, squeezing, bruising, &c., takes place. Injuries of this description are the points of entry for transit and ripening rots, such as black-end, squirter &c.

REMOVING THE BUNCH.

When cutting the bunch from the stool, care should be taken to keep, as far as possible, the bunch from coming in contact with anything which will bend the fruit in any way. With large bunches it is often advisable for two operators to assist in removing the bunch, one to cut the bunch whilst the other supports the weight and lowers it gently to the ground. Bunches should be kept, as far as possible, in a vertical position. A cane-knife is a useful tool for removing the bunch from the stool. Where the bunches have to be carried by hand a yoke is a useful adjunct for use, the bunches whilst being carried in this manner getting the maximum protection. Bunches should at no time be placed in a horizontal position one upon the other; individual fruits, on being pressed or twisted from their natural positions on the bunch, are bruised at the shank. This is often the start of black-end. Growers can observe this bruising taking place for themselves. Bend the shank of a banana slightly and notice the darkening or "flushing" that takes place under the skin of the shank. Unfortunately, when the pressure is released the bruising practically disappears, although the damage has been done and the development of black-end started. Growers are often observed carrying bunches on their shoulders, and also stacking them on their sides on top of each other. This is possibly a great cause of the production of black-end which no amount of care in packing could eliminate. Good overhead wiring systems, placed in the plantation in position to minimise as much as possible the necessity for carrying bunches far by hand, give great assistance in eliminating damage to the stalk ends of fruit. The wiring systems should be so placed and designed that it is impossible for the bunches to be jolted or touched by anything whatsoever whilst they are attached to the pulleys and running to the packing shed. The use of a yoke permits two bunches to be carried to the wirehead or packing shed at the same time.

Summarised, the following recommendations are important when handling before packing:—

1. Select only matured fruit;
2. Take every care to avoid bending the shanks of the bananas when removing the bunch from the plant and transporting it to the packing shed.
3. Keep bunches in a vertical position as far as possible.
4. Select only good case timber with thick sides to give maximum protection in transit.
5. In summer keep the fruit as cool as possible when harvesting and transporting from the plantation to the rail. In winter keep the fruit from becoming chilled by protecting from cold winds, &c.
6. Clean the fruit of all foreign and decayed matter caused by animals, insects, or otherwise.

THE PACKING SHED.

This should be situated on that part of the plantation nearest to the best road for carrying out. The erection and placing of the wiring systems will also have a great influence on this. As banana-growing is not permanently carried out on the same land, as with other fruit, sheds of a temporary nature are usually erected. The shed, without being too large, should have ample room for easy handling of the largest quantity likely to be put through. Provision should be made for space for benches for placing the bunches on to cool and sweat before dehanding, a case-making bench, and a room for case timber, and made up cases. A diagram (Plate 147, Packing House Layout) shows the method of planning a satisfactory shed.

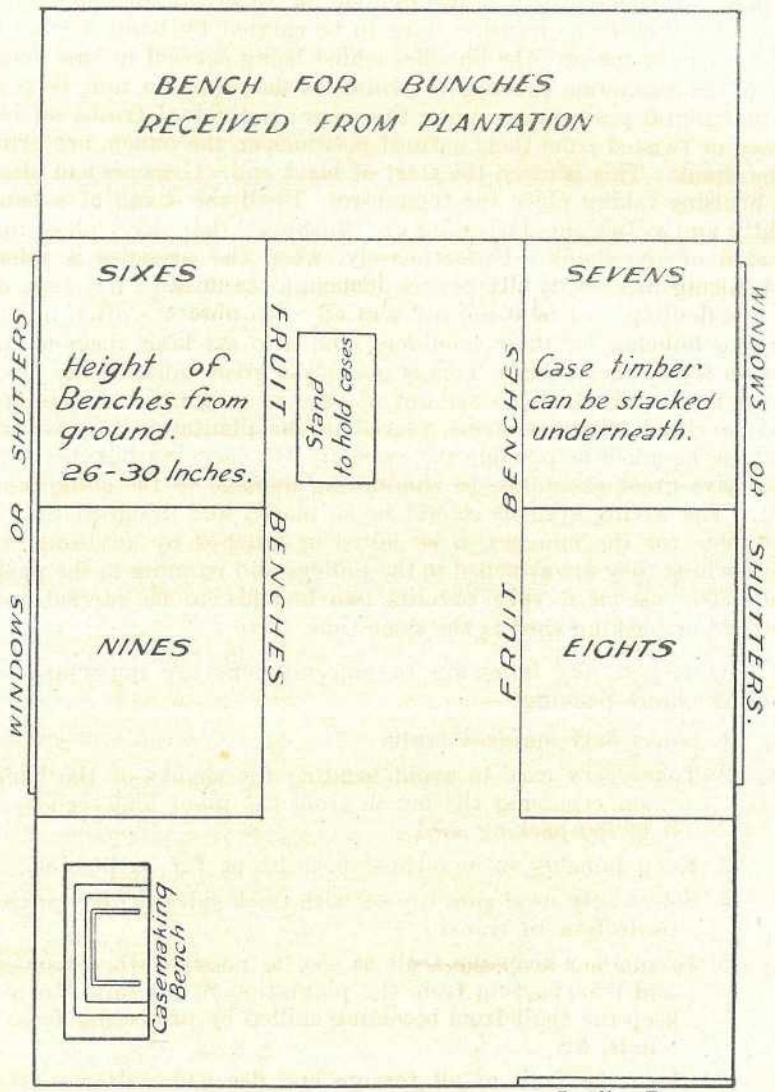


PLATE 147.
SUGGESTED LAYOUT OF A BANANA PACKING SHED.

This can be altered to suit any plantation. A shed of this type can be operated systematically, eliminating much work. The fruit is received at one end and stacked upright one bunch high, in order to cool. As the bunches are dehanded the hands are placed according to their approximate sizes on to flat-topped benches, "sixes," "sevens," "eights," or "nines," as the case may be, being separated. Time will be saved if the sizes which comprise the bulk of the shipment are handed off on to the benches nearest the heap of bunches. The packer then packs one size, and if fruit of one of the other sizes is found mixed in,

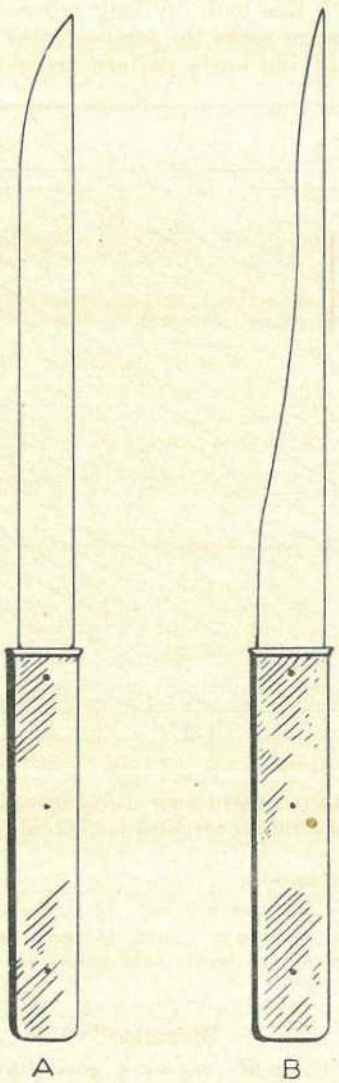


PLATE 148.

A. Unsuitable knife for de-handing.

B. Suitable knife, with thin blade making it easy to make the semi-circular cut necessary.

it is transferred to the bench holding that particular size. It is recommended to pack the largest sizes first, working back to the smallest. An alternate method is to pack two cases of the one grade at a time, large and small, to avoid the double handling mentioned.

PACKING HOUSE EQUIPMENT.

De-handing Knife.

Along with a well-designed packing shed, good equipment should be installed. A good dehanding knife is an essential tool. Much time will be saved with this tool. A long tapered sharp blade is ideal, permitting the operator to make the semi-circular cut with ease. Wide-ended blades of the carving knife pattern are slow and unsatisfactory.

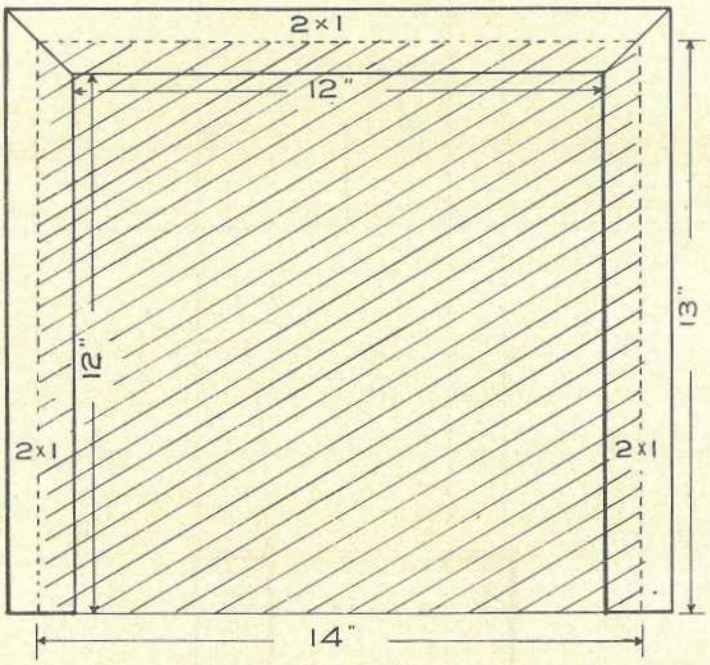


PLATE 149.

NAIL CLINCHER AND TEMPLATE can be made separately or fitted to the case-making bench. The dotted line enclosing the shaded portion shows the shape of the piece of sheet iron.

The materials required are—

2 pieces wood 2 inches x 1 inch, 14 inches long;
1 piece wood 2 inches x 1 inch, 16 inches long;
1 piece sheet iron 14 inches x 13 inches x $\frac{1}{8}$ inch;
and necessary nails.

Stencils.

Stencils are the means of placing a good finish to the packed case of fruit. The marketing regulations insist that the grower's name and full address be placed on the end of the case in letters not less than one-half-inch in height. The following stencils are needed:—Grower's stencil, with name and full address; stencil showing variety, such as

"Cavendish," and sizes, "Sixes," "Sevens," "Eights" or "Nines." Agents will generally supply the necessary stencils for shipping brands free on application.

Hammers and nail boxes are necessary.

Case lidding presses are extremely useful. There are many home-made ones to be seen which are quite satisfactory.

A properly made stencil-ink tin is a small moneysaver, as well as helping to do a better job. A flat tin filled with a handful of engineer's cotton waste, kept saturated with water and used in conjunction with the cake of stencil ink, is easily procured or made from a kerosene tin. Stencil ink used this way lasts longer, as well as giving a cleaner stencil print.

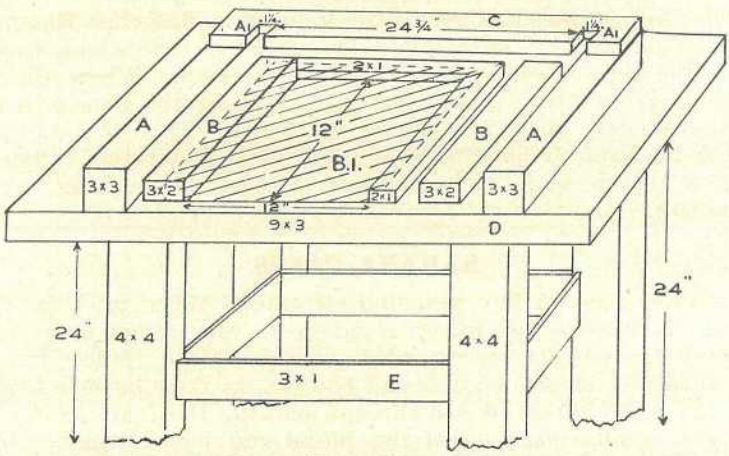


Plate 150.

BANANA CASE-MAKING BENCH, SHOWING METHOD OF ATTACHING CASE END, TEMPLATE AND NAIL CLINCHER.

SPECIFICATIONS:

Length:—42-50 inches;
Height:—(Underside of top), 24 inches;
Width:—24 inches;
Template:—As described (Plate 149);
Timber:—Legs, 4 inches x 4 inches;
Stops:—(A) Outside, 3 inches x 3 inches x 13½ inches;
(B) Inside, 3 inches x 2 inches x 12 inches;
(C) Back, 3 inches x 1 inch x 34 inches;
Top:—(D) 3 pieces 8 inches x 3 inches x desired length;
Stays:—(E) 3 inches x 1 inch.

DESCRIPTION:

The stops (A) and (B) are placed approximately 1½ inches apart, with the back stop (C placed across the back ends of (A) and (B). A cut 1 inch deep and 1½ inches wide is made in the back stop to correspond with the slot between (A) and (B). The back end of this cut should be 12 inches from the front of the bench. The inside stop (B) is placed ½ inch from the front edge.

Template and Nail Clincher.

Many growers find difficulty in making up two-piece ends for fruit cases into correct widths owing, often, to the badly-cut timber. This

can be easily overcome by attaching a template, in the form of a three-sided wooden frame, to the shed bench. A piece of flat sheet iron is placed to cover the space enclosed by the sides of the template. This acts as a nail clincher, turning the ends of the nails when the cleats used for joining the two pieces making the end are hammered on.

If a case-making bench is used the template can be attached as part of the bench, as shown in the illustration, the shaded portion representing the flat sheet iron. When the template is made up in combination with the casemaking bench it is only necessary to provide pieces of timber for two sides, the third side being made up by using the inside stop piece (B, Plate 150) of the bench top.

Case Making Bench.

The cost of timber is very little to make a first-class case-making bench. Some growers have found the use of an old stump excellent, placing the timber-holding portions on the stump. Where the bench illustrated is used, care should be taken to place the slots to hold the ends immediately above the legs of the bench. This permits the full force of the hammer blow to be utilised. The illustration (Plate 150) shows the bench made with template attached for making two-piece ends square.

BANANA CASES.

It never pays to buy second-grade cases. When used for distant markets the banana case has to stand up to very rough usage, mainly owing to its excessive weight when packed. Good timber free from knots should be chosen for lids and bottoms, as these have to bend and stand up to any strain caused through packing the fruit with a bulge. Ends are usually made up of two pieces and joined together by two cleats. Ends should be of a minimum thickness of three-quarters ($\frac{3}{4}$) of an inch, and where cleats are used these should be approximately two (2) inches wide by three-eights ($\frac{3}{8}$) of an inch thick. To prevent the timber of the ends and cleats from splitting when the lids are nailed on, care should be taken when nailing the two pieces together with cleats to space the nails correctly (see Plate 151) and place them as shown.

It is recommended to nail on the lids and bottoms across the grain as shown, but if care is not taken to nail the cleats correctly it is quite possible with some timbers for the pressure of the lid, if the case is packed with a high bulge, to break away a part of the end. If $1\frac{3}{4}$ inch nails are used and the top and bottom nails through the cleats are placed three-quarters of an inch ($\frac{3}{4}$ inch) from the cleat ends on the inside edge, it will be almost impossible for this trouble to occur. Owing to the occurrence of this trouble many growers prefer to drive the nails in end grain. Whilst with some timbers, provided the nails are driven on the skew, no apparent weakness is shown, it is recommended that driving the nails across the grain is the most fool-proof method of nailing down for all timbers. It is strongly recommended that all nails be of a minimum length of $1\frac{3}{4}$ inches and of 14 gauge. Using smaller nails is false economy, and leads to trouble with breakages and ullages during transit. Rusting the nails assists in making them hold better; a large pinch of salt thrown amongst the nails will soon rust them. The wiring of packed cases is strongly recommended for long-distance transit.

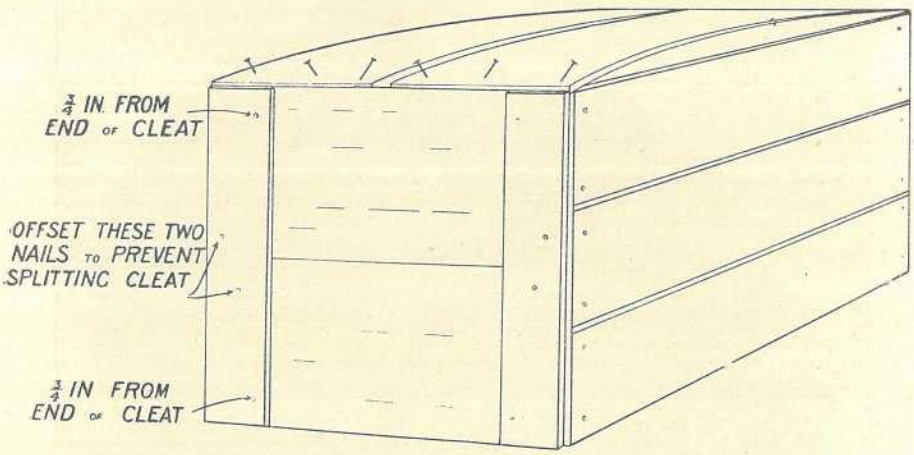


PLATE 151.

METHOD OF MAKING A BANANA CASE AND NAILING DOWN.

NOTE.—The direction in which the nails for the lid are driven.

DE-HANDING.

Much time and trouble can be saved if a little thought and attention is given when de-handing. The hand should be removed from the stalk by cutting around the stem through the flange joining the fruit to the stem. A careful examination will show the different sections that make up the full hand. (Plate 152.) The hand illustrated is quite a typical example, although variations in the actual composition of a hand occur according to the part of the bunch from which the hand is removed.

To remove the fruit from the bunch a cut is made through the flange or joining-piece along the raised brown ridge (4). Occasionally a slight variation in the placing of this cut may have to be made owing to some hands differing slightly in the way they are attached to the stalk. Notwithstanding any slight difference as mentioned, the cut should always be made at least a quarter of an inch from the girdle (3) around the shank of the fruit, leaving a small piece of the wood attached to the shank. (Plate 153.) It may be necessary with awkwardly-shaped bunches to avoid damage to adjoining hands to make two cuts, one to remove the hand, and a second to trim away any surplus wood before breaking for packing. Hands removed from the bunch in this manner will easily break into part hands or singles, leaving a small length of the corky wood attached at the end of the shank to dry out. This assists in protecting the fruit from black-end, squirter, and other infections, also leaving the shank full and well-shapen.

The following faults may occur in hand-cutting:—Cutting the hand from the stalk and leaving too much wood on the hand makes it difficult to break the fruit from the hand. This may cause the shanks or stalks to become wrenched, and, in some cases, torn. (Plate 154.)

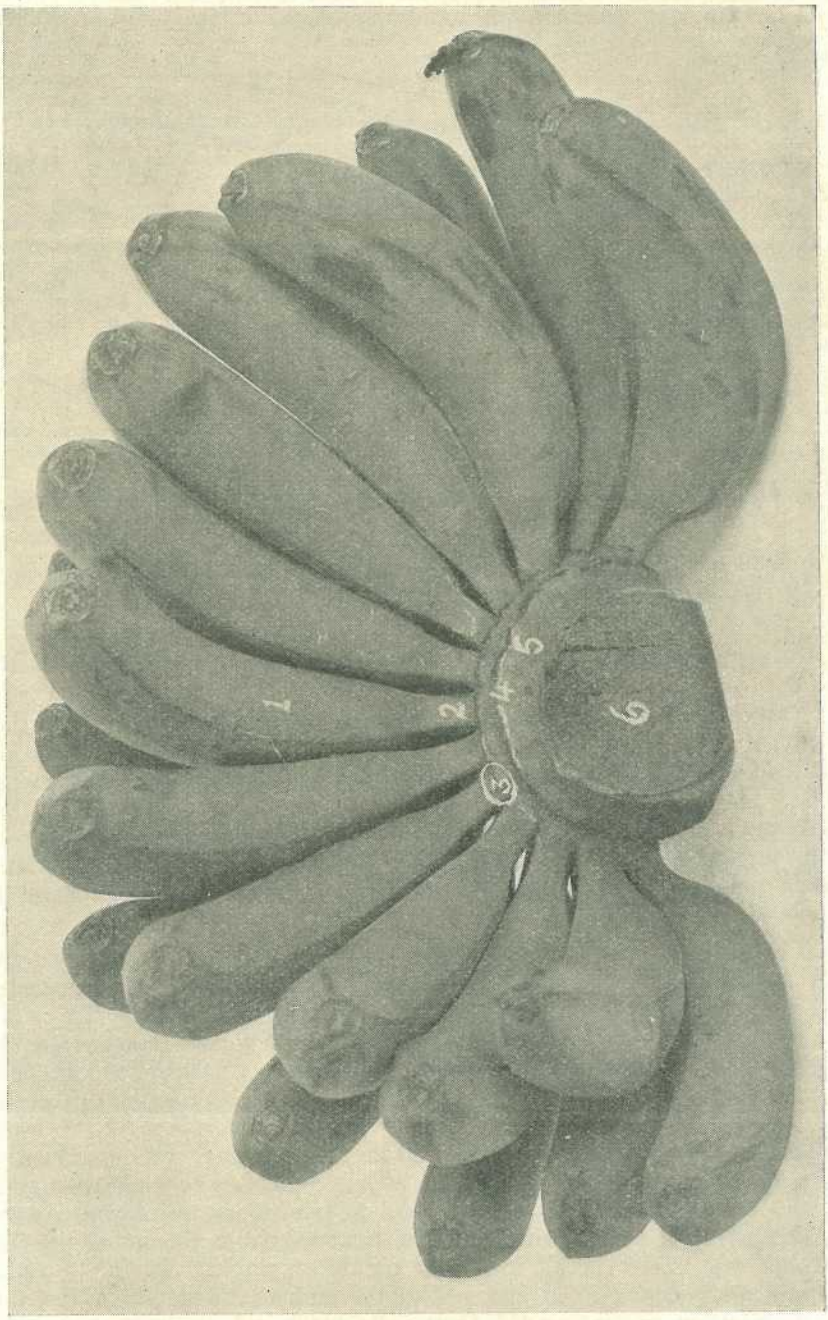


PLATE 152.

A FULL HAND OF BANANAS CUT IN SECTION THROUGH THE STALK OF THE BUNCH.

1. The fruit;
2. The shank or neck of the banana;
3. The raised girdle around the neck of the banana where the fruit is joined to the flange;
4. The raised brown ridge running round the flange or piece joining the fruit to the stalk;
5. The joining-piece or flange;
6. Cross-section of the bunch stalk.

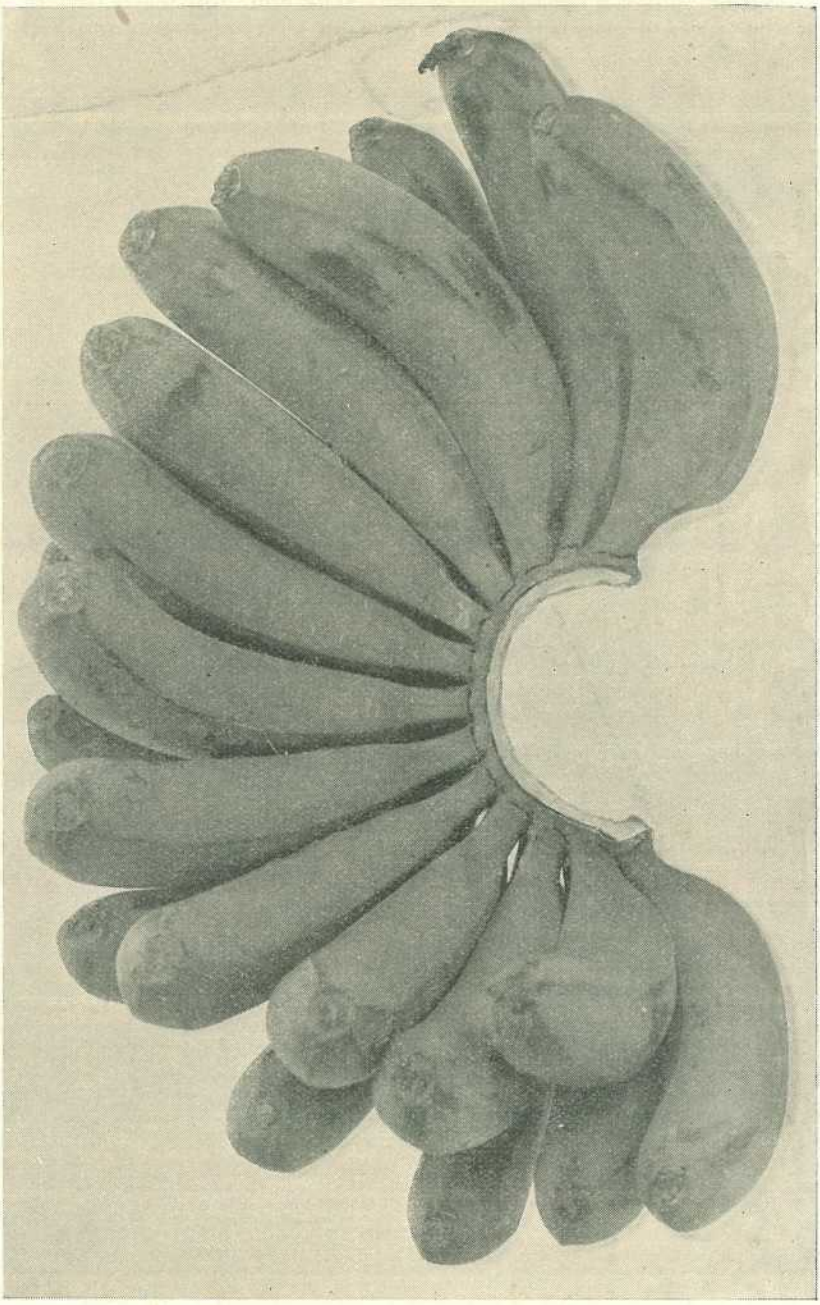
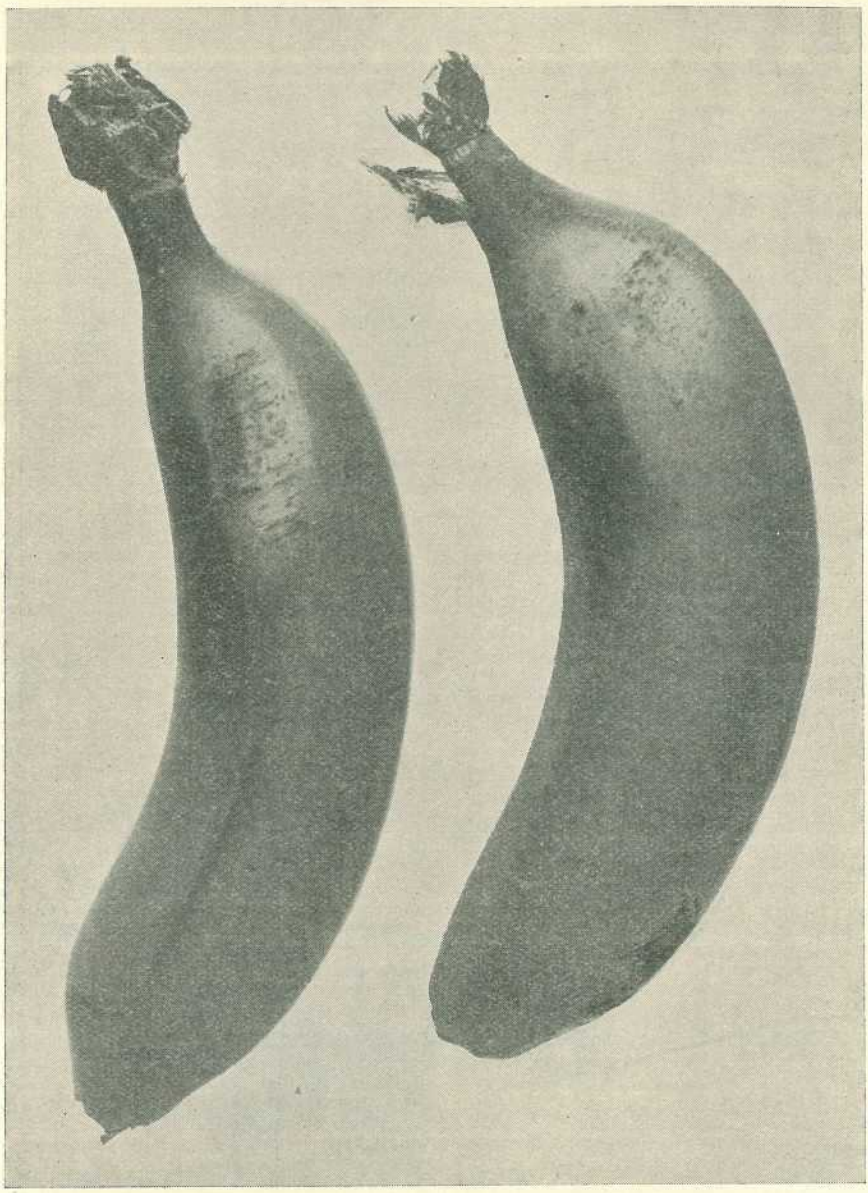


Plate 153.

HAND REMOVED FROM THE BUNCH.—Note the absence of excess wood. If in doubt it is better to leave too much wood, as a second cut can always complete the operation.

Leaving too little wood, so that part of the stalk is removed when de-handing causes a shrivelling of the shank end, and often during the ripening process these shrivelled ends show signs of premature rotting. (Plate 155.)



A B

PLATE 154.

BANANAS REMOVED FROM THE HAND SHOWING AN EXCESS OF WOOD LEFT ON THE END.

A.—Showing excess wood.

B.—Torn shank, which often occurs through leaving excess wood.

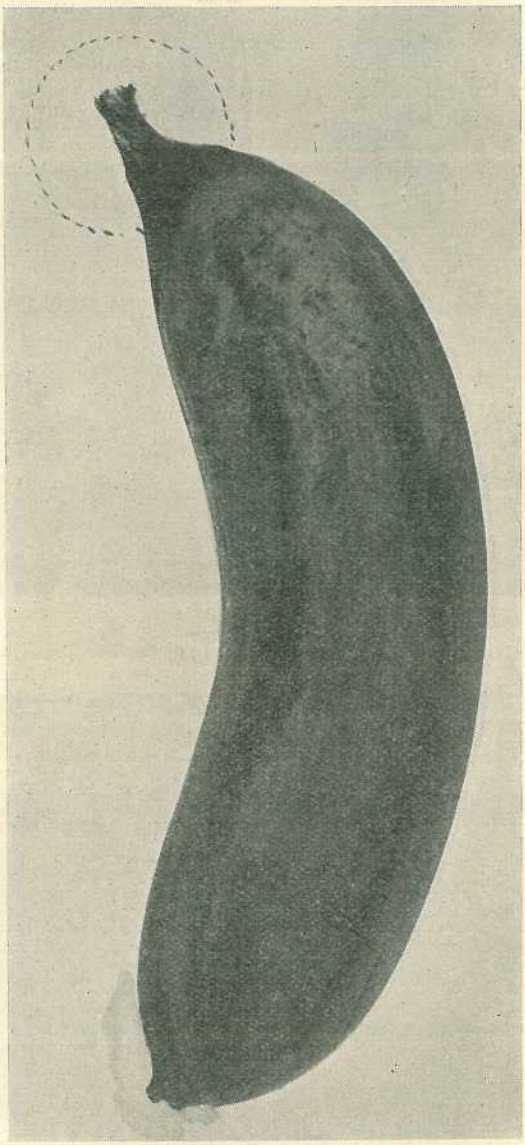


Plate 155.
Banana showing shrivelled shank end caused by removing too much wood.

This type of fruit is the cause of much dissatisfaction to ripeners, retailers and consumers. The value of the fruit from the point of view of display is spoilt to both ripener and retailer. Fruit of this description also appears smaller than it would otherwise. The consumer gathers the impression that the fruit is starting to decay, which makes it an unappetising commodity for table purposes. These troubles and

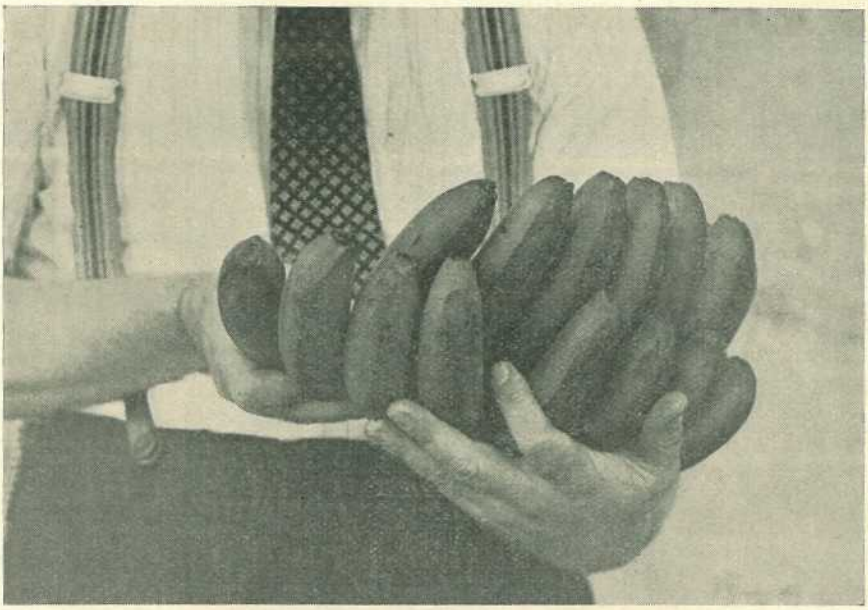


PLATE 156.
Method of holding the hand of bananas for breaking.

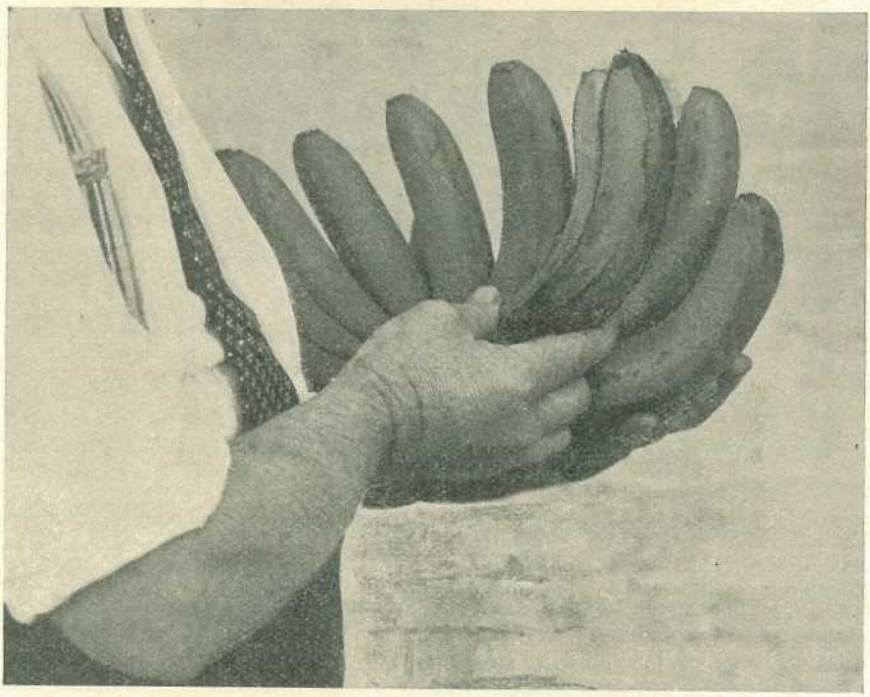


PLATE 157.
Breaking bananas from the hand. Note how the fruit is held by the shank.

faults can all be overcome by care in cutting and the use of a good de-handing knife. A good de-handing knife is a necessity for fast, efficient work. Compare the types of knives shown in Plate 148. The long thin knife (B) makes it possible to make the semi-circular cut comparatively easily and quickly. Sharpness of the knife is essential.

Breaking the Hands.

Breaking the hands into part hands or singles will present no difficulties if the de-handing has been carried out correctly. The easiest method of breaking is to support the full hand along the arm with the hand spread beneath one end and the other end resting on the wrist and forearm.

The fruit is then broken from the hand by being gripped firmly by the shank (Plate 157) and broken off by the use of a semi-circular motion. On no account should fruit be pulled or wrenched from the hand.

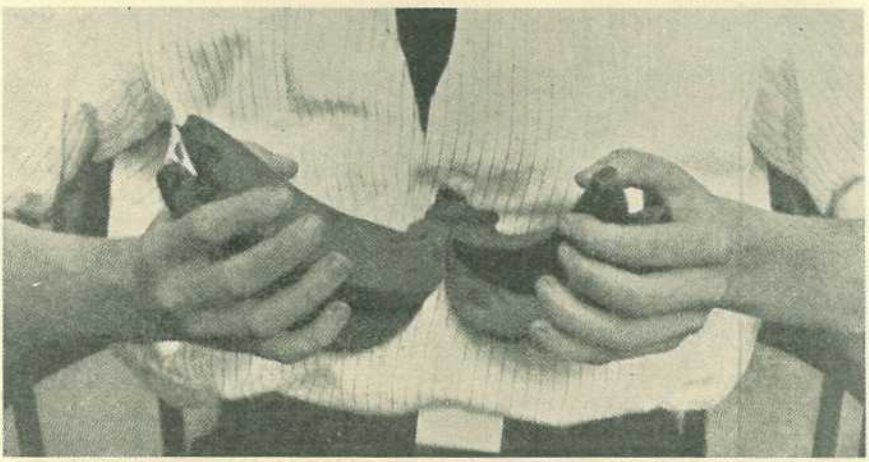


Plate 158.
Wrong method of breaking hands.

Handling by the shank only, so far as the shape of the bunch will allow, is of the utmost importance. Some operators hold the hands by the flower end of the bananas when breaking (Plate 158). This must cause damage to the fruit and increase the possibility of transit and ripening troubles. Cutting the hands into singles or part hands is to be recommended, but it is doubtful whether most growers would consider it an economical proposition to do this when banana prices are low. Cutting gives an excellent appearance to the fruit after ripening. An example of a well-broken and cut banana is shown in Plate 159.

To summarise the foregoing, the following points should be stressed when dehanding and breaking hands:—

Procure a satisfactory dehanding knife.

When removing from the bunch do not leave too much or too little wood attached to the hand.

PLATE 159.

A.—A well-removed single banana. Note the amount of wood adhering to the end of the shank.

B.—Example of fruit cut from the hand.

Make two cuts if necessary. It is better to do this than to take too much off with the first cut.

When breaking hands, take care to handle the fruit by the shank end.

Support the "hand" of fruit on the arm so that no strain is placed on any individual fruit.

Care and cleanliness should be exercised in order to eliminate chances of fungal infections which bring Squirter and Black-end.

[TO BE CONTINUED.]

ASPARAGUS GROWING.

By H. Barnes, Director of Fruit Culture.

ORCHARDISTS and small crop growers who are looking for something new to grow might well devote an area of land to the production of Asparagus. There is a definite demand for considerable quantities from both the fresh vegetable market and the canneries. Queensland conditions are suited to its growth, and there is no reason why we should not eventually produce sufficient to develop an export trade in this excellent vegetable product; at present we import large quantities. Growers in New South Wales have wakened up to the possibilities, and now quite a lot of asparagus is grown in that State, and a canning factory for treating that which is not required as a fresh product has been erected at Bathurst.

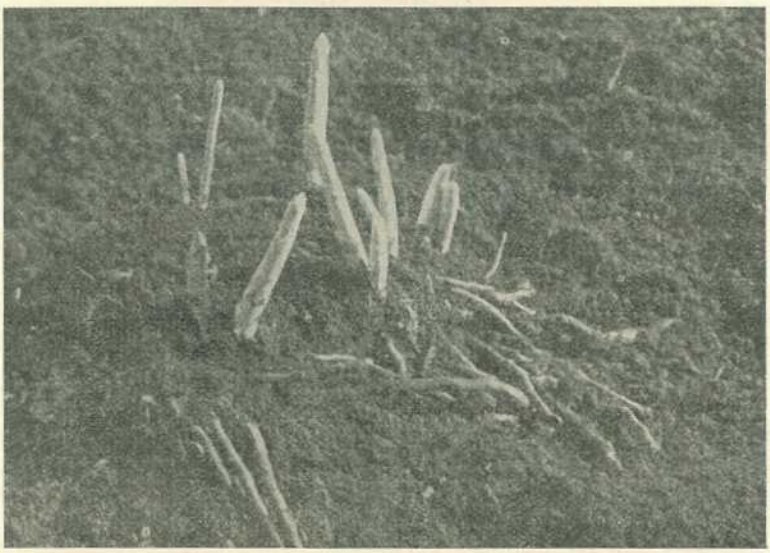


Plate 160.
Asparagus Stems Ready for Cutting.

The asparagus tips of commerce are the edible shoots of the asparagus plant, a perennial thriving best in soils containing a large percentage of sand. The rich alluvial soils of river flats will produce asparagus of large size and good quality, and therefore their composition may be imitated in preparing other soils for the cultivation of this plant. Although asparagus can make use of large quantities of water when growing, it requires a well-drained soil. Stagnant water is fatal to the plant.

Propagation.

Seed should be sown in the spring in a well-prepared seedbed containing a large percentage of sand. Germination is slow, but it may be hastened by soaking the seeds in warm water for twenty-four hours prior to planting. When the seedlings are several inches high they should be thinned out to three to four inches apart, and the strongest left to grow.

Early the following spring, just prior to the new growth, the plants may be transplanted into the field, care being taken not to expose the roots to the sun or dry air. All weakly and shrubby plants must be discarded, and only the tall, strong plants with thick succulent stems planted out.

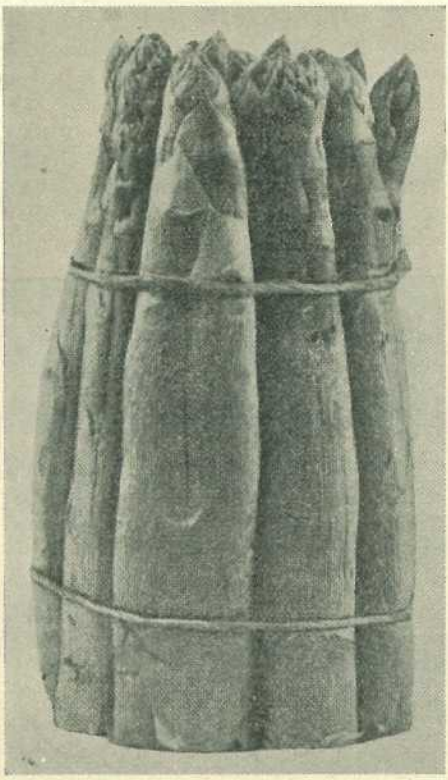


Plate 161.
Bunched Asparagus Tips.

Planting.

The root system of asparagus plants is extensive and vigorous, and therefore ample room must be allowed for development. Drills 9 in. deep with a slight ridge in the bottom should be opened not less than four feet apart, and the plants set out about 4 ft. apart in the drills. This will admit of horse cultivation being employed each way for the suppression of weeds. The ridge in the bottom of the drills will be of material assistance for spreading the roots of the crowns, which should then be covered with 2 to 3 in. of soil. If "blanched" asparagus tips are required, the crown should be covered with about 6 in. of soil; if "green" tips, the soil should be shallower.

Each year the growth of the crown forces it closer to the surface of the land, but if available animal manures are added annually the original depth can be maintained.

Cultivation.

After the plants have been set out the land should be kept well cultivated to keep down weed growth and to conserve moisture. If the weather is dry and irrigation is available, copious applications of water are advisable. During the autumn the plants will seed and turn brown. They should then be cut down about 6 in. above the ground, and the tops carted off and burned. During the winter the land should be well cultivated and more farm-yard manure applied. Early in the spring artificial fertilizers may be applied. The Agricultural Chemist recommends 2 cwt. nitrate of soda, 2½ cwt. bonedust, 2½ cwt. superphosphate, and 1 cwt. muriate of potash per acre.

During the second spring, after planting out, it is not advisable to harvest any tips; rather it is better to allow the plants to build up a strong constitution for the subsequent years and the grower may depend that his patience will be then well rewarded. During the autumn of the second year the plants should be cut down before they have seeded. Seed bearing is very exhausting to the plants and is also one of the chief sources of trouble in keeping the cultivation clean. The same cultural practice as outlined above should be adopted during the subsequent winters and early spring months.

Cutting.

During the third spring, after planting out, light cutting may commence. The tips should be cut before the scales on the heads have opened out. At first it would be wise for the grower to carefully scratch away a few inches of the soil in order to see where he is cutting the tips. They should be from 6 to 9 in. long. With practice all that will be necessary will be to insert the knife into the soil to sever the tips below the surface. A special knife with the cutting edge at the end is made for the purpose.

During the third year the cutting season may cover from four to six weeks, and the plants should then be allowed to grow again, the tops being cut down in the autumn before seeding. In subsequent years the cutting season can be extended to about ten weeks before the plants are allowed to run to stem and leaf.

Throughout the cutting season the field should be gone over and the shoots cut each day, preferably commencing very early in the morning. If "blanched asparagus" is required it should be cut when the tops show above the ground. This system naturally necessitates the crowns being well below the surface, and may necessitate ridging the soil in the rows. For "green asparagus" the shoots are cut when they are about 7 in. high, cutting about 2 in. below the surface.

When cut the stalks should not be exposed too much to the sun. They should be washed in clean water, and if they are to be kept overnight they should be stood on end on wet straw or clean hessian in the shade. Prior to being tied into bundles of about twelve stalks they should be graded for quality and appearance.

With care the asparagus plot will last for a minimum of twelve years.

Varieties.

Varieties recommended are Connovers Colossal and Palmetto. About 20,000 seeds weigh 1 lb.

SOME TROPICAL FRUITS.

2. THE CASHEW NUT.

By S. E. STEPHENS, Instructor in Fruit Culture.

ALTHOUGH very well known and popular in the market places of its native home, the Cashew is unheard of in the markets of Queensland; in fact, it is quite unknown to all but a very few people. Even trees of this peculiar fruit are very few in the Queensland tropics.

A native of tropical South America, it is related to the mango, and is known botanically as *Anacardium occidentalis.*

The habit of growth is frequently ungainly, trunk and branches being very crooked and twisted. The foliage is clustered towards the ends of the stiff branchlets, the leaf being broad, oblong-oval, with rounded or emarginate apex. The flowers are produced in terminal panicles.

The fruit is peculiar in that it appears to carry its seed externally as an appendage at the lower end. In reality, the upper fleshy portion is the swollen peduncle and disc. The fruit proper is the seed or nut suspended from this.

The fleshy portion, called the Cashew apple to distinguish it from the true fruit or "Cashew nut," is commonly used for food purposes in its native Brazil. With its distinctive aroma it is said to make a pleasing jam, and is also largely used for making wine and a species of beverage similar to lemonade. The edible varieties of the Cashew apple are bright yellow or brilliant red in colour when ripe, thin skinned, juicy, and astringent.

The Cashew nut is a regular article of commerce, and is imported into European countries in fairly large quantities. It is a kidney-shaped nut about an inch in length and protected by a tough husk or shell, possessing caustic properties due to the presence of cardol and anacardic acid. Fortunately these substances are easily dispelled by heat. The nuts are, therefore, subjected to roasting, which renders them perfectly innocuous. The resultant product is a fine edible nut.

The Cashew is a simple tree to grow, but is one that dislikes being transplanted. The usual mode of establishing trees is to plant the fresh seed in the situation the tree is to occupy. The seed germinates readily within a few days, and the young trees make rapid growth both above and below ground. In young trees the tap root is often more extensive than the aerial growth, but lateral feeding roots are often deficient.

Growth is rapid for several years, and under favourable conditions the tree will start bearing at about three years, the crop being ripened during the summer months.

The tree is usually regarded as being fairly short-lived, surviving for only fifteen to twenty years, when it gums excessively and dies out. In North Queensland, however, several trees up to about twenty-five years old are still vigorous, and fruit well when seasonal conditions are favourable.

In regard to soil requirements, the Cashew is not particular, but its preference is for a sandy soil. It is intolerant of frost and does best under fairly dry climatic conditions, consequently its cultivation must be restricted to the drier parts of the tropics.

Well known allied species native to Queensland are the Burdekin plum (*Pleiogynium solandri*) and the Tar tree (*Semecarpus australiensis*). The former of these produces an edible fruit with a large stone, and is popular with school children. The latter exudes a black tar-like substance from both the bark and the fruit, which may cause a great deal of pain if it comes in contact with the skin.

VITICULTURE.

NOTES ON SUMMER PRUNING.

W. J. ROSS, Senior Instructor in Fruit Culture.

WITH the advent of the growing and fruiting season, summer pruning will engage attention in every well-conducted vineyard. Small-scale growers, i.e., those cultivating a few vines for household requirements, will be well repaid by giving the matter their careful attention also. Under normal conditions the degree of success attained will depend upon the amount of care exercised in performing this work.

Summer pruning, of which there are a number of forms, consists of the removal of buds, shoots, or leaves whilst they are green, and is performed after the vines have commenced growth in spring. Summer pruning is best performed early in the growing season before the vines have made too much growth, so that the operation causes the least possible injury to the plants. The leaves are intimately connected with the assimilation of food material for the use of the plants, consequently if summer pruning is left until late in the season and it then becomes necessary to remove well-grown canes, the vines not only lose the energy expended in the development of such canes, but lose also the assistance of the food material which would have been made available by the foliage destroyed, thereby having a weakening effect on the vines. Whereas winter pruning is carried on when the vines have been defoliated, and the operation has the effect of strengthening the plants, late summer pruning has the effect of weakening them. For this reason, disbudding should be attended to early in the spring before the shoots have made very much growth.

The early removal of growing shoots or parts of shoots causes a concentration of the growth in the parts allowed to remain. This concentrating effect and the weakening effect occur in inverse ratio and vary according to the time and method of operation. For instance, if the operation is carried out in early spring when the shoots have started growth, the weakening effect is very slight, and the concentrating effect is almost as marked as that of winter pruning, but if done when the vines are in full growth, the weakening effect may be sufficient to completely neutralise the concentrating effect—i.e., the removal of some of the canes may weaken the vine so much as to cause a halt in the growth

of those canes which are left. Still later in the season the weakening effect may exceed the concentrating effect and the canes left will, in this case, make less growth than if no canes had been removed.

The objects of summer pruning are briefly—

(1.) To direct growth into the most useful channels by disbudding and the removal of unwanted shoots, including suckers and water sprouts.

(2.) To moderate vigour and increase bearing and the size of the fruit (though usually at the expense of sweetness) by means of pinching and topping.

(3.) To provide for the desired amount of shade for the bunches; to promote upright growth of shoots and laterals; and to decrease shade when necessary.

(4.) The removal of surface roots and the thinning of fruit may also be considered as forms of summer pruning.

As regards disbudding. This operation is practised on young vines during the second and third years of growth. It consists of removing the buds on the lower region of the stem or trunk of the vine in order to concentrate the growth on the shoots above, and to prevent the production of canes low down, which would have to be cut off eventually.

The removal of buds is advocated when they have grown an inch or so. In large vineyards earlier disbudding is not feasible, as many of the buds are still dormant after the first start into growth.

Removing these too early would in most cases necessitate the vines being gone over again later, and this is, of course, a matter of economic importance. The sooner these young unwanted growths are removed, however, the better, because if they are allowed to remain too long they draw too much upon the reserves of the vine. When dealing with very young vines, which have not yet formed a stem, disbudding consists in the removal of all buds except the one selected to carry on growth in a single cane which the following year will form the arm or trunk of the vine.

The thinning of shoots has the same object as that obtained by disbudding. It may be performed when the shoots have grown several inches. It is not to be preferred to early disbudding, as it weakens the vine more and the concentration of energy to desirable channels is correspondingly less. It is simpler than disbudding, and the vines only require to be gone over once. It is practised principally during the second year in connection with vines which have been cut back to two buds at the end of the first season's growth.

Topping Young Vines.

As a result of disbudding or thinning of shoots during the second year all the growth has been directed into a single shoot, and this shoot will grow with great vigour. When it has grown to about a foot or so above the height at which it is desired to develop the head or the trunk, it should be topped in order to effect a forced growth of laterals which are made use of at the next winter pruning as first spurs or for the establishment of permanent arms. If topping is not done, as is frequently the case among beginners, there may be very few buds on the cane, when it is mature, at the height at which it is desired to lay down an arm

or establish a crown. Also it will be difficult to find buds properly situated for the development of canes to produce the crop which the vine should yield the third year. During the third summer, the number of shoots will be small in comparison to the vigour of the young vine. They will grow rapidly and consequently will be very liable to be broken off by wind while tender and succulent. To guard against this, topping should be resorted to before they are too long. This will aid them to lignify their tissues and become tough enough to withstand the pressure of wind. Also, topping at this time helps to keep the shoots upright and assists to give the arms the proper direction for the following winter pruning.

All shoots which originate at or below the surface of the ground (suckers) must be removed. Neglect to do this results in diminished vigour of the whole of the above-ground portions of the vine. Suckers bear little or no fruit, and since they grow vigorously they appropriate the sap which should go towards the nourishment of the whole vine. Furthermore, they rob the vine to such an extent that they may cause its death eventually. Should it happen that the above-ground portion of a shaped vine succumbs, it may be rebuilt by cutting off the dead portions and allowing a vigorous sucker to grow. Grafted vines which have been seriously weakened by the prolonged growth of suckers will not recover, and are better replaced with a new vine. It is important that desuckering be done with the greatest care and thoroughness during the first four or five years, as by so doing a great deal of work will be avoided in later years. Very few suckers will grow from vines which have been properly tended in this respect during their early life, but if desuckering has been imperfectly done an abundant crop of underground shoots will appear every year. Like disbudding, desuckering should be done early in the season. If suckers are left till late in the season, or allowed to grow throughout the summer, they promote the formation of dormant buds and of tissue, which forms adventitious buds below ground. To only partially remove a sucker is worse than useless as the portion left attached to the vine forms an underground spur which will be a source of perennial trouble.

Whilst the removal of water sprouts (sterile shoots) is advisable when it is wished to prevent growth where it is not wanted, or to promote growth where the reverse is the case, it is a mistake to remove all sterile roots in every case on the theory that they are useless. With vigorous vines the foliage they produce helps to nourish the vine and improves its capability to produce fruit. They are useful also at times as renewal and replacing spurs, for which purpose they are very suitable on account of their vigour.

When large numbers of water sprouts appear, it may usually be taken as a sign that the full vigour of the vine is not being used for the production of the crop, and the remedy for this happening is a change of style in the winter pruning. The production of sterile roots on what should be fruit wood is frequently the result of some cultural error, such as excess of water, nitrogen or humus, or the vine might be making growth too late in autumn or producing excessive vigour. The removal of water sprouts is advisable if the vines are weak, as growth can then be concentrated in the fruiting shoots to enable them

to nourish their crops better. In such cases the sprouts should be removed early, before they have grown more than a few inches.. Otherwise, the vine will be further weakened and the trouble increased the following year. If, on the other hand, vines are excessively vigorous, reducing the foliage by late removal of water sprouts may provide a remedy, but it is preferable to utilise this vigour for crop production by a change in the winter pruning.

Water sprouts sometimes give trouble by growing through the bunches, making it impossible to gather the crop without injury, and where this is prevalent, it indicates that the vine has been trained to an unsuitable shape. This can be modified during the winter pruning by giving the vine a greater spread to permit the bunches to hang free.

Pinching consists of the removal of the growing tips of a shoot with thumb and finger. Its weakening effect is very slight, as no expanded leaves and a very small amount of material are sacrificed. Its effect is to toughen the shoots and render them more capable of withstanding the pressure of wind. Shoots that are pinched early in their growth usually produce a new growing tip from a lateral. Late pinching causes several strong laterals to grow. Pinching fruiting shoots just before flowering tends to make the fruit "set" better and also promotes the starting of other buds for the production of more bunches. By pinching can be obtained most of the objects gained by topping, and with a minimum weakening of the vine.

Topping consists of removing one, two, or more feet of the end of a growing shoot. Generally it is practised more in the cooler than in the warmer areas. If done early it has much the same effect as pinching. The later topping is done the more weakening it is to the vine, because more leaves are removed than if done early. Constant severe topping may have a serious effect on the vigour of even the strongest of vines. Generally speaking, topping tends to increase the size of grapes, and to decrease quality. It is sometimes an advantageous practice in the case of table grapes on vigorous vines provided it is not done too severely. It is not advised in the case of wine or sultana grapes on account of its tendency to decrease the sugar and flavour of the grapes. Both pinching and topping are practised with the object of protecting the fruit from sunburn by increasing shade, and in this respect pinching is to be preferred.

Thinning Fruit.

Excessive tightness of bunches is a defect when it comes to the matter of packing and the removal of defective berries. This can be remedied by thinning the bunch before the berries are one-third grown. It also increases the size of the remaining berries, helps ripening and tends to promote colouring. Furthermore, it dispenses with a lot of trimming of bunches at time of packing. Thinning is done by cutting out several of the side branchlets on the upper part of the bunch. The number of branchlets to be removed will depend upon how tight the unthinned bunches usually become. After a little practice thinning can be done very rapidly, as no great care is necessary in preserving the shape of the bunch. Bunches which appear irregular or one-sided

immediately after thinning will later round out and become regular before ripening. Grape-trimming scissors are the most useful for this work.

Removing Surface Roots.

Young vines in some soils show a disposition to throw out roots at or very close to the surface of the ground, and especially so where irrigation in summer is practised. If these are allowed to grow they will form main roots and are liable to injury in cultivation. During the early life of the vine, therefore, it is advisable to cut off any roots which originate near the surface of the ground. This can be done while desuckering is being carried out.

THINNING DECIDUOUS STONE FRUITS.

By H. ST. JOHN PRATT, Instructor in Fruit Culture.

THE thinning of the fruit crop is really an operation almost as necessary as pruning, but unfortunately comparatively few growers appear to realise its great importance—probably this is because they have never given it their serious thought.

Some growers are alive to its value, but many say it is too costly and doesn't pay. As a matter of fact, no grower can afford not to thin his crop these days when the public rightly demand value for their money, and will not accept any old rubbish a grower may case up.

Good fruit is easy to handle and sells itself, whereas on the other hand, inferior fruit gluts the market, reduces the price for the good fruit, and is almost always handled at a loss.

There are grade standards laid down by the Department of Agriculture for plums, but they specify the minimum sizes that can be marketed, and no grower could hope to make fruit growing pay if he were to take these standards as his objective. With stone fruit it should be borne in mind that it is the formation of the stone that puts the strain on the tree and uses up the mineral constituents of the soil. The pulp of the fruit is mostly water. If the case production of two plum trees when harvested amounted to, say, 4, 5 or 6 cases each, but with tree No. 1 the fruit was $\frac{3}{4}$ inch in diameter and with tree No. 2, through thinning, the fruit was $1\frac{1}{2}$ inch in diameter, it would appear that the fruit of No. 2 was twice the size of No. 1, and so there would be twice the number of stones produced by No. 1 tree as by No. 2. In reality there would be eight times as many. Few growers would care to accept this statement, but if they work it out they will find it is correct. I have taken the sizes as $\frac{3}{4}$ inch and $1\frac{1}{2}$ inch; reduce these figures to quarter inches and you will get three quarters and six quarters, take the cube of each—for it is the cubic content of the case you have to fill—and you will get $3 \times 3 \times 3 = 27$, and $6 \times 6 \times 6 = 216$. So the volume of the $1\frac{1}{2}$-inch plum would be eight times as great as the $\frac{3}{4}$-inch plum.

From the above it will be seen that thinning out, apart from producing a saleable product at a payable price, must prolong the commercial life of the tree; and remember, too, that most of the diseases of stone fruit trees can, in very many cases, be traced to a debilitated state caused through over bearing.

As regards the direct expense of thinning—this can be discounted quite a lot when you consider that it takes no longer to pick a large plum than a small one, and if you thinned out 50 per cent. of the crop, it would mean that half was picked at the beginning of the life of the fruit and the other half at maturity, but more cases would be filled and more money received from the thinned crop. Thinning should be commenced directly after the "early drop," this drop being caused by deficient fertilization—then it will be seen what quantity of fruit there is to deal with.

Obviously the thinnings should be completed before the stone has hardened, and, in many cases, if the crop is a heavy one, the trees should be gone over twice, and possibly three times if necessary. Plums and apricots should be spaced at least 2½ to 3 inches apart and peaches and nectarines from 4 to 6 inches, according to variety.

If thinning was regularly, systematically, and intelligently practised in the Granite Belt the result would be:—

(1) No gluts in stone fruits.
(2) Prices would be better.
(3) Trees would live longer.
(4) A far easier crop to handle.
(5) Far less fruit fly.

One of these points would make thinning worth while—the five of them surely make it an obvious necessity.

CITRUS NOTES.

By R. L. PREST, Instructor in Fruit Culture.

THE present period in the citrus orchard is a very busy one. For the trees, it is the most active period of food uptake, and continues until the set. With the increase in temperature and the possibilities of a dry period, the utmost attention should be paid to soil conditions, particularly to aeration and moisture conservation. Soils begin to warm and bacteria becomes more active, and where conditions are satisfactory the trees put on rapid growth. At the same time, care and forethought should be given to cultivation, as, in coastal areas, the possibilities of the approach of storms will call for the consideration of shallow drains to care for excess water and prevent erosion.

Pruning operations should have been completed. The reworking of unprofitable varieties may be continued. Where trees have been headed back, care should be taken to whitewash the limbs to prevent sunburn. A satisfactory wash may be prepared by slacking down 7 lb. of stone lime and adding 2 lb. of powdered sulphur and 1 lb. of salt. During the following months a limited number of growths is permitted, and budding is carried out in the autumn.

Where soil and climatic conditions are favourable, planting may be continued. In planting care should be taken to spread the roots so as to radiate outwards and downwards. The roots should be covered carefully with fine top soil, and firmly pressed down and watered, after which the rest of the soil may be filled in. In the late sectors Valencia Lates will require harvesting in order to avoid the ravages of fruitfly.

FRUIT MARKETING NOTES.

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

THE most noteworthy feature of the marketing of fruit during September has been the phenomenal rise in the price of mandarins. This goes to prove that the law of supply and demand still operates in so far as prices for fruit are concerned. This factor should be a feature to impress growers that it should be possible to organise marketing to a greater extent, with a view to maintaining regular supplies without oversupplying the market. It is also a travesty that the poorer-quality, end-of-season fruit should command much better prices than the first-grade, mid-season fruit. This applies to most of the fruits during the season. These features of marketing should give rise to much thought as to whether it would not be better to raise the minimum standards of fruit permitted on the market, thus giving a better return and protection to those growers who do endeavour to market fruit to the best advantage.

Apples.

It is time that all lines of apples held in cold storage were starting to be placed on the market. Prices are firm for Granny Smiths at 8s. to 13s. The holding of large fruit from now on is increasing the risk of loss.

Papaws.

Melbourne, 8s. to 10s.; Sydney, 7s. to 12s.; Brisbane, 1s. 6d. to 4s. 6d. per bushel. The warm weather is approaching, so care must be taken to select suitable fruit to carry to interstate markets; fruit which will arrive in Brisbane ripe, in Sydney well coloured, or in Melbourne partly coloured, should give good returns.

Pines.

The return from pines is almost on a par from all markets, Sydney 7s. to 9s. being perhaps the best. Melbourne prices were 7s. to 10s. per case; Brisbane, 4s. to 6s. 6d. Remember blady grass is not to be preferred to clean woodwool for packing. Blady grass generally opens, giving the case a musty odour.

Bananas.

Melbourne, 14s. to 15s. for "nines" and "eights," 12s. to 13s. for "sevens," 10s. to 11s. for "sixes"; Sydney 1s. per case better all round, excepting "nines," which touched 17s. to 18s. Now that the weather is warmer, care should be taken to keep the fruit cool during all stages of packing and handling.

Tomatoes.

Prices ranged, at Melbourne, up to 9s., coloured 10s.; Sydney, 7s. to 9s., special higher; Brisbane, green 4s. to 7s., ripe up to 8s., special ripe to 10s. Let us all work this year to improve on the excellent quality and maturity of last season. If the maturity is kept up, speculators will find it difficult to operate on the market to their own advantage. This will help to maintain more even prices.

Oranges.

The wet weather had an adverse effect on the market, oranges being slow of sale, 4s. to 10s. were the ruling prices, these prices being an indication of the difference in the quality of the supplies available.

Mandarins.

I have dealt with the main marketing aspects of this fruit. Prices were, for Glen Retreat, 5s. to 16s.; for King of Siam, 6s. to 10s. The prices of Glen Retreat show a wide difference in the quality available. Dry puffy fruit is always hard to move.

Lemons.

Slow of sale, with prices from 5s. to 8s., but the demand should improve with the advent of warm weather.

Grapefruit.

Prices ranged from 8s. to 13s. for good quality. Marsh Seedless still retain its popularity as the best grapefruit. The writer is at this time (late September) still enjoying some first-rate fruit of this variety, purchased at the Royal National Exhibition last month. True lovers of grapefruit do not appreciate the orange-skinned, so-called grapefruit. The presence of seeds is also a drawback.

Strawberries.

This fruit suffered through the heavy rains, lines being hard to keep. Prices were: Sydney 1s. 6d. to 4s. per tray; Brisbane 5s. to 10s. per dozen boxes. Poorly filled boxes are still in evidence

Passion Fruit.

Passions are in good demand at 5s. to 13s. Keep out the crinkly fruit and market it separately; it will amply repay the trouble. A useful pamphlet on packing is available upon application to the Department of Agriculture and Stock.

Cucumbers.

These are good money. Prices at Melbourne ranged from 12s. to 16s.; at Sydney from 9s. to 12s.

Lettuce.

Lettuce growers would do well to pack their lettuce in tropical fruit cases, placing the hearts down with the cut stalks upwards, in layers two across, and filling the cases with layers enough to reach to the top. Small heads can be placed in two and one. The count can be marked on the end of the box. This would be a great improvement on the old method of packing in bags, etc.

Publication.

The apple booklet will not be published until the latest export regulations are ratified at the Hobart Conference at the latter end of October. Pamphlets on passion, papaw, custard apple, strawberry, tomato, oranges and lemons are available for distribution, as well as various packing charts.

CONDITIONS GOVERNING THE MAKING OF WINE FOR SALE.

INQUIRIES are frequently received by the Director of Fruit Culture regarding the conditions governing the making of wine for sale. In reply to a communication the Licensing Inspector, Brisbane, recently supplied the following information:—

A grower of fruit, i.e., oranges, pines, mulberries, and plums, is permitted by law to make wine from these fruits, with the addition of sugar, and sell same to the public. Such wine must not contain more than forty per centum of proof spirit by volume.

A license to sell or to manufacture wine from the abovementioned fruits is not required. It is illegal, however, to make wine from the juice of the grape, containing added sugar, honey, glucose or other sweetening matter, without first obtaining the necessary manufacturer's license, which costs £20 per annum, from the Customs Department. Wine made from the juice of the grape, with the addition of the ingredients mentioned, is subject to 20s. per gallon duty.

A grower and maker of wine is permitted to sell wine made by him in any quantity at the premises where it is grown or made, but the sale of such wine in quantities of less than two gallons at one time elsewhere than on the premises where it is grown or made is prohibited.

There is not any restriction as regards the hours of sale during the six business days of the week by a grower and maker of wine, but the sale of any such wine on Christmas Day, Good Friday, Sunday, or Anzac Day is prohibited.

The use of fortifying liquor, such as brandy, whisky, rum, or grape wine, is permitted, but, as already mentioned, "wine" must not contain more than forty per centum of proof spirit by volume.

It is not necessary to guarantee home-made wine under "The Pure Foods Regulations" of "*The Health Acts*, 1900 *to* 1931." Inquiries made at the Health Department elicited the information that there is not any standard as regards the purity of foodstuffs. "Food" is either fit or unfit for human consumption. If impure, and therefore unfit for consumption, a prosecution would, of course, be launched by the Health Department. It would be advisable for fruitgrowers making wine to forward a sample to the Health Department, South Brisbane, for analysis.

Cheese Making.

By A. R. WILKIN, Cheese Instructor.

CHEESE, on the farm or at factories, is usually made from the evening's and morning's milk mixed together; and, provided the evening's milk is not sour, the mixed milk is preferable to freshly drawn milk.

For cheese making the milk should have sufficient acid to make the batch work in a given time. This should be from two and a-half to three hours from the time of adding the rennet until there is sufficient acid for running off the whey.

The quantity of acid required will be decided by experience, some districts and milks being different from others. It will usually be found to be from ·19 per cent. to ·21 per cent. If the milk is set at ·19 per cent. acidity, and does not work in the three hours mentioned above, more acidity must be developed before adding the rennet. This is done by either letting the milk stand until the desired acidity has developed or by using more lactic starter.

Starters are prepared from lactic culture, which may be procured from the Animal Health Station at Yeerongpilly. Full instructions are sent out with each bottle, and should be adhered to strictly.

When the starter is ready for use, which is generally about the third or fourth propagation, it should be like firm junket showing no whey; and, when thoroughly stirred or poured from vessel to vessel, it should have a smooth and silky appearance, showing no curd lumps, and should not be over ·8 per cent. acidity. Starters not only increase the acid, but add flavour to the cheese, and should be used at any time, provided the quality of the starter is good. Some starters are good for months, others go off quickly and should be replaced.

For the purpose of ascertaining the acidity of milk an acidimeter outfit is necessary. This consists of a 10 c.c. burette, graduated in one-tenths, with a stand; a 9-c.c. pipette; a small porcelain dish and glass rod; a bottle of tenth normal soda solution (strength, 1 c.c. equals ·009 lactic acid); and a small bottle of phenolphthalein. This chemical will turn any soda solution which is free from acid pink.

How to use the Acidimeter.

Take the pipette and suck up the milk or whey to be tested above the 9 c.c. mark. Place the right index finger on the top of the pipette and allow milk to run out until it is on the 9 c.c. mark. Empty the contents into the porcelain dish and add three or four drops of the phenolphthalein. Place the dish under the burette, which has been previously filled to the 0 (zero) mark with the soda solution. Allow the solution to drop into the milk by holding the tap with one hand and stirring the milk with the glass rod. Watch carefully, and immediately the milk turns pink turn off the tap on the burette and read off how much of the solution was used. This will indicate the amount of acid present, viz., if 1·6 c.c. of solution have been run from the burette the milk has ·16 per cent. of acidity (i.e., the acidity equals one-tenth of the reading).

Hot Iron Test.

Another method of ascertaining the acidity of curd, and should be used each day is the hot iron test, which is used as follows:—

Take a piece of iron or iron piping about 3 feet long and ¾ inch in diameter and rub all rust scales off with an old rasp or brick; heat the iron in the boiler fire to just below red heat, take a small handfull of curd, and squeeze it until it is fairly dry and well matted together; then take the hot iron in the left hand and hold it on a bench or some convenient place, and place the curd firmly on the iron on a spot where it will stick but not smoke. Then gently draw the curd away from the iron. If there is acid present fine threads like hairs will be noticeable, the length and number of threads indicating the amount of acid present. This test requires practice to know the correct heat and also how to place and draw the curd from the iron.

At the time of running off the whey the curd should show threads about ¼ inch long, and at the time of milling 1¼ to 1½ inches long. When the curd has sufficient acid by the iron test for running off the whey, an alkaline test should be made and recorded. The reason the hot iron is more dependable is that sometimes other than lactic acid is present in the whey. The alkaline test has the advantage, however, that should the cheese maker be indisposed or off duty it is easier for the novice to follow than the iron test. At the time of milling the curd should show ·8 per cent. acidity, but it is often difficult to get sufficient whey for a test at this period.

Rennet and Colour.

Rennett should be a dark amber colour, free from sediment and cloudiness, and should be of such a strength that 3 or 4 oz. will coagulate 100 gallons of mlik, showing ·2 per cent. acidity at a temperature of 86 degrees Fahr., in ten minutes.

Colour should be bright and free from sediment, and if of standard strength 1 oz. per 100 gallons should be sufficient for local and/or interstate trade and 3 oz. for export.

Salt.

A good, coarse-grained, fine salt should be used at the rate of 1 lb. to each 40 lb. of dry curd; as 1 gallon of milk produces approximately 1 lb. dry curd the amount of salt to be used is reckoned by the number of gallons treated, viz., 1 lb. salt to each 40 gallons of milk.

Bandage.

Bandage is procurable in tubes for almost every size cheese hoop.

How to place the Bandage on Hoops.

First cut the tube about three inches longer than the inside section of the hoop. Put the inside section in its lid and put the bandage around the outside of this section, allowing it to come down about 1¼ inches from the top. Now put the other part of the bandage down the inside of the hoop and about an inch towards the centre of the lid. A cheese cap should then be placed in the hoop to cover up that portion of the lid, not covered by the bandage.

Setting the Milk.

When the milk to be treated is in the vat, heat it up to 86 degrees Fahr. and then add sufficient starter to give the required acidity. However, more than 2 per cent. of starter should not be used, as it has a tendency to soften the curd. It would be preferable to let the milk stand until sufficient acidity develops rather than to use too much starter. It is always advisable to thoroughly stir and strain the starter just before adding to the milk in the vat. The milk being ready to set, measure out the required quantity of colour, dilute it in three times its volume in rain water, add it to milk and thoroughly mix with a wooden rake. Then repeat the process with rennet, after the addition of which the milk should be stirred for three minutes. A careful watch should then be kept, to note the time the milk takes to coagulate. This test is made by inserting the finger into the milk and gently lifting it in a forward position to the surface. With a little practice one can tell exactly when coagulation takes place. The curd is generally ready to cut in two and a-half times the time it takes to coagulate, viz., if ten minutes are taken to bring about coagulation, the curd should be ready to cut in twenty-five minutes. This is a good guide, and is generally correct, but must not be taken for granted. The correct method to adopt is, when the 2½ times the period of coagulation has expired, place the index finger deep in the curd and slowly raise it to the surface in a horizontal position. If the curd is ready to cut, it will then show a clean break in front of the finger.

Cutting the Curd.

First use the vertical knife and cut the curd lengthwise by drawing the knife up and down the vat, until the whole has been cut, being careful not to overlap or miss any portion; then cut the curd crosswise, starting at one end and finishing at the other, making sure that the whole is completely done. Next take the horizontal knife and draw it lengthwise up and down the vat, as was done with the vertical knife. The cutting is now finished. A test for acidity should now be made and recorded.

Heating the Curd.

Commence by stirring the curd slowly with the hands for about three minutes, at the same time removing any curd which may be sticking to the vat. Then take the wooden rake, and, after turning the steam on gently, stir slowly until the desired temperature, viz., 100 degrees Fahr., is reached. This should take from twenty-five to thirty minutes. A second test for acid should now be made and recorded. Stirring should be continued for ten minutes after the heat is up, and intermittently until the running off of the whey. The stirring is for the purpose of keeping the curd from matting, thus ensuring an even cook. This will indicate how the batch is working, and will provide valuable data for reference. At this stage, in addition to the tests mentioned, further acid tests should be made every ten or twenty minutes, according to the development of the acidity. It is always advisable to use the hot iron test in conjunction with the alkaline tests. When the curd shows threads ¼ inch long by the iron test it is ready for running off the whey.

Drying the Curd.

After the whey has run off, shift the curd on to one side at the top end of the vat, and stir the curd by turning it over and over, and not allowing it to mat together until it is fairly firm and dry; during this process the curd should be kept in a heap about 6 inches deep. This operation should take five or ten minutes, according to how the curd firms. The curd should now be packed in a uniform heap, about 6 inches deep. Trim the edges of the heap with curd knife, and place the trimmings evenly on top of the heap. After ten minutes cut the curd into blocks about 6 inches wide, turn the blocks over and reverse them end for end; this should be repeated every fifteen minutes to allow the whey to drain off, and so ensure an even cheddaring. When the curd shows one inch threads on the iron, which should occur in about one hour, it should be packed in a heap, say four blocks high. After fifteen minutes reverse the position of the blocks on another heap by bringing the bottom curd to the top.

Curd when ready to mill, which should be about one and a-half hours after the commencement of cheddaring, should show 1½ inch threads by the iron test, and should be bright and silky, and resemble a chicken's breast when torn apart.

Note.—As packing the curd sometimes has a tendency to affect the body of the cheese, the operator should be careful to observe this, and reduce the time specified above accordingly.

Milling the Curd.

Cut the curd into pieces of a suitable size to go into the hopper of the curd mill and go on with the milling. After milling put the curd in a heap similar to that before cheddaring and slowly turn it over until pieces of curd begin to shrink. This generally takes about ten minutes. Salt should then be added at the rate of 1 lb. to each 40 gallons of milk; thoroughly mix the salt into the curd. Then put the curd in a high heap to drain off surplus moisture. Usually this takes about ten minutes; longer if the curd is soft or wet.

The temperature of the curd at salting should be about 80 deg. Fahr., hence the necessity of keeping the curd in bulk during cold weather, and spreading out well after milling, in hot weather.

The cover provided for the milk vat should be used during the setting of the milk, and also the cheddaring of the curd, unless the weather is very hot.

Hooping.

Sufficient curd should be put into the hoops, so that the cheese when pressed will show a ¼ inch collar, which means ½ inch higher than the inside runner of the cheese hoop. If there is any curd over after filling the hoops it can be kept until the next day, but should be warmed with water or whey before mixing with the freshly milled curd.

After putting the cheese in the press, gradual pressure should be applied for the first ten minutes, and then increased until you put almost one arm strength on the levers. If too much pressure is applied at first, it has a tendency to lock in the whey and push out the fat.

Dressing the Cheese.

After twenty or thirty minutes pressing, the cheese should be taken out of the press. Remove the lid from the big end, take off the outside runner, pull up the bandage, using a little pressure to remove any creases that may have formed down the side of the cheese, then replace outside runner. The cap should now be put on the top of the cheese and the bandage neatly turned in towards the centre over the cap. If the bandage is too long it should be cut with scissors so that it will overlap the cap by ½ inch. If any curd has squeezed over the edges of the hoop, when the outside runner is removed it should be trimmed off with a knife. After dressing the cheese a round hessian cap, about the size of the cheese cap, should be put on top to press the bandage and cap into the cheese. One of these caps could be put on the other end of the hoop when dressing (caps cut from salt bags are quite suitable for this purpose), then the lid should be replaced.

Pressing the Cheese.

The cheese, after being dressed, is put back in the press, and screwed up to about one arm strength pressure. A couple of buckets of scalding water should then be thrown over the hoops. This helps to put a rind on the cheese, and prevents cracking.

If the press is not of the continual pressure type, it will be necessary to keep the press well screwed up. You can now put on more than one arm pressure, easing if you see any curd squashing out. Be sure and screw up before retiring and first thing in the morning. Eighteen to twenty hours are sufficient pressing for small cheese, and two days for medium and export sizes.

After pressing, the cheese should be taken from the hoops. Remove the hessian caps, and wipe the cheese with a dry cloth, removing any pieces of curd that may have pressed through the bandage.

Marking the Cheese.

Put on the date and brand, allow the cheese to dry, then remove same to the curing room. Wet cheese are likely to mould in curing room. Old cheese are more difficult to brand on account of the greasy nature of the surface.

Curing Room.

The curing room should be kept at a temperature not higher than 70 deg. Fahr., and not below 60 deg. Fahr. The room should also be well ventilated, and plenty of fresh air circulated, provided that the natural temperature of the air is suitable. The air at night time will usually be found to be satisfactory. All cheese should be turned each day, so that the moisture will be evenly distributed.

In conclusion, it must be realised that cheese making is a scientific profession, and will not admit of any guess work if success is to be achieved. Further, it depends upon the purity, quality and lactic content of the milk, which can only be obtained by the strictest cleanliness being observed, from the milking of the cow until the product is consumed. All buildings and surroundings must be kept in a clean and sanitary condition; all vessels and utensils that come in contact

with the milk should be kept scrupulously clean and scalded immediately before use, to ensure that there is no risk of contamination by harmful bacteria.

Plant Required.—Steam boiler for heating and steaming purposes, double-jacketed milk vat, cheese knife with vertical blades, cheese knife with horizontal blades, curd mill, wooden curd rake, cheese press to suit size of cheese, cheese hoops, sizes as required, ordinary butcher's knife for cutting curd, 2 thermometers bearing Government certificate, one measure glass graduated in ounces, acidimeter outfit, pair scales for weighing cheese, salt, &c., pair scissors for cutting bandages, brand, for branding cheese, milk test flasks, milk pipettes, acid measure.

Material Required.—Bandage correct size for hoops, cheese caps correct size for hoops, canvas cover for cheese vat, broom or whisk for sweeping curd in vat, broom for floor, rennet, colour, and salt, alkalic solution, phenolphthalein, sulphuric acid, formalin, and washing soda.

PIG LITTER RECORDING.

Four litters of pigs, whose growth to weaning time at 56 days old was recorded recently by the Department, have given the following interesting results:—

Large White litter from the sow Laurel's Lady Fay, and sired by Gatton Junker, owner A. G. Stewart, Cedar Pocket, Gympie—

Weight in lb. at 56 days.

Boar	Boar	Boar	Boar	Boar	Boar	Sow	Sow	Sow	Sow	Total	Avg.
43	49	46	35	37	38	44	45	40	48	425	42.5

Wessex Saddleback litter from the sow Holmsleigh Ace (imp.), and sired by Holmsleigh Surprise (imp.), owner R. Turpin, Lowood—

Weight in lb. at 56 days.

Boar	Boar	Sow	Sow	Sow	Sow	Sow	Sow	Total	Avg.
47	37½	53	40	49	45½	48	46½	366½	45.8

Middle White litter from the sow Wootha Peggy, and sired by Wisteria Hero 6th, owner H. O. Rees, Maleny—

Weight in lbs. at 56 days.

Boar	Boar	Boar	Boar	Boar	Sow	Sow	Sow	Total	Avg.
33	35	31	37	31	34	34	32	268	33.5

(Sow's first litter.)

Large White litter from the sow Highfields Peg II., and sired by Grenier Goliath, owners Hibberd Bros., Indooroopilly—

Weight in lb. at 56 days.

Boar	Boar	Boar	Boar	Boar	Boar	Boar	Sow	Sow	Total	Avg.
37½	40	36	46	36½	42	23	37	38	336	37.3

Seeds Every Farmer Should Know.

By F. B. COLEMAN, Officer in Charge, and R. J. HOLDSWORTH, Inspector, Seeds, Fertilizers, Veterinary Medicines, Pest Destroyers, and Stock Foods Investigation Branch.

DATURA STRAMONIUM (Figure 1).

Common names.—Datura, stramonium, thorn apple, castor oil plant. In other parts of the world it is known as Jimson weed, mad apple, and devil's apple.

Description.—Dull, black, some grey, and a few light-brown flat seeds. Irregular surface covered with small pits.

Size.—3 x 2½ mm. and 1¼ mm. thick.

Occurrence.—Found in samples of the following seeds:—Japanese millet, Sudan grass, foxtail millet, white French millet, white panicum, canary; sometimes in prairie grass, lucerne, barley, oats; also in hay and chaff.

DATURA TATULA.

Seeds of this plant are indistinguishable from those of *Datura stramonium.*

DATURA FEROX (Figure 2).

Description.—Dull grey, few black and a few lighter grey flat seeds. Irregular surface covered with small pits.

Size.—4½ x 3½ mm. and 1½ mm. thick.

Occurrence.—Sometimes found in Sudan grass and canary seed.

DATURA METEL (Figure 3).

Description.—Dull, brown flat seed. Pitted surface with deep irregular furrows marked near the edge three parts of the way round.

Size.—5 x 3½ mm. and 1½ mm. thick.

Occurrence.—Sometimes found in Sudan grass and canary seed.

DATURA FASTUOSA (Figure 4).

Description.—Dull, yellow flat seed. Pitted surface with deep irregular furrows round the edge.

Size.—6 x 4 mm. and 1½ mm. thick.

Occurrence.—Sometimes found in Sudan grass and canary seed.

[mm. = millimetre. 25·4 mm. = 1 inch.]

The seeds of all species of Datura, under the Pure Seeds Acts, and the seeds, plants, and parts of such plants under the Stock Food Acts are totally prohibited on account of the poisonous properties attached to this weed.

The following species have been recorded in Queensland:—

Datura stramonium,
Datura tatula,
Datura ferox,
Datura metel,
Datura fastuosa.

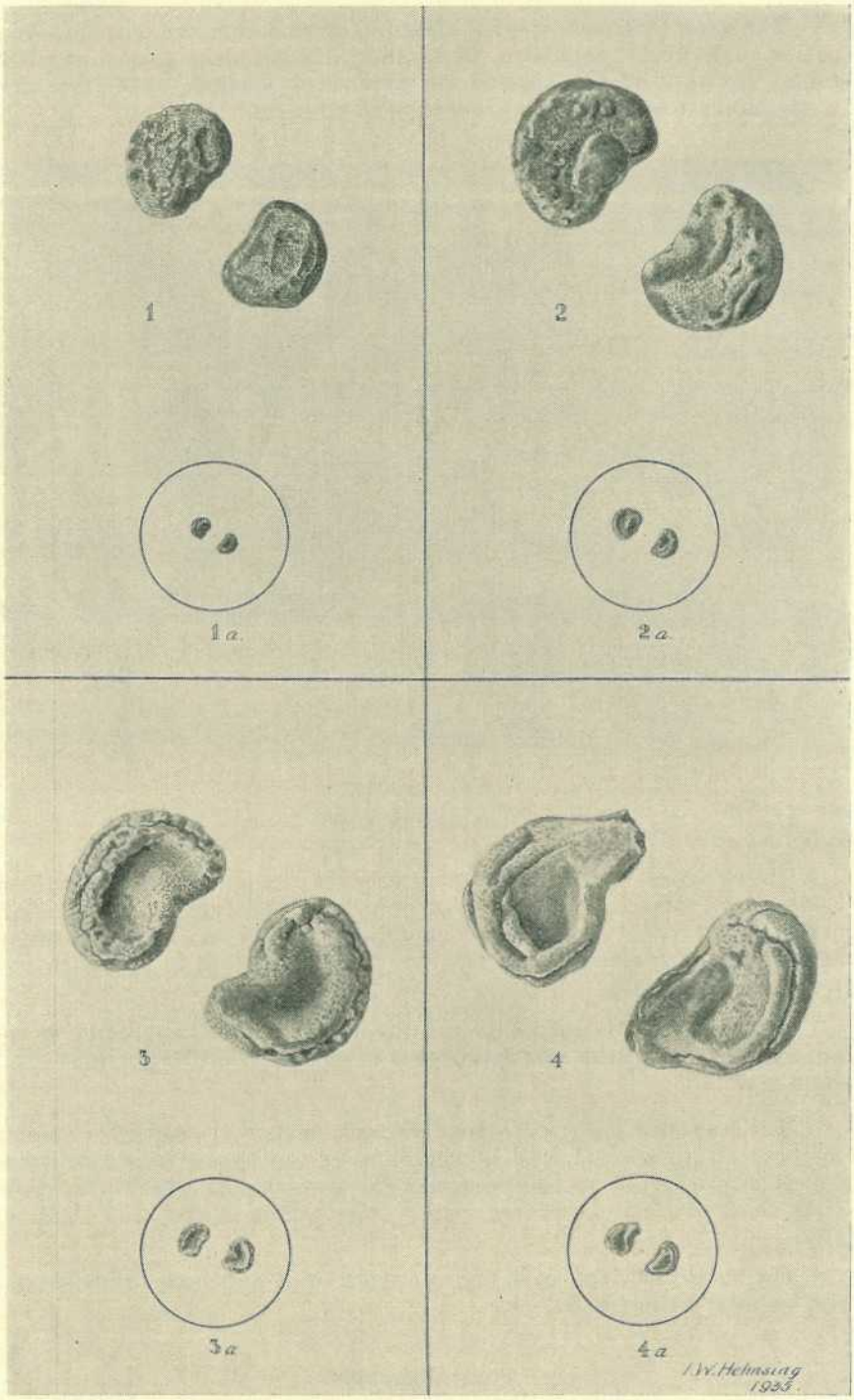


PLATE 162.

Fig. 1.—*Datura stramonium* × 5.
Fig. 1A.—*Datura stramonium* natural size.
Fig. 2.—*Datura ferox* × 5.
Fig. 2A.—*Datura ferox* natural size.
Fig. 3.—*Datura metel* × 5.
Fig. 3A.—*Datura metel* natural size.
Fig. 4.—*Datura fastuosa* × 5.
Fig. 4A.—*Datura fastuosa* natural size.

The most common species—Datura stramonium, an annual—is a coarse, pale green, repulsive, ill-smelling, dangerously poisonous plant found growing in Queensland on cultivated ground, roadways, and waste land; it bears trumpet-shaped white flowers.

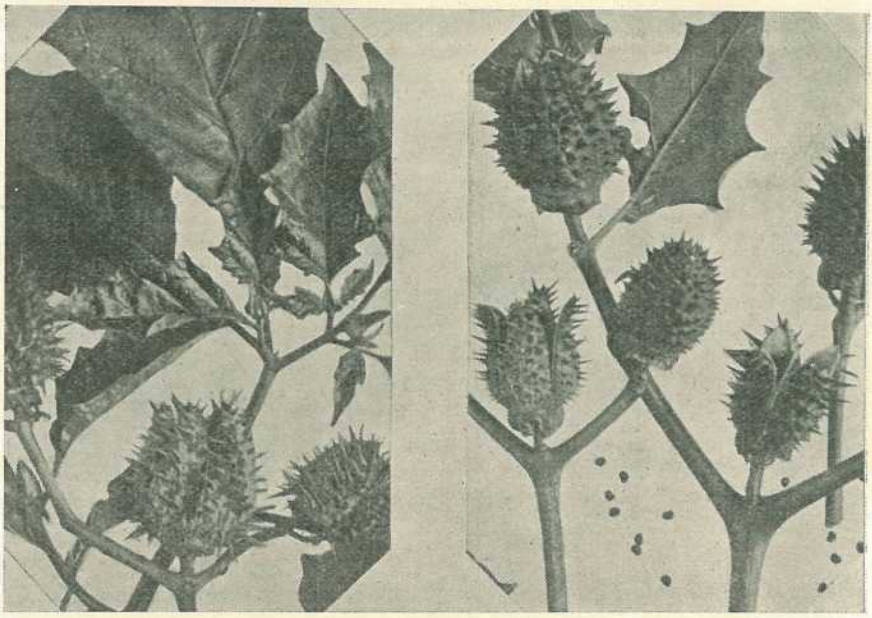


PLATE 163.
Datura stramonium.

Every year considerable quantities of Sudan Grass (*Sorghum Sudanense*), Foxtail Millet (*Setaria, Panicum*), and Japanese Millet seeds are found to contain seeds of this plant and have to be destroyed; action is being taken for a closer inspection of the seeds sold in an endeavour to eliminate Datura.

Grazing animals refuse to eat the plants, but when found as an admixture in chaff the seeds and parts of the plant are consumed—with fatal results.

The leaves of *Datura stramonium* have medicinal properties similar to those of Belladonna, and the inhaling of the fumes from the burnt leaves is prescribed to relieve spasmodic asthma. A tincture is made from seeds of *Datura fastuosa* variety *alba,* which is also used medicinally.

Owing to the dangerous nature of the seeds and leaves they should not be used indiscriminately.

Toxic Principle.

According to Long, in "Plants Poisonous to Live Stock," the Thorn Apple is usually stated to contain the highly poisonous narcotic alkaloid Daturine ..... An investigation conducted at the Imperial

Institution (Bul. Imp. Inst., 1911) showed the amount of alkaloids present in European specimens (of Datura stramonium) to be

Seeds, 0·21 to 0·48 per cent.

Leaves, up to 0·4 per cent.

Stems, average 0·22 per cent.

Roots, average 0·17 per cent.

Among humans it has been recorded that the greatest number of accidents have occurred among children who have eaten the half-ripe seeds, which have a sweetish taste.

No doubt many farmers are well acquainted with the nausea caused to men who are for any length of time engaged upon hoeing out Datura.

Propagation.

All species herein mentioned are reproduced by means of seeds and are annuals, therefore every endeavour should be made to kill the young plants before they flower. Unfortunately, in too many instances does one see attempts to kill weeds by various methods when the plants are in full seed, with the result that although the parent plant is rooted out it still has enough vitality to mature a crop of seeds. It cannot be emphasised enough that *the time to eradicate annual weeds is before they flower,* and at no other stage can one expect to achieve satisfactory results for one's efforts.

The large area over which these objectionable weeds are to be found is due to the seed being spread as an impurity in agricultural seeds or hay and chaff, also to the fact that animals do not assist in checking their growth by grazing.

In the event of the presence of Datura being suspected, farmers and others should forward specimens to this Department for identification—which is carried out free of charge—rather than run the risk of distributing this objectionable plant over their land.

The following appeared in this Branch's Annual Report for 1923:—

> "Unfortunately, many farmers and merchants cannot identify even the most common weed seeds, some of which, such as Datura, are so poisonous that if the farmer recognised the plants on their first appearance he would postpone all other work until they were destroyed, or as an alternative cut the weeds down before they produced seed. Apart from the fact that weed seeds easily shatter out before or during the harvesting of the crop, it is well to recollect that they do not germinate with the regularity of crop-seeds, and some may remain dormant in the ground for several years."

Any person who sells any seeds or grain for sowing containing Datura seeds, or any hay, chaff, or any stock food containing seeds or any part of the Datura plant, is liable to prosecution.

On reference to the July copy issued in 1917 of this journal, on pages 31 to 35, will be found further information by Mr. C. T. White, the Government Botanist, relating to these plants.

The Queensland Pig Industry Act.

DESIGNED entirely in the interests of Queensland farmers who are producing pigs as a profitable branch of live-stock husbandry, "*The Pig Industry Act of* 1933" was assented to on 11th October, 1933, in the Queensland Legislature, having received Royal Assent in accordance with State law. The Act actually came into operation on 23rd August, 1934, which date is referred to as "the commencement of this Act." The Act is divided into twenty-five sections, while there are twenty-three additional provisions in the Schedule to the Act, which latter are largely covered by the Regulations. Sections 1 to 4 of the Act may be referred to as the administrative portion, covering, among other things, interpretation of various terms used in the text—thus, the word "dealer" is interpreted as meaning "any person who engages in the buying and selling of pigs or pig carcasses"; "piggery" means and includes any land, buildings, or place where pigs are depastured or kept; and similarly with other terms.

Inspectors under this Act have, for the purposes of the Act, all the powers and functions of an inspector under "*The Dairy Produce Acts,* 1920 *to* 1932," "*The Diseases in Stock Acts,* 1915 *to* 1931," "*The Slaughtering Act of* 1898," or any Act or Acts amending the same or in substitution therefor respectively.

Section 5 gives the inspector power of entry and inspection, and in his official capacity he may enter and inspect any premises or place where pigs are depastured or kept, and any factory. He is empowered to deal with any position arising as a result of unclean piggeries, disease in pigs, impure or unwholesome water or food, &c.; and he may forthwith order the necessary steps to be taken to remedy the defect.

Section 7 sets out the duty of the owner in notifying disease; isolating diseased pigs; disposing of diseased carcasses.

Section 8 prohibits the feeding of meat, offal, or blood unless such foodstuffs are thoroughly cooked.

Section 9 requires the owner to render any assistance required by the inspector in the carrying out of his duties, and in searching for and discovering the cause of disease or any source of contamination or infection to which pigs may be exposed.

Section 10 deals with the marking of pigs by a representative of a factory—i.e., a sufficient mark to ensure identification of the vendor or consignor if pigs are forwarded direct to a factory. Such identification marks are, of course, necessary in the ordinary course of marketing; otherwise there would be endless confusion.

Section 11 requires every autioneer, agent, dealer, factory, or butcher to keep a record in respect to every transaction in pigs with which he is concerned—that is, the date, number, description, distinguishing marks, name, and address of vendor and of purchaser, and such other particulars as may be prescribed.

Section 12 prohibits payment for the whole or any part of a carcass which has been condemned by an inspector as unfit for food of man; this is an important section, as payment for diseased carcasses has proved to be a most unsatisfactory way of eliminating disease.

Section 13 deals with grading of carcasses, and is more fully described in dealing with the Regulations.

Section 14 provides the inspector with power in marking of quality of carcass pork and bacon sides.

Sections 15 to 25 give powers of administration under this Act and provide for penalties in case of offence, &c.

The Schedule to this Act covers a fairly wide range of provisions and deals with subject-matter covered by regulation.

The Regulations.

In the Regulations additional terms are interpreted—thus, the grader is the person duly appointed as such under the Act and/or his assistants duly appointed under the Act.

A saleyard is a live-stock market operating as a saleyard, a receiving and/or trucking yard, or place where pigs are sold, bartered or exchanged, or otherwise disposed of, &c.

Regulations 1 and 2 are purely administrative.

Regulation 3 sets out requirements in conduct of examination of graders and/or inspectors under this Act, and is largely an administrative clause.

Regulation 4 provides that no person shall be employed in the grading of pork or bacon pig carcasses unless he holds the necessary certificate of competency under this Act.

Regulation 5 deals with management of piggeries which are not specifically provided for in any of the other Acts under which inspectors work in administering this Act.

Provision is also made that pigs shall not be allowed to trespass or to pollute running water. This Regulation also provides the inspector with powers to prevent introduction and spread of disease among pigs, &c.

Regulation 6 deals with identification of pigs, and requires that every pig offered for sale, barter, or exchange be identified in accordance with this Act and its Regulations, the object being to facilitate tracing of disease to source of origin. This regulation is a particularly important one that will require the hearty co-operation of everybody interested in the progress of the pig industry.

Regulation 7 deals with grade definitions and defines the various grades into which carcasses will be graded by the grader at the factory.

Provision is made for two particular grades in each group—thus, there will be in baconers for the Australian trade a grade defined as choicest, and another first grade; carcasses not coming within these grades will be second grade or smallgoods grade, as the case may be.

In export baconers and in export porkers the grades are those required by the *Commerce (Trade Descriptions) Acts*, 1905 *to* 1930, and are the grades in operation at present under Commonwealth veterinary inspection.

In porkers for the Australian trade, in addition to the two grades referred to as "G.A.Q." (good average quality) and "F.A.Q." (fair average quality), there is a second grade and a reject porker grade. Boars and stags shall be accepted, graded, and paid for only when of suitable quality and age for manufacturing into edible products.

Regulation 8 deals with payment for pigs sold for slaughter, and requires that in the case of choicest or highest grade carcasses there shall be paid a premium of one halfpenny per pound above the rate paid for next grade. It is felt that the introduction of this system of payment will be entirely satisfactory, and will do much to encourage the breeding and marketing of better quality and properly finished pigs. This Regulation provides that when live pigs are sold at public auction and where carcass pork graded as provided is sold at public auction and/or by private contract, the clause requiring payment of premium shall not apply, for the reason that purchase of pigs at public auction and carcass pork ditto or by private contract requires the buyer to pay maximum value to secure the best quality offering, and, therefore, payment of an additional premium would not be workable.

Regulations 9 and 10 deal with the sale of live pigs by public auction and sale of carcass pork respectively.

Regulation 11 provides for the issue with account sales of grade certificates—i.e., where pig carcasses are paid for on a basis of grading. It is desirable the farmer be informed as to the reason why carcasses are paid for at below choicest or highest-paid grade, if they are so graded and paid for; and this Regulation paves the way for this information to be supplied.

Regulation 12 provides for check grading and for vendor to be supplied with a certificate of grade of all carcasses other than those of highest-paid grade.

The check grader shall also determine the grade of any carcass reduced in value by causes obviously occurring after purchaser has taken delivery from vendor. This clause provides for losses due to injuries in transit, &c., not actually covered by any preceding or following clause.

Check grading protects interests of the farmer and should be the means of providing him with necessary information, for, as stated, the farmer is to be informed in all cases where his pigs are not of choicest grade. It is hoped to be able to follow up grade certificates and indicate to the farmer how to overcome faults in type and condition, and how to produce and market the most desirable class of animal.

Regulation 13 deals with grade marks, and paves the way for identification by indelible grade marks of graded carcasses, thus preventing errors and enabling a more accurate check to be kept of the different grades. Where grading is carried out by Commonwealth officers (as in the case of pork for the export trade), only such grade marks are required under the *Commerce* (*Trade Descriptions*) *Acts*, 1905 *to* 1930, will be applied.

Regulation 14 provides for compulsory refund of price paid for any pig whose carcass is subsequently slaughtered and condemned within thirty days of sale by Government inspectors as unfit for the food of man. Many pigs are purchased in Queensland and are paid for prior

to slaughter. All such pigs come within the ambit of this Regulation and thus are brought into line with those consigned direct to factories and not paid for until slaughter and inspection is complete. The Regulation makes it compulsory for the purchaser to demand the refund, and for the vendor to pay within a stated period. This clause will, it is believed, be of inestimable benefit to the industry in this State.

Regulation 15 has reference to a similar subject, but deals with the purchase of live pigs by dealers who thereafter consign to factories for slaughter within thirty days. In this case the dealer is placed on the same footing as the farmer, and will be compelled to refund in case of condemnation. This clause will apply to every such transaction between a dealer and an owner of a factory.

Regulation 16 requires the owner of a factory to supply to the Minister a list of trade marks used, &c.

Regulation 17 requires the owner of a factory to supply to the Minister a list of all products manufactured or sold by such factory.

Regulation 18 provides for the use of more than one trade mark where so desired by the owner of a factory.

Edible products shall be identified with a different trade mark from inedible products such as fertilizer.

Regulation 19 makes it an offence to beat a pig with a whip, stick, or other weapon capable of bruising or damaging the carcass of such pig. Similarly, it will be an offence to ill-treat a pig in any way, penalty being such as is provided for in the Act.

Regulation 20 indicates the scope of the Regulations and is largely administrative.

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 excellent rains received from the 9th to the 12th September throughout the whole of the agricultural and pastoral areas have greatly enhanced the prospects of the industries concerned. The falls were particularly heavy in the Maranoa and South-west, and in these districts the best spring experienced for many years is in evidence. A good season appears assured up to Christmas, and the majority of agisted stock have now returned to home pastures. Stock prices have naturally hardened, owing to the demand for breeding stock to replace losses, but are not likely to rise to high levels, owing to the depleted finances of those concerned. Although the central district received lighter rains than elsewhere, they were sufficient to be of great benefit to the herbage, which had been very backward in growth.

Dairy farmers are benefiting by much increased returns and the growth of their pastures, while the opportunity has been taken to sow large areas of all spring crops under favourable conditions. With the advent of warmer weather weeds will be making great headway where not checked by inter-row cultivation or the working of the fallows. Crop returns are greatly increased where due attention is given to weed eradication and the preservation of an effective soil mulch.

Wheat.

The appointment of the members of the State Wheat Board for the period 1st September, 1935, to 31st August, 1938, recently announced by the Minister for Agriculture and Stock, will be welcomed by growers as giving greater stability to the industry.

Some high returns should be received in the Dalby and Maranoa districts, but the rains throughout the main Downs wheatlands were rather late to assure an average yield. An encouraging feature is the recent rise in world prices, wheat now being quoted at a higher level than for some years past.

Cotton.

The 1934-35 cotton crop is completed, with a total production of 14,505 bales of lint, which, although appreciably lower than appeared

at mid-season would likely be obtained, has to be considered satisfactory, considering the exceptionally dry conditions that ruled from January through the rest of the season.

The prospects for the coming crop appear very promising in all districts except the South Burnett and Southern, where further rain is badly required. The frequent soaking rains which have been experienced in the Central district have influenced some rather early planting, but a majority of the farmers have taken advantage of the favourable season to prepare excellent seed-beds first, and are now planting under ideal conditions. Provided further rains occur early in October to enable the rest of the districts to get planted, the cotton crop will get off to an excellent start.

Purchases of planting seed still continue in considerable quantities, the total sold being well ahead of comparable dates of last season—sufficient seed to plant at least 50,000 acres having already been despatched.

Tobacco.

Generally, good prices have been realised for the past season's leaf, especially in the Mackay-Sarina district, where the bulk of the leaf produced was of high quality. However, dissatisfaction is again prevalent amongst growers over prices received for lower grade leaf, but this in many instances is the fault of irregular grading and the marketing of immature leaf.

Activities for the coming season have now commenced in all districts, while at Texas and Inglewood seed beds are fast reaching the planting-out stage.

Sugar.

Light rains of a spasmodic nature were experienced in most cane areas during September. With the advent of warmer conditions the young crops will therefore benefit, while the condition of the mature cane will be maintained. The mills are crushing the crop at a satisfactory rate, and the sugar content of the cane is high.

All areas report good strikes in the young plant crop, which has, therefore, made an excellent start for the 1936 harvest.

POINTS IN SELECTION OF SEED MAIZE.

Select ears which are heavy in proportion to their size when dry.

Soundness, weight, plumpness, and good bright colour of grain are of more importance than depth of grain. Deep grain may be light and chaffy and of poor colour and feeding value.

Select ears true to type or thoroughly representative of the variety.

Avoid ears with wide furrows between the rows of grain.

Soft, rough-dented grain is more likely to carry the infection of root, stalk, cob, and grain rot disease than medium-hard grain of smooth to medium-rough dent.

Do not strive too much after small cores.

Well-filled tips make a good show point, but poorly filled tips do not necessarily disqualify otherwise good seed ears.

Straight regular rows are only a fancy show point, and need not be stressed greatly in selecting seed.

Avoid selecting ears in which the grain is split, discoloured, or showing any external sign of disease.

Also avoid ears which on being detached from the stalk show a shredded, stringy, or discoloured (especially pink coloured) stalk attachment.

Avoid ears which shell grain with a stringy tip cap.

The 1935 Brisbane Exhibition Championship Awards.

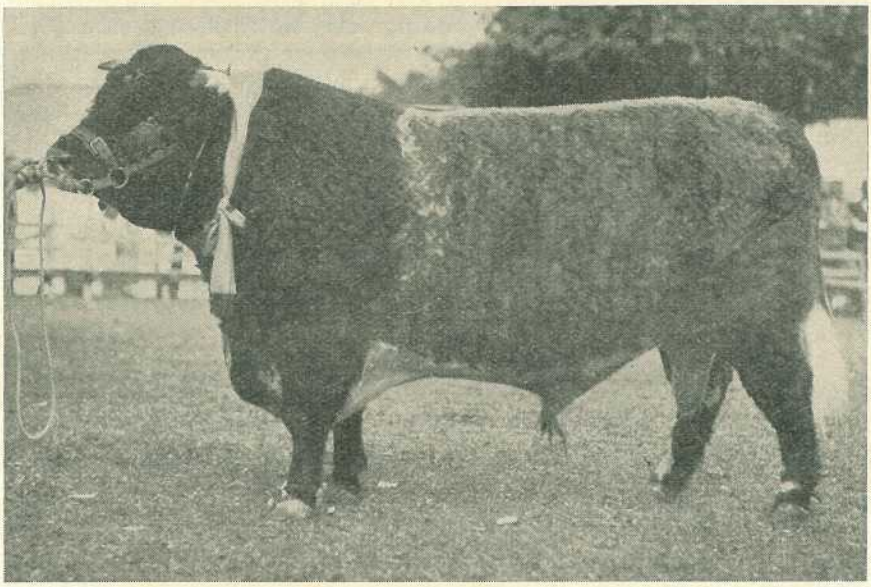


Plate 164.
Champion Shorthorn Bull, Mr. J. T. Scrymgeour's Netherby Royal Challenge.

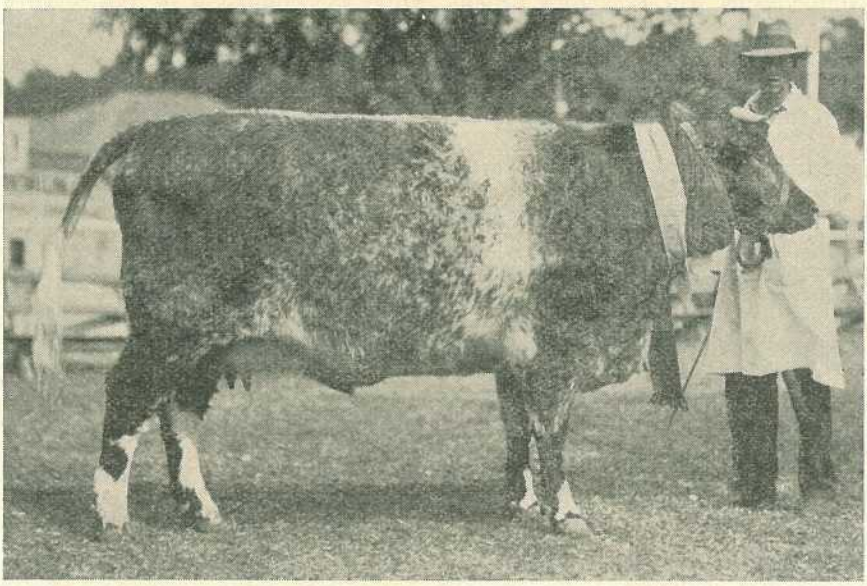


Plate 165.
Champion Shorthorn Cow, Mr. J. T. Scrymgeour's Netherby Mistress Lovely.

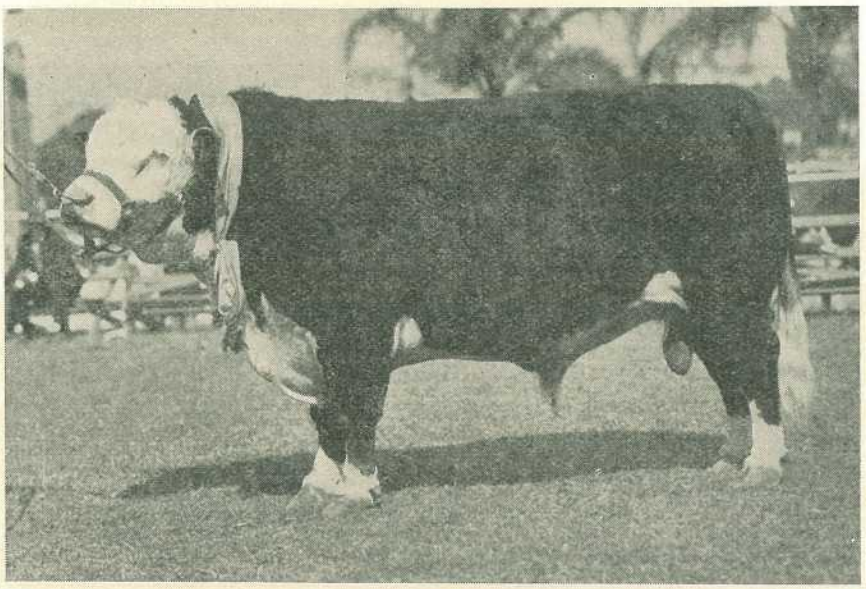


Plate 166.
Champion Polled Hereford Bull, Mr. S. A. Plant's Trevanna King.

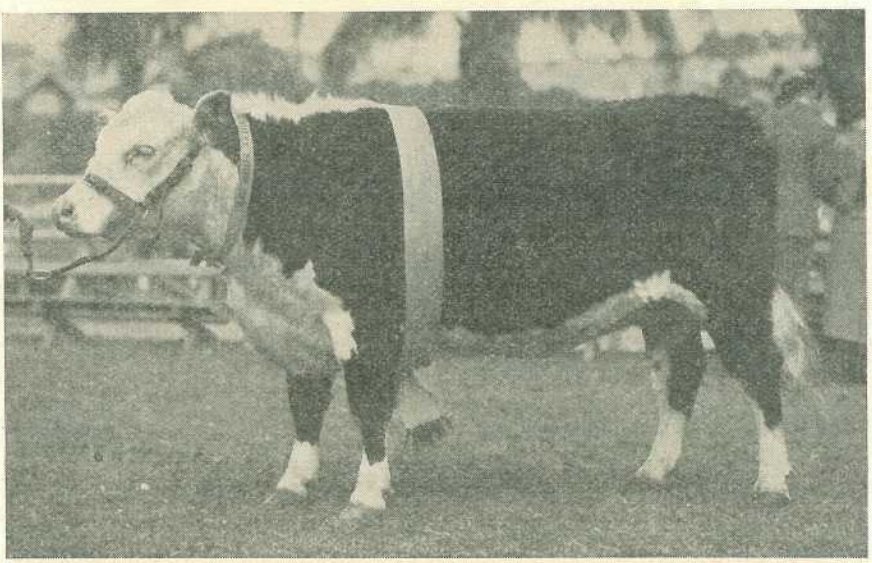


Plate 167.
Champion Polled Hereford Cow, Miss L. A. Dearden's Daisy Mount Princess Bessie.

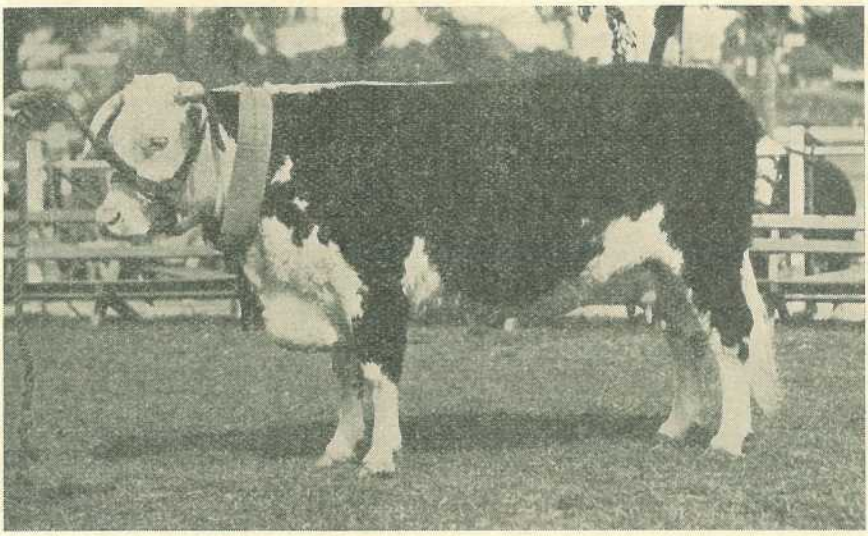


PLATE 168.
Champion Hereford Cow, Mr. E. R. Reynold's Ennisview Lady Illustrious.

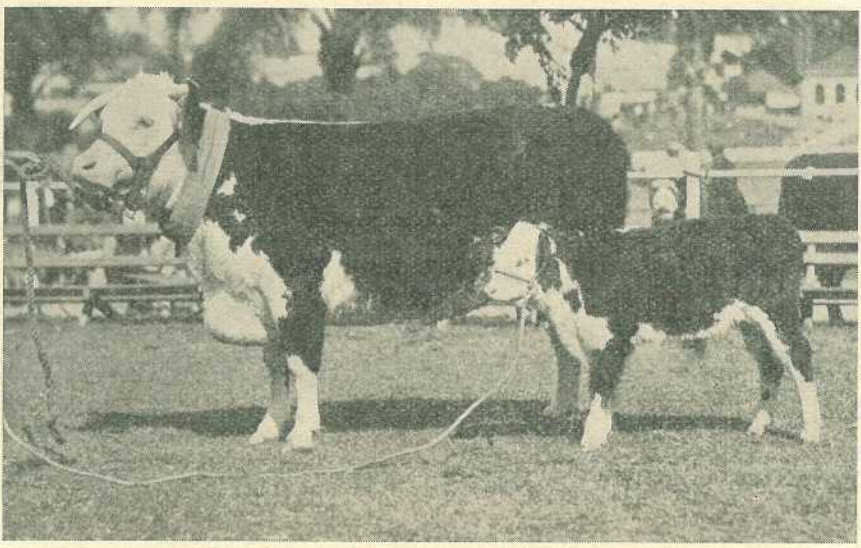


PLATE 169.
Ennisview Lady Illustrious, Champion Hereford Cow, with Calf at Foot.

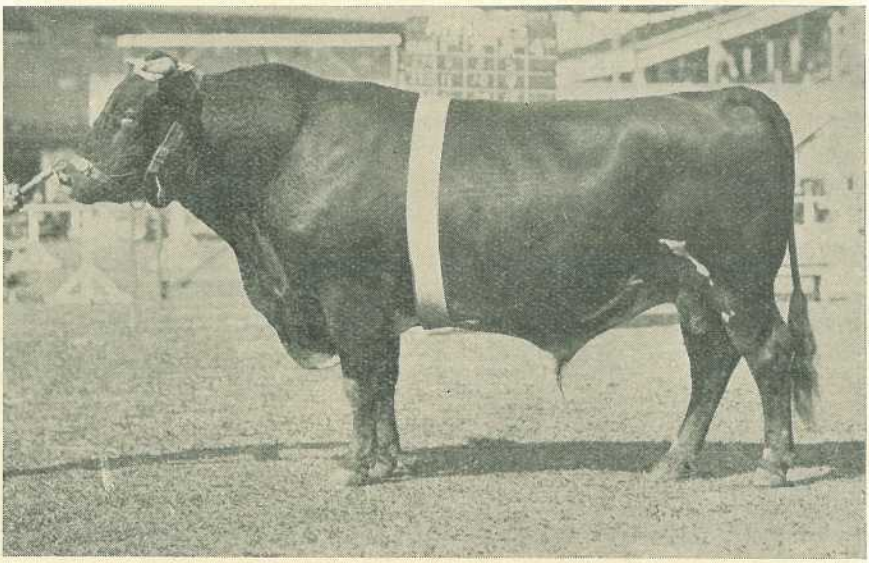


PLATE 170.
Champion A.I.S. Bull, Kilbirnie Pride, owned by Macfarlane Bros., Radford.

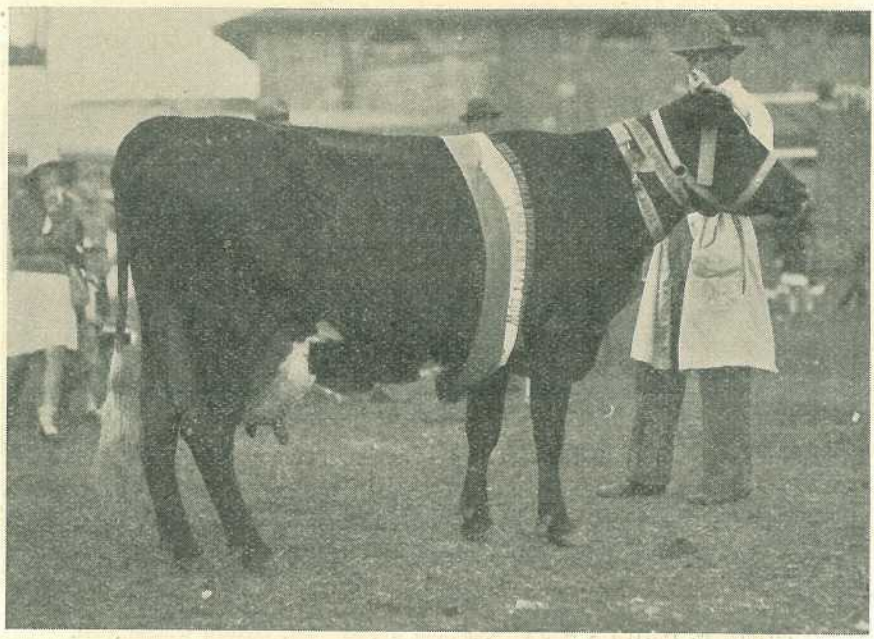


PLATE 171.
Champion A.I.S. Cow, Mr. J. Phillips' Trevor Hill Princess 2nd.

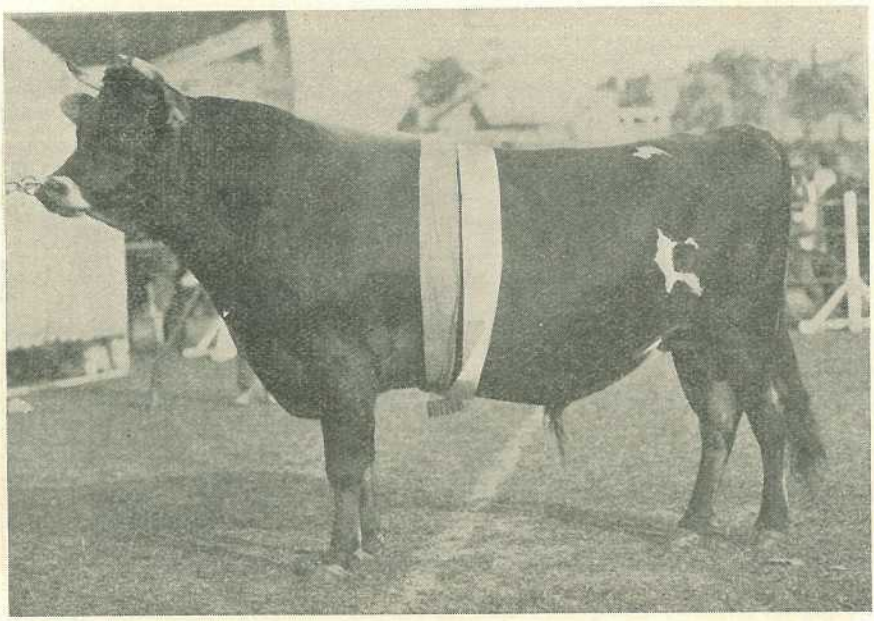


PLATE 172.
Champion Jersey Bull, Oxford Brown Victory, the property of Mrs. E. Stanton, Neurum.

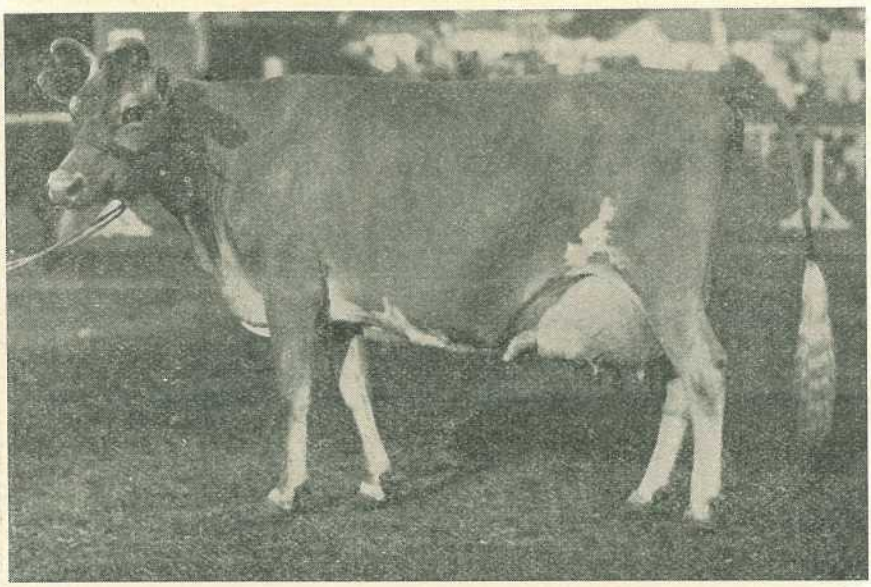


PLATE 173.
Messrs. E. Burton & Son's Champion Jersey Cow, Oxford Ginger Girl.

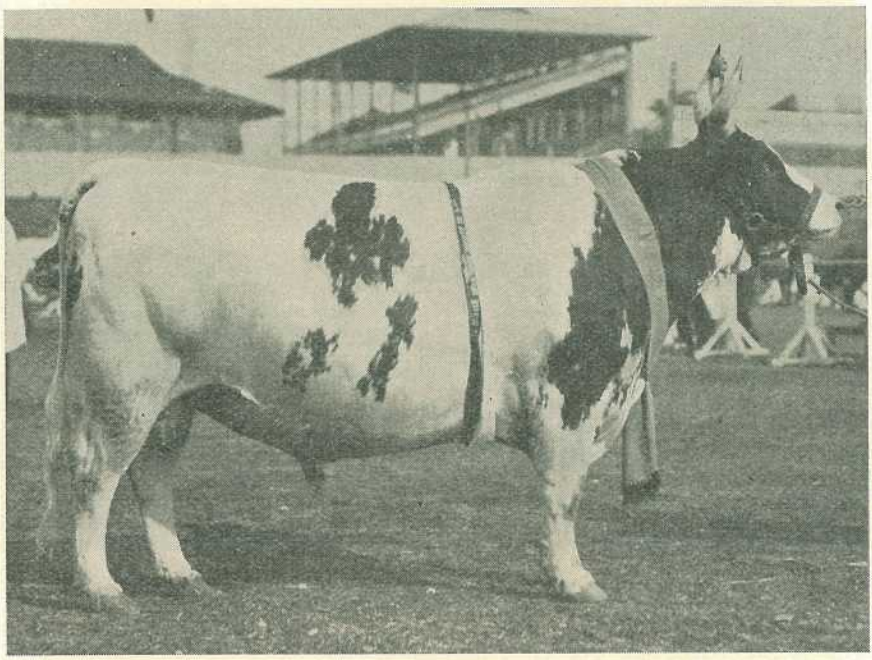


Plate 174.
Champion Ayrshire Bull, Myola Bonny Boy, the property of Mr. G. Norgaard.

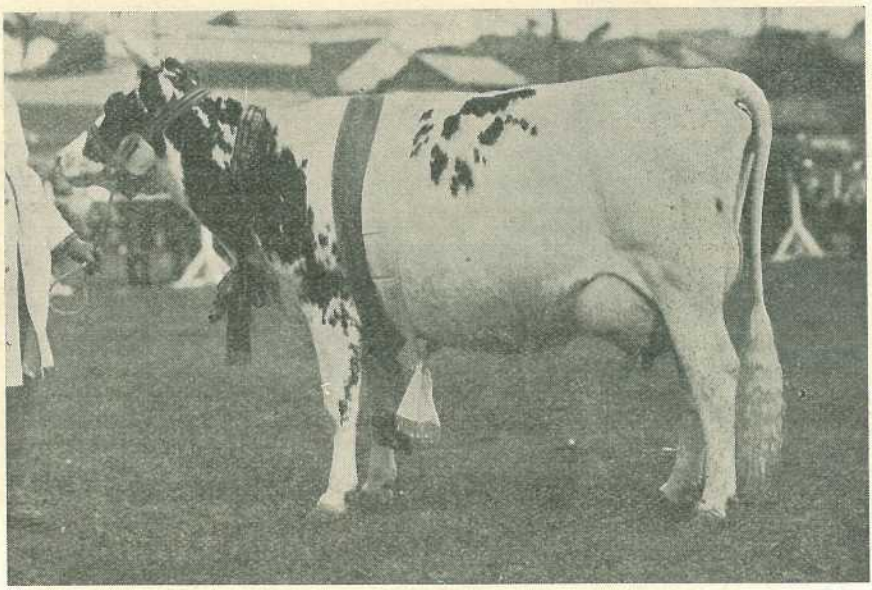


Plate 175.
Champion Ayrshire Cow, Benbecula Tulip, the property of Mr. T. Holmes.

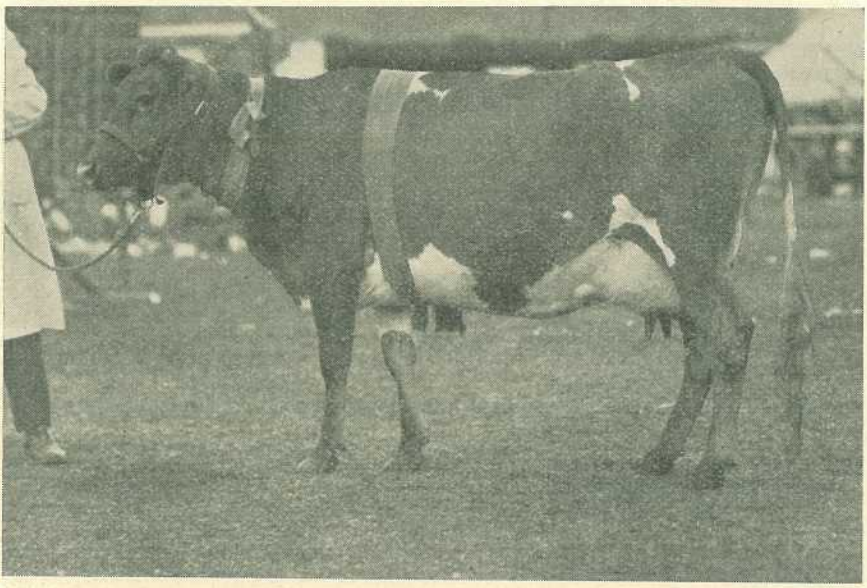


Plate 176.
Champion Guernsey Cow, Mr. A. Cooke's Linwood Sylvia.

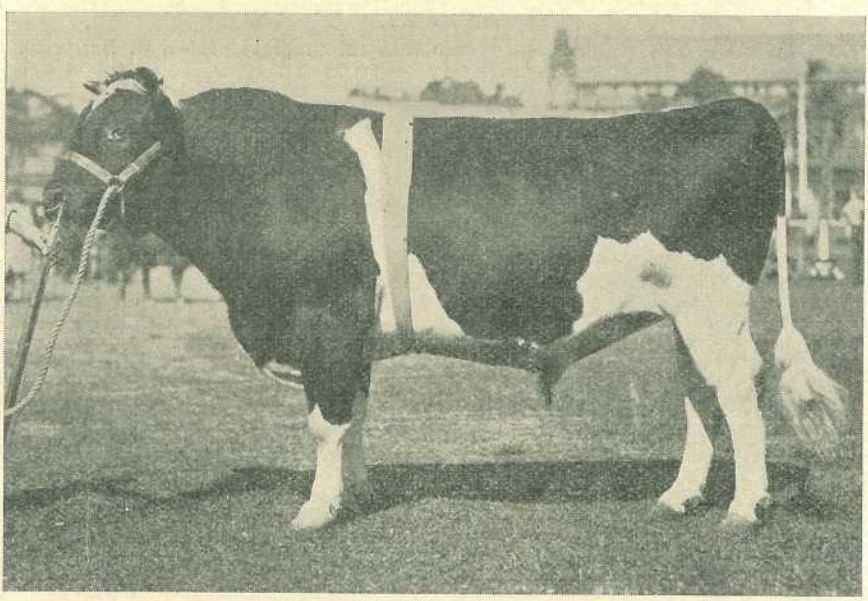


Plate 177.
Champion Friesian Bull, Starling's Actuary, the property of Mr. W. H. Grams, Tent Hill.

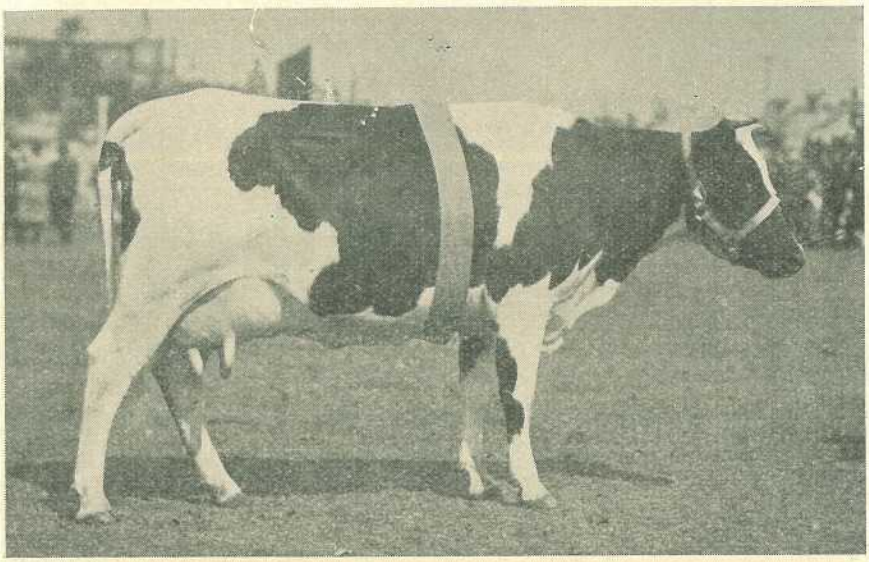


PLATE 178.
Messrs. Hickey & Son's Champion Friesian Cow, Glendalough Corndale 2nd.

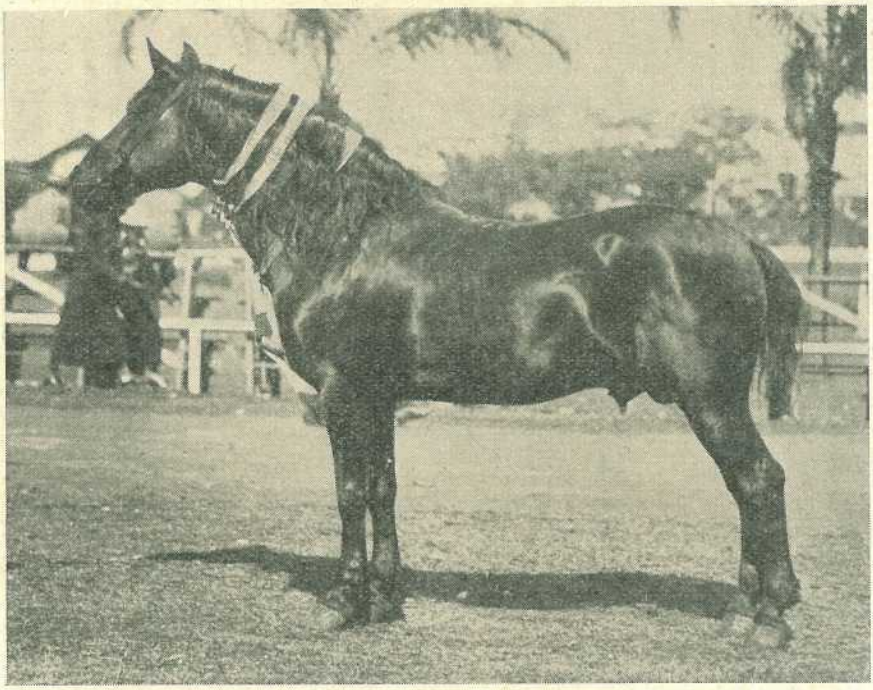


PLATE 179.
Mr. J. A. Rudd's Champion Pony Stallion, Halford Sensation.

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Books of the Australian Illawarra Shorthorn Society, the Jersey Cattle Society, the Ayrshire Cattle Society, and the Guernsey Cattle Society, production charts for which were compiled during the month of August, 1935 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORNS.				
	MATURE (OVER 5 YEARS), STANDARD 350 LB.			
Snowdrop II. of Blacklands (365 days)	A. M. Johnson, Gracemere	4,420·35	612·056	Premier of Hillview
	SENIOR 4 (OVER 4½ YEARS), STANDARD 330 LB.			
College Queen	Queensland Agricultural High School and College, Gatton	9,173·39	433·237	Fussy's Kitchener of Hillview
	JUNIOR 4 (UNDER 4½ YEARS), STANDARD 310 LB.			
Sunnymede Fairy 3rd	E. O. Althouse, Cloyna	8,331·62	316·524	Larry of Dnalwon
	JUNIOR 3 (OVER 3½ YEARS), STANDARD 270 LB.			
Rocklyn Ruby	T. Strain, Wondai	6,837·42	289·622	King of Sunnyside
Golden View Trixie	S. L. Holmes, Goomburra	6,781·67	277·751	Wunulla of Perfection
	SENIOR 2 (OVER 2½ YEARS), STANDARD 250 LB.			
Stirling Flora (365 days)	J. W. Crabb, Woodstock	11,259·44	439·256	Defender Boy of Orchard's Daisy
Rocklyn Shamrock (272 days)	T. Strain, Wondai	8,761·04	359·622	King of Sunnyside
	JUNIOR 2 (UNDER 2½ YEARS), STANDARD 230 LB.			
Trevor Hill Bluebell (254 days)	G. Gwynne, Umbiram	7,781·25	312·922	Viceroy of Wilga Vale
Blacklands Royal 8th	A. M. Johnson, Gracemere	7,065·8	280·4	Blacklands Major
Waverley Princess	R. A. Scott, Toogoolawah	6,623·35	256·658	Waverley Chieftain
Marn Pet	R. Martin, Coalstoun Lakes	5,725·26	245·497	Glenlee Victory
Happy Valley Miss Myrtle	R. R. Radel, Coalstoun Lakes	5,495·74	238·033	Burradale Emperor
AYRSHIRE.				
	MATURE (OVER 5 YEARS), STANDARD 350 LB.			
Fairview Bonnie Angela	R. M. Anderson, Southbrook	9,926·45	386·23	Fairview Jaunty's Masterpiece
	SENIOR 4 (OVER 4½ YEARS), STANDARD 330 LB.			
Fairview Lady Bess	R. M. Anderson, Southbrook	12,719·5	488·662	Longland's Bonnie Willie 2nd

GUERNSEY.

Senior 3 (over 3½ Years), Standard 290 lb.

Moonji Olivia	W. Smee, Peeramon	5,923·4	318·203	Caramarra Favour

Senior 2 (over 2½ Years), Standard 250 lb.

Lilac Perfection	W. Smee, Peeramon	4,856·05	279·884	Moonji Knut

Junior 2 (under 2½ Years), Standard 230 lb.

Willowbrae Princess	H. T. Blanch, Eudlo	5,846·75	303·561	Linwood Lone Star

JERSEY.

Mature (over 5 Years), Standard 350 lb.

Fairy Girl of Rosedale	J. Schull, Oakey	6,643·6	370·014	Oxford Prince Palatine

Senior 4 (over 4½ Years), Standard 330 lb.

Keystone Governess	A. Walker, Dawn	7,252·3	353·082	Trinity Radio

Junior 4 (under 4½ Years), Standard 310 lb.

Vanette of Linwood	F. Kath, Ellesmere	7,640·75	421·516	Aerofoil of Banyule
Connie of Linwood	F. Kath, Ellesmere	7,591·95	382·817	Aerofoil of Banyule

Senior 3 (over 3½ Years), Standard 290 lb.

Glengariffe Noble Carnation 2nd	Cox Bros., Witta	5,104·1	301·416	Retford Golden Heritage

Junior 3 (under 3½ Years), Standard 270 lb.

College Mildred	Queensland Agricultural High School and College, Gatton	6,916·26	355·339	Burnside Renown
Oxford Dawn	A. H. Koppen, Peeramon	6,289·15	327·111	Trinity Ambassador
Molly of Linwood	F. Kath, Ellesmere	5,748·4	310·223	Aerofoil of Banyule
Faith of Arranmore	J. M. Newman, Caboolture	4,860·1	285·959	Trinity Prince of Wales

Senior 2 (over 2½ Years), Standard 250 lb.

Snowdown of Peeramon	A. H. Koppen, Peeramon	5,141·6	285·86	Roseboy of Richmond
Trecarne Myrtlette 2nd	C. W. Barlow, Wyreema	4,293·15	252·250	Trecarne Renown

Junior, 2 (under 2½ Years), Standard 230 lb.

Maiwand Mistletoe 2nd	Queensland Agricultural High School and College, Gatton	5,965·84	338·61	Aveley Rex
Pineview Beryl	J. Hunter and Sons, Borallon	4,991·97	301·493	Oxford Jeweller
Waltham Farm Daffodil	McGregor Bros., Yalangun	4,453·28	284·616	Trecarne Reminder
Fauvic Luxury	H. Cochrane, Kin Kin	5,654·4	271·508	Condong Double Prometheus
Dora of Billabong	J. Mollenhauer, Moffattdale	4,973·24	265·22	Bruce of Calton
Bonnie Brae Dainty Favourite	R. A. Anderson, Yandina	5,291·6	262·18	Cinders of Burnleigh
College Milkmaid	Queensland Agricultural High School and College, Gatton	5,708·43	259·635	Burnside Defender
Lucy of Hopeview	H. T. Gibson, Kingaroy	4,926	257·97	Reminder of Calton
Greenstock Pride	McGregor Bros., Yalangur	4,438·76	250·193	Westbrook Scots Noble 3rd
Model of Romsey	J. Wilton, junr., Raceview	3,720·32	232·926	Retford May's Victor

AGRICULTURE ON THE AIR.

Radio Lectures on Rural Subjects.

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

On Tuesday and Thursday of each week, as from the 1st October, 1935, a ten minutes' talk, commencing at 7 p.m., will be given on subjects of special interest to farmers.

Following is the list of lectures for October, November, and December, 1935:—

SCHEDULE OF LECTURES.

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

Tuesday, October 1st, 1935—"Planting Cotton," by R. W. Peters, Cotton Experimentalist.

Thursday, October 3rd, 1935—"Summer Pasture Plants," by C. W. Winders, B.Sc., Agr., Assistant in Agronomy.

Tuesday, October 8th, 1935—"Summer Pasture Plants," by G. W. Winders, B.Sc., Agr., Assistant in Agronomy.

Thursday, October 10th, 1935—"Over-run and the Factors Which Affect It," by G. B. Gallwey, Inspector of Accounts.

Tuesday, October 15th, 1935—"Cultivating Cotton," by R. W. Peters, Cotton Experimentalist.

Thursday, October 17th, 1935—"Avocado Growing," by H. Barnes, Director of Fruit Culture.

Tuesday, October 22nd, 1935—"When the Cows Come Home," by J. F. Reid, Editor of Publications.

Thursday, October 24th, 1935—"Seasonal Notes," by A. E. Gibson, Director of Agriculture.

Tuesday, October 29th, 1935—"Those Backward Chickens," by P. Rumball, Poultry Expert.

Thursday, October 31st, 1935—"Shade Trees," by W. D. Francis, Assistant Botanist.

Tuesday, November 5th, 1935—"Thinning Cotton," by R. W. Peters, Cotton Experimentalist.

Thursday, November 7th, 1935—"The Preparation of Wool for Market as from Small Holdings and Mixed Flocks," by J. Carew, Senior Instructor in Sheep and Wool.

Tuesday, November 12th, 1935—"The Pineapple Industry," by H. Barnes, Director of Fruit Culture.

Thursday, November 14th, 1935—"The Eradication of Tuberculosis from Dairy Herds," by J. C. Maunder, B.V.Sc., Government Veterinary Surgeon.

Tuesday, November 19th, 1935—"Keeping Pigs Healthy," by L. A. Downey, Instructor in Pig Raising.

Thursday, November 21st, 1935—"Market Garden Pests," by J. A. Weddell, Assistant Entomologist.

Tuesday, November 26th, 1935—"Some Factors in the Control of Worm Parasites," by Dr. F. H. S. Roberts, Entomologist.

Thursday, November 28th, 1935—"Tobacco Culture and Varieties Grown in Southern Rhodesia," by R. A. Tarrant, Instructor in Agriculture.

Tuesday, December 3rd, 1935—"Types of Barns and Methods of Curing Employed in South Africa," by R. A. Tarrant, Instructor in Agriculture.

Thursday, December 5th, 1935—"Pork Products on the Breakfast Menu," by E. J. Shelton, Senior Instructor in Pig Raising.

Tuesday, December 10th, 1935—"Our Best Market for Butter and Its Requirements," by G. H. E. Heers, Director of Dairying.

Thursday, December 12th, 1935,'' Marketing Tropical Fruit in Australia,'' by J. H. Gregory, Instructor in Fruit Packing.

Tuesday, December 17th, 1935—''Packing Houses and their Equipment,'' by J. H. Gregory, Instructor in Fruit Packing.

Thursday, December 19th, 1935—''The Value of Silage,'' by H. B. Ball, Assistant Experimentalist.

Tuesday, December 24th, 1935—''Farming in France—A Christmas Memory,'' by J. F. Reid, Editor of Publications.

Tuesday, December 31st, 1935—''The New Year in Agriculture,'' by J. F. Reid, Editor of Publications.

TREE PLANTING—PROTECTION OF BIRD LIFE.

The need for an active policy of tree-planting, particularly in relation to the encouragement and protection of bird life, was emphasised by the Director of Agriculture (Mr. A. H. E. McDonald), Department of Agriculture, New South Wales, recently.

Mr. McDonald said that in recent years public interest had become intensified in the planting of trees. This was due largely to the laudable efforts of the forest leagues and other societies and individuals, who had realised that the land surface had become bare of trees, and that this had not only caused a dreariness of aspect, but had brought about dangers to the community.

Only a few years ago Australia over a great part of its area was covered by a dense growth of trees. This was especially so in its more favoured parts. The trees were originally considered a serious impediment to the productivity of grass and crops desired by settlers, and timber growth came to be regarded as man's chief enemy.

The stage had now been reached when whole sections of the country were completely bare of trees, and it was difficult to find suitable timber for fencing and firewood. In country towns where a few years ago ample supplies of firewood could be obtained right at the doors of the housekeepers, it was now necessary to import coal for the domestic fires. This was a serious matter, but was only of minor importance compared with the extinction of birds, which had naturally followed the loss of their homes. Trees also provided a resting place for the birds, shelter from the storms and heat, and a sanctuary where safety might be obtained from enemies.

Without doubt the decrease in the bird population had added to the perplexities of producers. Birds had been their greatest friends, and now that many had entirely gone and the numbers of others greatly reduced, the insect and weed pests were rapidly becoming a great danger. A few months ago great hordes of grasshoppers spread over the country, devastating the grasses and crops in their flight. Although several months had elapsed the effect of this invasion was still apparent, and hungry emaciated sheep were vainly seeking for the little feed left by the pest. In the wheatgrowing districts of New South Wales, wheat-root grubs were becoming so great a menace that some farmers were seriously talking about abandoning their holdings.

''Where areas are big it is oftentimes impossible to check insect pests by artificial means such as spraying,'' Mr. McDonald continued. ''Their natural enemies must be relied upon, and it should be part of our agricultural policy to encourage the development of bird life. As homes for the birds are the first essential, there must be greater activity in the planting of trees, and these must be planted in such a way as to provide a suitable harbourage for our feathered friends.

The leaves which constantly fell to the ground were not blown away, but remained to form a mulch to enrich the soil and conserve the moisture. The thick growth made ideal shelter for birds, which also found food in the grubs and other insects that lived amongst the fallen leaves. Such coppices also give the best shelter for the farmers' livestock both in winter and in summer.

Another advantage of the grouping of trees was that very little expense was entailed in providing fencing to protect the young plants during their early years. No great difficulty should be experienced in finding space almost anywhere, as quite small coppices, of, say 20 feet wide and 50 feet upwards in length were very effective. Travellers in the country could not help but observe the examples of natural thickets and be struck by their beauty.

Many kinds of trees could be easily and cheaply raised from seed, which could be obtained at small cost. It was important that the trees selected should be hardy, quick growing, but long lived, and suited to the soil and climatic conditions. Too often attempts were made to grow trees of other countries such as oaks, planes, and others that were quite unsuited to the environment. Beautiful and useful native trees could be obtained for almost any locality.

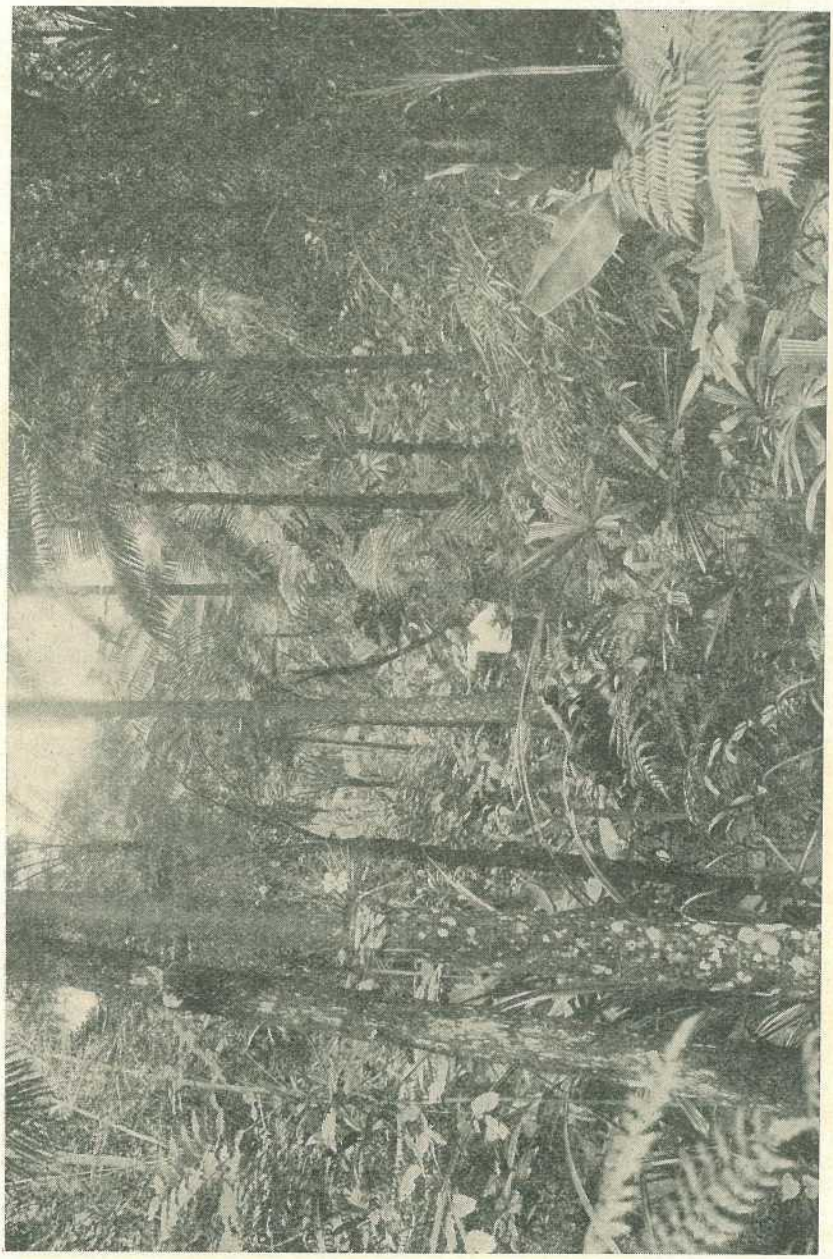


PLATE 180.
IN THE JUNGLE, NEAR KURANDA, NORTH QUEENSLAND.

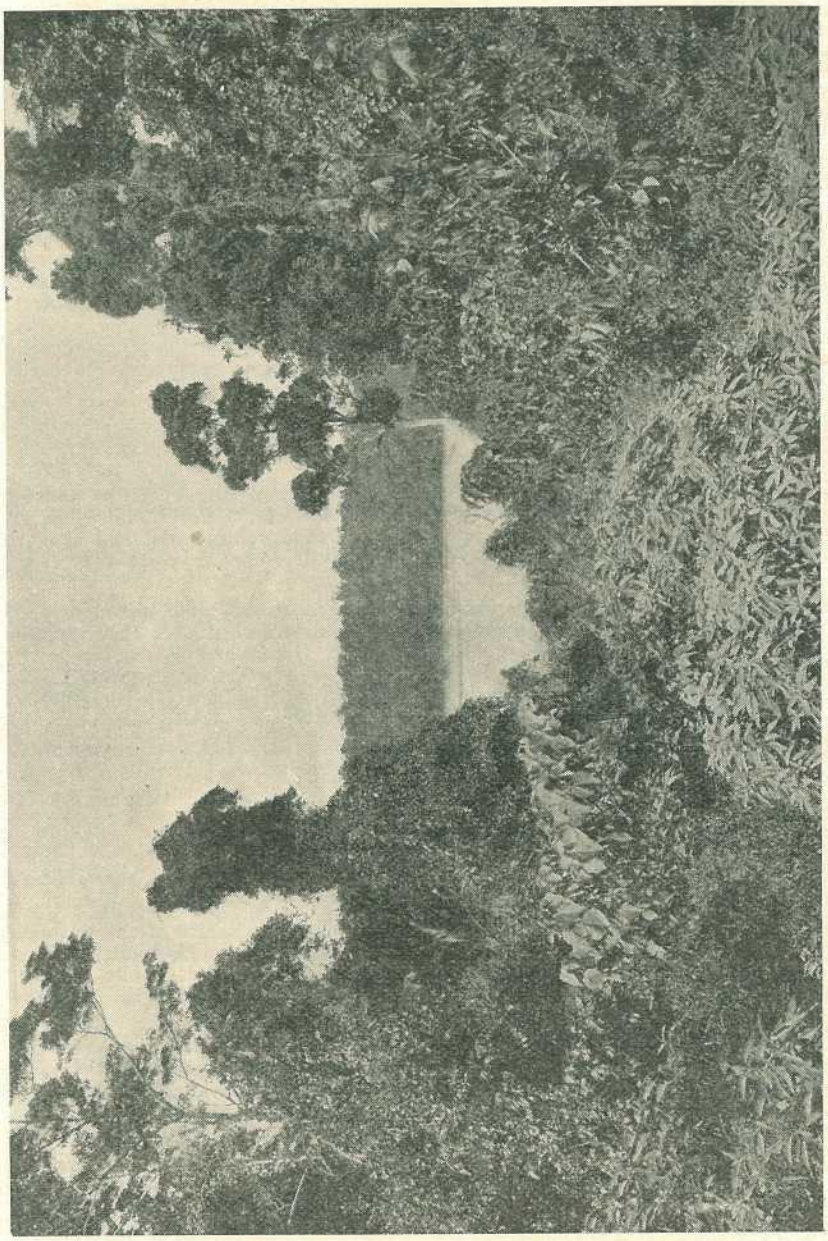


PLATE 181.

A GLIMPSE OF LAKE BARRINE, ATHERTON TABLELAND.

Answers to Correspondents.

BOTANY.

White Root.

A.J. (Buderim)—

The specimens represent the White Root (*Lobelia purpurascens*), a native plant, but one of the worst weeds, in some ways, we possess, and exceedingly difficult to eradicate. In some parts of Southern Queensland it is a particularly bad pest in pineapple plantations, and it is practically impossible to eradicate it. In your case, so far as we can see, the only plan would be to fork over the land in dry summer, and expose the white roots as much as possible to the hot drying sun. It might be possible to hasten their drying up by spraying the plants with a weak solution of salt. Any waste salt, such as butchers' salt, would suit this purpose. Arsenical solutions at weak strength might be tried to hasten the killing of the white roots, but great care is necessary to make certain that the solution is not strong enough to injure the standing trees. A leaflet on the weed has been posted to you.

Eumundi Plants Identified.

School Project Club (Eumundi)—

1. Leaves only, but seems to be *Paspalum conjugatum*, sour grass, or yellow grass—widely distributed over the warm regions of the world, and believed to be a native of America. It is a very undesirable grass, and should be eradicated if possible. Seed heads required to be certain of the identification.
2. Leaves only, but seems to be *Axonopus compressus*, the broad-leaved carpet grass, a native of tropical America, now widely spread over the tropical and subtropical regions of the world. In Queensland it is generally regarded as a pest except on inferior sandy lands where better grasses will not thrive. In America it is looked upon as quite a good fodder. Seed-heads are required to be sure of the identification.
3. *Paspalum dilatatum*. The common *Paspalum* grass of Eastern Australia. It is a native of South America, and since its introduction into Australia has become the chief dairy pasture grass of the coastal districts.
4. *Juncus* sp. A rush. Flowers required for identification.
5. A grass. Impossible to identify in the absence of seed heads.
6. *Digitaria didactyla*. Blue couch—a native of Queensland, very widely used as a lawn grass.
7. *Cynodon dactylon*. Common couch or Indian couch—a native of the warmer regions of the old world. It was originally described from Southern Europe. In Queensland it is sometimes used as a lawn grass, and it is also a good fodder, although its low growing habit is a disadvantage. In America it is known as Bermuda grass.
8. *Poa annua*. English meadow grass—a native of Europe, now naturalised in Australia, and very common in the winter and early spring months.
9. *Eleusine indica*. Crowsfoot grass—a native of the warm regions of the old world, common in Queensland as a weed in backyards, along roadsides, etc. Stock eat it readily at times, and its food value is high. However, it contains a prussic-acid-yielding glucoside, and if eaten in quantity by hungry stock would probably cause trouble.
10. *Sporobolus elongatus*. Rat's tail grass—a native grass common in Eastern Australia, and usually regarded as useless. The seed heads of your specimens are badly infested by a fungus disease.
11. *Gahnia aspera*. Not a grass but a sedge—it is a native plant, and seems to be of little value.
12. *Imperata cylindrica* variety *Koenigii*—bladey grass. A native grass common in open forest country, and frequently invading cultivation paddocks, where it becomes a great pest.

Trees for the Roma District.

C.C. (Roma)—

When in Roma last we noticed a number of bottle trees in some of the streets, and they appeared to be doing well. As you say, they transplant very readily. We are sorry that you have not had better luck with other native species. We feel inclined to vary the bottle trees with kurrajongs, and for this purpose we think it would be best to secure a half or a quarter of a pound of seed. The seed germinates fairly readily, and if sown in flats or in proper seed-beds would transplant quite readily.

Regarding Portuguese elm (*Celtis sinensis*), this tree is not usually stocked by nurserymen. It is a tree that should grow well in Western Queensland. Last time we were in Dalby we saw a few young trees. Perhaps you could obtain trees or probably young plants through the Brisbane City Council.

The *Bauhinia hookeri*, the Queensland ebony. This does rather well about Roma, and is well worth planting. The Brisbane City Council had a number of these trees at their Hamilton nursery.

Bella somba (*Phytolacca dioica*). We remember seeing a beautiful specimen of this a few miles out of Roma. The great objection to this as a street tree is derived from its very gouty stem, and we do not think it is very suitable for street planting.

Jacaranda, camphor laurel, silky oak, and citron gums should all do well, and should be obtained through the ordinary commercial channels.

Flindersia australis. Crows' ash. One of the most favourable trees for street planting. You may be able to obtain supplies from the Brisbane City Council, or from the Queensland Forestry Service, Lands Department.

Calodendrom capense, Cape Chestnut. A beautiful flowering tree that should, we think, do well at Roma.

Nephelium tomentosum. This tree should do well at Roma. Young plants may be obtained from the Brisbane City Council.

Regarding pines, various kinds would do well. Probably the insignis pine (*Pinus radiata*) would be well worth growing. It can generally be obtained from most nurserymen. Cypress pines should do well also at Roma. One of the best for general street planting in your district would be *Cyperus torulosa*, the Torulosa pine. Both seedlings and plants are available. The latter are more expensive, but are of a more uniform character. This pine has been used extensively for street planting about Toowoomba. Some of the Cypress pines do very well, particularly the rock Cypress. They are disliked by some people because they present rather a sombre appearance.

Poisonous Plants—Hoya Vine; Peach-leaved Poison Bush.

E.A.B. (Dangore, via Kingaroy).—Your specimens have been determined as follows:—

The plant with the fleshy leaf is the hoya vine or wax flower (*Hoya australis*), a very common climber in the scrubs of some parts of South-eastern Queensland. The plant is definitely poisonous, and has been responsible for trouble on several occasions. We think there is no doubt that if a poisonous plant is responsible in your case, this is the one. Experimental feeding with guinea pigs has shown that they develop symptoms of paralysis on the second day of feeding, and the general experience with cattle is that after feeding on this plant they go in the hindquarters. Some stockowners have found that drenching with Epsom salts saves animals. The following remedy has been recommended by one of the departmental veterinary Surgeons:—One lb. of Epsom salts and 1 lb. of treacle given as soon as the animal is noticed to be sick. This mixture should be followed daily with two drachms of potassium iodide dissolved in half-a-pint of water.

The plant with the smaller leaf is the peach-leaved poison bush (*Trema aspera*). It has an evil reputation among stockowners, though we have known many cases of ordinary paddock stock browsing on badly infested peach country and eating the peach in large quantities without any ill effects whatever. At times, however, it develops a prussic-acid-yielding glucoside. The occurrence of the glucoside is sporadic, it is only present for a short time, and what controls its formation in the plant is at present unknown. If the plant is eaten in large quantities by hungry stock when this glucoside is present, no doubt trouble will ensue.

Goondiwindi Specimens Identified.

W.D. (Goondiwindi)—

1. *Geijera parviflora*, wilga.

2. *Geijera parviflora*, wilga growing on black soil. This is tree wilga. The large plant is generally regarded as the better fodder. Wilga is a plant with a very mixed reputation. It is generally thought that soil has much to do with its palatability, but in other areas is has been reported that sheep will eat some and reject others. This is probably due to a difference in the flavour of the leaves on account of the presence of an essential oil of rather varying character. Most sheep seem to prefer wilga when it is cut and more or less withered.

3. *Acacia harpopylla*, young brigalow shoots. This, like other acacias and wattles, is a legume, and the food value to sheep should be fairly high. We think, when old, like No. 6, it tends to become rather harsh, and contains a lot of indigestible fibrous matter.

4. *Acacia* sp. Wonga. We shall have to wait for flowering material to be sure of the species. If sheep are eating it with relish we think it should be a good fodder. Like other allied plants, including mulga, it will, of course, cause congestion according to the amount of fibrous matter it contains.

5. *Atriplex semibaccata*, creeping saltbush, and another very imperfect specimen which looks like *Rhagodia hastata*. We are very interested in the account of these saltbushes. Both are generally regarded as quite good fodder, particularly the first. As a matter of fact, it is generally listed by some seedmen, and is imported by many people for growing on their properties. It seems strange that the sheep do not eat it, unless cut. It is generally eaten when it is half dry in preference to when it is very succulent, or when it is extremely dry.

6. *Acacia harpophylla*. See notes on No. 3; food value is not so high. We should say that it contains rather much fibrous indigestible matter present in the leaves and foliage to be of much value.

7. *Rhagodia spinescens*—a shrubby saltbush for which we have not heard a common name.

"Wild Gooseberry."

J.J.McL. (Brisbane)—

The specimen collected at Atherton represents *Nicandra physaloides*, commonly called wild gooseberry or poisonous gooseberry. The plant is very closely allied to the Cape gooseberry, and regarded as mildly poisonous. It is quite a common weed in parts of Queensland, but we cannot say that we have seen stock eat it, at least to any great extent. We should say that its use as green feed for fowls, particularly young chickens, would be risky.

Ochrosia Nicker Bean. Pittosporum.

B.M.J. (Magnetic Island)—

1. *Ochrosia elliptica*, the Ochrosia plum. We have not heard of a local name for this plant, and recommend the use of the generic name, which is fairly short and euphonious. The red fruits we should say from information received are poisonous, and the plant belongs to a poisonous family. The plant is fairly common on Queensland beaches.

2. Very small, but we would say *Caesal piniacrista*, nicker bean. A very common plant of prickly, scrambly growth, mostly found behind mangroves. The seeds are round and pearly-grey in colour. They are rather large, and are often used for necklaces, &c.

3. *Pittosporum ferrugineum*. We have not heard of a local name for this plant, but many call it pittosporum, and this name is now generally used by many gardeners, especially as one or two of the species are common in cultivation.

Free-flowering Clerodendron.

"Sap" (Townsville)—

Your specimen represents *Clerodendrom floribundum*, a native tree fairly widely distributed over Queensland. The flowers are tubular and white, and are succeeded by the black fruits held in red enlarged calyx. Whether in flower or fruit this tree is rather a handsome one and worth cultivating. It is sometimes seen in Queensland gardens. We have not heard of a local name given to it, but if you wish to coin one you may call it the *free-flowering clerodendrom*.

Blackall Range Plants Identified.

T.H.B. (Curramore, Maleny)—

1. *Cassia bicapsularis.* A native of tropical America, now widely cultivated in most tropical and subtropical countries.
2. *Campenula* sp. A kind of bluebell.
3. *Asclepias curassavia.* Red head or milky cotton bush. A weed common in parts of Queensland. At various times it has been accused of poisoning stock in Queensland.
4. *Oxalis variabilis.* This is not an Irish shamrock. There has been a considerable argument, even in Ireland itself, concerning the true identity of the shamrock, and different plants are still regarded by various people as being the true shamrock. Four different plants, viz., white Dutch clover (*Trifolium repens*), suckling clover (*Trifolium dubium*), black medick (*Medicago lupulina*), and wood sorrel (*Oxalis acetosella*) are still looked upon by various people as representing the Irish shamrock, and of these it seems that one of the first two is most likely to be the original plant mentioned in the tradition. White Dutch clover is the commonest clover we have in Queensland, and suckling clover recently appeared in many places. All the plants mentioned are common throughout the British Isles, and are by no means confined to Ireland. This information is taken from an article by C. Nicholson, in the "Gardener's Chronicle," of the 14th March, 1931. There the matter is discussed at some length.
5. *Cynoglossum amabile.* Chinese forget-me-not.
6. *Juncus communis.* The common rush.
7. *Viola hederacea.* Wild violet.
8. *Leucojum aestivum.* Summer snowflake. This is not the English snowdrop, but an allied plant. They are similar in general appearance.
9. *Salvia leucantha.*
10. *Hardenbergia monophylla.* A white flowered form of the common wild sarsaparilla.
11. *Iresine herbstii.*
12. *Dimorphotheca ecklonis.*
13. *Thuja orientalis.* Book cypress.
14. *Solanum pseudocapsicum.* Jerusalem cherry.
15. *Chrysanthemum frutescens.* Marguerite or Paris daisy.
16. Appears to be *Myosotis* sp., a species of forget-me-not. Complete plant required to be certain.

A Common Vetch.

H.W. (Miva)—

Your specimen represents *Vicia sativa* var. *segetalis*, a variety of the common *vetch*. This particular variety is a common form, which is naturalised in Queensland, but I have not heard a distinctive local name given to it. It is quite a good fodder, especially as it comes in at a time when usually speaking grass is rather short.

Some Native Trees.

Forestry Club (Rosedale, N.C. Line)—

1. Wattle. A name applied in Australia to any plant of the genus *Acacia*. The name is supposed to have risen from the fact that the twigs of an allied plant were used in the early days of New South Wales to make wattle and daub houses.

2. Blood Wood. There are several sorts of blood wood in Queensland, all belonging to the genus *Eucalyptus*. Common in your district is red blood-wood (*Eucalyptus corymbosa*). The timber is much prized for house stumps, but is not usually cut, due to the prevelance of gum veins. The name "blood wood" comes from the fact that the tree when cut exudes a blood-like sap, which on drying turns quite hard. Such substances are named and known technically as *kinos*, and are much used in dyeing and tanning.

3. Iron Bark. There are several sorts of iron bark in Queensland. They all belong to the genus *Eucalyptus*, and are all prized for heavy building purposes, where strength and durability are required.

4. Mahogany. A name applied indiscriminately in Queensland to a number of different trees. One of the commonest in your district is Swamp Mahogany (*Tristania suaveolens*), a timber most favoured for wharf piles, because of its resistence to the attacks of the marine borer.

5. Stringy Bark. There are several sorts of stringy bark, such as the yellow stringy bark, the white stringy bark, &c. These all belong to the genus *Eucalyptus*, and are much used in general building.

6. Oak. There are several kinds of oaks. They are distinguished by the type of country in which they grow such as desert oak, swamp oak, &c. They all belong to the genus *Casuarina*. One of the commonest in your district is rose oak (*Casuarina torulosa*). They are greatly prized for firewood. Some of them are utilised for different purposes, and used to a limited extent.

7. Box tree. The common box of your district is the brush box or scrub box (*Tristania conferia*). This timber is much cut in New South Wales, but is not cut here to any great extent as yet, due to its tendency to warp unless carefully seasoned.

8. Moreton Bay Ash. This is a Eucalypt (*Eucalyptus tessellaris*).

9. Tea-tree. The correct spelling of this tree is "Tea-tree" not "Ti-tree." The origin of the name is, that leaves of one of the species were used by a surgeon on Cook's third voyage as a substitute for ordinary tea. The beverage was found useful in keeping down scurvy. The leaves of the tea-tree vary in composition, but some contain a valuable essential oil. There are several sorts of tea-tree in your district, and most of them belong to the genus *Melaleuca*.

We strongly advise you to obtain for your school library a copy of the "Timber and Forest Products of Queensland," by E. H. F. Swain, obtainable from the Government Printer, Brisbane, or the Sub-Department of Forestry. Price, 6s. 6d, post free.

A Pond Weed.

Inquirer (Brisbane)—

The specimen represents *Potamogeton pectinatus*, a species of pond-weed, sometimes called fennel-leaved pond-weed, a native of Australia, but like many aquatic plants widely spread over the temperate regions of the world. This is the first time we have had this plant reported as a pest. As a matter of fact it has been reported from only one location on the Darling Downs. The plant seen at Murweh is, we think, a different plant, a species of Chara or stone-wort, which we have had from that location on one or two occasions as causing serious trouble in the bore drains. Regarding the eradication of the pond-weed or *Potamogeton*, we have little experience to guide us. In the countries where it is a pest the usual procedure is for men to walk along the bank with a weighted cutting instrument and cut the plants off above the surface of the mud. This is, as far we know, the only control known. The plant is not known to be poisonous or harmful in any way. I am rather inclined to think the plant will die out at the approach of hot weather, but on this point I am not at all sure.

General Notes.

Staff Changes and Appointments.

Messrs. H. N. Lund and D. Dignam, Tully, have been appointed honorary rangers under the Animals and Birds Acts.

Acting Sergeant S. D. Kreutzer, of Harrisville, has been appointed an Inspector of Slaughter-houses.

Mr. A. V. C. Smith, Clerk of Petty Sessions, Mackay, has been appointed Chairman of the North Eton, Racecourse and Cattle Creek Local Sugar Cane Prices Boards, vice Mr. T. E. Dwyer, transferred.

Messrs. K. R. Hack (Nerang) and Malcolm Buchanan (Goomboorian, via Gympie), have been appointed growers' representatives on the Banana Industry Protection Board until the 30th September, 1936.

Mr. A. G. Muller, manager, Yanko Station, via Thargomindah, has been appointed an honorary Inspector of Stock, vice Mr. Chas. Dorrell, resigned.

Mr. A. J. Everist, Private Secretary to the Secretary for Agriculture and Stock, has been appointed Librarian and Registrar of Co-operative Agricultural Associations, Chief Office, Department of Agriculture and Stock.

Messrs. R. Nott and K. S. McIntosh, Government Veterinary Surgeons, Department of Agriculture and Stock, have been transferred from Rockhampton to Blackall, and from the Animal Health Station, Yeerongpilly, to Rockhampton, respectively.

Mr. T. D. Cullen has been appointed Cane Tester at the Fairymead Sugar Mill for the currency of the sugar season.

Mr. D. A. Logan, Inspector of Stock, Rockhampton, has been appointed a District Inspector of Stock.

Mr. E. McKeown, National Parks Ranger, Tully, and Mr. R. P. Dare, Southport, have been appointed honorary rangers under the Animals and Birds Acts and the Native Plants Protection Act.

An area of about 2,540 acres adjacent to Goorganga Homestead, Proserpine (comprising portions 2v and 379 and part of Goorganga Creek, County of Herbert, Parish of Bonaventura), has been declared a sanctuary under the Animals and Bird Acts, and Mr. E. G. Lascelles, the manager of Goorganga Station, has been appointed an honorary ranger under these Acts for the protection of the sanctuary.

Mr. F. P. C. Bell, Inspector under the Fertilizers, Pure Seeds, and Stock Foods Acts, Department of Agriculture and Stock, has been appointed also Inspector under the Pest Destroyers and Veterinary Medicines Acts.

The Officer in Charge of Police, Laura, has been appointed also an Inspector under the Brands Acts.

Mr. W. A. Kearney, Inspector under the Stock, Slaughtering, and Dairy Produce Acts, has been transferred from Cloncurry to Mount Isa.

Cream Regulations.

The Minister for Agriculture and Stock (Mr. F. W. Bulcock), in referring to the new Regulation which came into operation on 1st September, governing preferential payment for cream, pointed out that there seemed to be some misapprehension regarding its interpretation.

This Regulation prescribes definitely preferential rates of one halfpenny for "choice" over first-grade cream, and one penny less for "seconds" than first-grade cream.

As the difference in preferential rates of payment for the grades have been taken in some quarters as a minimum, Mr. Bulcock, in order that there should be no misunderstanding, emphasised the fact that these rates are fixed and cannot be varied whilst the Regulation is in force, but he further stated that the new order does not affect cream which may be graded below second grade, as in this case factories may make a further reduction if they so desire.

The Minister called attention to the fact that this Regulation gives effect to the wishes of the dairying industry, as expressed in conference.

Duck Season Closed.

The Minister for Agriculture and Stock (Hon. F. W. Bulcock), in referring recently to the protective provisions of the Animals and Birds Acts relating to the wild duck, pointed out for the benefit of those interested that the variation of the open season last year in Southern Queensland would not apply during the present year, as it was proposed to revert to the scheduled dates of protection included in the original Order in Council issued on the 27th March, 1930.

Following this decision, the open season in respect of the wild duck in the Southern portion of the State expired at midnight on the 30th September, when protection will apply automatically in that area for a period of seven months, as prescribed in the Order in Council.

Shire of Cleveland a Sanctuary.

An Order in Council has been issued in pursuance of the provisions of the Animals and Birds Acts, declaring the Shire of Cleveland to be a sanctuary for the protection of native animals and birds.

Stanthorpe Fruit Statistics.

A Regulation has been issued in pursuance of the provisions of the Fruit Marketing Organisation Acts, providing that every fruitgrower growing fruit for market in the Granite Belt district shall furnish to the Committee of Direction of Fruit Marketing on or before the 30th November in each year, a return in the prescribed form, containing all the information and particulars mentioned or referred to in such form.

The necessary forms will be supplied to growers by the Committee of Direction.

Cotton Board.

An Order in Council has been issued under the Primary Producers' Organisation and Marketing Acts, amending the constitution of the Cotton Board by providing for certain alterations in the boundaries of the cotton districts.

The definition of a grower has been amended to provide that the class of persons who shall be eligible to vote on any referendum or election shall be persons who have during the twelve months preceding the referendum or election, delivered to ginneries seed cotton which was grown by them on land of which they were owners or tenants, or who, during such preceding twelve months, have furnished a cotton return to the Board showing such owner or tenant to be a bona fide cotton grower.

Fairymead Mill Levy.

Regulations Nos. 464 and 465 have been issued under the Primary Producers' Organisation and Marketing Acts empowering the Fairymead Mill Suppliers' Committee to make a particular levy at the rate of one penny (1d.) per ton on all sugar-cane supplied to the Fairymead Mill during the current season, the amount of the levy to be used for the purpose of defraying the costs of employing a farmers' representative at the mill during the season. Any petition to the Minister requesting a poll to be held on the question of whether or not the levy shall be made must be signed by at least 50 per cent. of the cane suppliers to the Fairymead Mill, and must reach the Minister on or before the 21st October, 1935.

Hail Insurance Compensation.

The State Wheat Board hail insurance scheme Regulations have been amended to provide that growers' returns for the purposes of hail insurance compensation must be lodged with the Wheat Board on or before such day not later than the 30th September in the year in which the crop is grown as the Board may determine. The form of the return to be tendered by growers wishing to be eligible to receive compensation in case of damage to their crops by hail has also been altered, so that growers must now show the number of acres under each variety and the estimated yield of each variety per acre on appearances at the time of making the return, as well as a description giving the number of the portion, the name of the parish and the name of the county of the land in question.

Murwillumbah Show.

The Secretary of the Tweed River Agricultural Society (Mr. J. L. Banner) has informed us that the annual show of his society will be held at Murwillumbah on 27th and 28th of November next.

Rural Topics.

More and Better Stock by Permanent Pastures.

A strong case for pasture improvement was presented by Mr. L. Freebody, of Adaminaby, at the recent South Coast and Monaro District conference of the New South Wales Agricultural Bureau. They had grown up, said the speaker, in a land which had been bountifully blessed by nature, and which had been sufficiently fertile in the past to enable them to make good profits with very little effort in the way of adding to, or increasing, the natural production. This state of affairs could not last for ever, and with closer settlement and the desire to make up, as far as possible, for lower prices by increased production from the same area of land, overstocking had taken place, with the result that many landowners to-day were expressing the opinion that the carrying capacity of their natural pastures was not the same as it used to be, and also that the health of the animals on these pastures was not so good.

To him, said Mr. Freebody, the remedy seemed simple—it consisted in the laying down of permanent pastures. As evidence of the benefit of this procedure he quoted the following actual results obtained by him from improved pastures since he had started in 1922.

In that year the property comprised 5,087 acres and carried 60 cattle and 2,500 sheep, producing 58 bales of wool. Since then, 1,870 acres had been sold, leaving an area of 3,217 acres, and it now carried 140 cattle, and 4,000 sheep, producing 110 bales of wool. This despite the fact that actually less than one-third of the property had yet been treated. He hoped, said the speaker, to have the safe carrying capacity of the property up to 5,000 sheep in two or three years. Before improvement this country was ordinary granite hill country, fairly heavily timbered, and was possibly capable of carrying a half sheep or little better to the acre. Since improvement, the weight of wool per head had very materially increased.

Points in Pasture Management.

Proper management is imperative if the full benefit is to be obtained from money spent on pasture improvement. If pasture mixtures sown in the autumn have made normal headway, vigorous growth will be made in the spring, during which period stocking should be regulated to control the seeding of the various species as desired.

Sown pastures may be stocked as soon as the plants have made sufficient root growth to withstand grazing, and it is preferable to commence by turning in a fairly large number of stock and leaving them in the paddock for a short time only; they must be removed as soon as the growth is shortened back. Regulated grazing in the early stages encourages the plants to stool out and make stronger growth. Stock should not be turned on to young grasses and clovers if the weather is wet and the ground boggy and soft, for the tramping under these conditions will kill out many of the plants. When the land settles down and becomes firm, the liability of plant damage from this cause is reduced. As the plants develop, the stocking periods can be lengthened until eventually normal grazing can be carried out, which, however, should be rotational.

During the early grazing periods it is advisable to observe closely the grazing behaviour of the stock, and in the event of their paying too much attention to comparatively slow growers such as *Phalaris tuberosa*, they should be removed for a time.—"Agricultural and Pastoral Notes," N.S.W. Department of Agriculture.

Washing Dairy Utensils—Boiling Water Essential.

Boiling water is absolutely necessary in dairy work to ensure cleanliness, and there should be no sparing of it. It is well, however, not to start washing the utensils with water that is boiling, for this very high temperature has a tendency to cause the albumen to coagulate, and to stick to the utensil in a thin, often invisible, film that supplies a breeding ground for bacteria. The utensils should first be washed with warm water, with a little washing soda or other alkali added, using good brushware (cloths being very objectionable), after which they should be scalded in ample boiling water, and then put in a clean place to dry.

Points in Dairy Farm Management.

"Himi," a well-known writer on rural topics, discussing points in dairy farm management in the "New Zealand Farmer" for July, has this to say:—

"Improvement, and still more improvement" in the quality of New Zealand's dairy products is a slogan that might well be adopted, with a view to meeting the world-wide competition which threatens to become more pressing with each succeeding year. Notwithstanding all the advances that have been made in the hygienics of the farms and factories, and the progress towards the perfection of the chemical and manufacturing processes, there still remains much to be done. Take the elimination of unpleasant feed flavours from butter, as one instance amongst many. This trouble has been a fruitful source of discussion between factory suppliers and factory managers for many years. As a result of these conversations, and of experiments, it is now very widely known that if taint-producing feeds such as turnips, cabbage, and green lucerne are fed shortly prior to milking time bad feed flavours develop; whereas if these are fed immediately after milking little or no taint is observed at the following milking. Simple discoveries such as this have enabled the farmer to safely use the most profit-producing foodstuffs, and have added to our knowledge of what constitutes good farming practice.

During recent months farmers in the Waikato appear to have become increasingly definite in their opinion that proper pasture and herd management may succeed in lessening strong feed flavours where, for example, clovers may be dominant. Mr. E. Bruce Levy, agrostologist of the Department of Agriculture (N.Z.), made an inquiry into the Waikato difficulties. His conclusion is that an examination of the morning cream compared with the night cream from the same herd and shed, and often from the same pastures, clearly indicated that "there is something in farm management." Comparisons between night and morning milk consistently showed that the night cream is often strongly feedy, and the morning cream is comparatively mild. There is no material increase in feed flavour intensity with ageing of the cream. The fact that morning cream was less feedy than night cream did not support the opinion that enzymes or ferments were responsible for feed flavour—if it is correct that at night the plant tissues contain large amounts of these ferments, and during the day the ferments are practically absent. Mr. Levy's theory is that the difference between night and morning milk is largely influenced by the grazing habit of the cow at night, as compared with day, in relation to the amount consumed, and the nearness or otherwise to milking time that food is eaten.

Observations have shown that there is comparatively little grazing done between midnight and milking time in the morning, and this, it is said, may have an important significance when coupled with the mild feed flavour of the morning's cream. "This brings up the question," said Mr. Levy, "whether it would be possible to manage the dairy herd in such a way that the luscious early spring growth is rationed, so that a herd is off it and on non-luscious feed four to five hours prior to milking time in the evening." A common practice amongst farmers is to put their cows on the best paddocks by day, whilst their night paddocks may merely contain harder feed, with or without hay or ensilage. This practice probably developed from the original idea that cows don't graze much at night, and in the daytime the farmers liked to see them on the best feed, anyway. From the fact that there is very little grazing done between midnight and morning milking, Mr. Levy advances the idea that the dairy herd automatically rations itself at night, and therefore suggests the use of the early luscious pasture as night grazing, rather than as day grazing, as at present. In this way it is hoped to avoid feed flavours. The soundness of the theory may or may not stand practical tests. Cattle, after all, are very natural creatures. After feeding all day on bush pasture they will, after the evening's milking, consume a fair quantity of comparative roughage. But when they discovered, as they probably would after a few days, that night time was to be their rich feeding time, there might be no "automatic self-rationing," as is observed at present, and vaster quantities of luscious grasses might be taken to offset the less palatable feed they had in the daytime. However, Mr. Levy is not dogmatic, and it is within the province of all farmers troubled with feed-flavoured milk to give his suggestion an earnest trial.

It is interesting to note that clovery pastures are essentially worse in causing feed flavours than grassy pastures. That, of course, is not intended as an indictment of clover, but as an additional pointer to the need for better farm management. The practice of keeping the sward short tends to encourage clover rather than grass and to produce greater quantities of young, vigorously-growing leaf rich in protein, and these two factors appear to intensify feed flavours. The hardening of the pasture and the consequent ageing of the leafage appears entirely to correct feed flavours.

Trials have shown that feediness is governed by weather conditions. Unless the weather is such as to promote rapid growth, particularly in clovers, no feediness should be apparent from herbage grazing. Young, fresh, quick-growing growth, particularly in clovers, is held to be largely responsible for feediness. Once the plant ages, or is fed in conjunction with more hardened feeds, feediness declines. Getting back to Mr. Levy's suggestion, rotational grazing—that is, giving the cows four six-hour shifts instead of two twelve-hour shifts (representing day and night grazing)—appears to be simple enough. After all, the practice would only have to be observed at certain times of the season.

Strictness Required in Cream-Grading.

Dairying is much the same the world over, especially when it comes to payment for quality problem. The man who is prepared to do things well in the aim to produce a high-quality milk or cream is not being encouraged to the extent he should be encouraged. Many a man has slackened off in his efforts to do the right thing when he finds neighbours who have poor equipment and have no appreciation of cleanliness getting the same price for their product that he gets. The one thing to force the indifferent to improve their methods and to encourage those who are producing a high-quality raw material is a more strict system of grading. And this will never be brought about while the keen competition for supply between different factories continues, not only between proprietary and co-operative companies, but even between co-operative concerns, and this at times to such an extent that it makes one wonder if the spirit of co-operation actually exists. The trouble is not common to this country (N.Z.). Apparently, judging by the report of a Sydney dairying conference, the "incorrect and lenient grading of cream" at some factories is just as prevalent in Australia as it is in New Zealand. The policy, declared a speaker at the conference, led to disappointed suppliers at one factory, whose cream had been correctly and conscientiously graded down, taking it to another factory where they could obtain choicest grade because of the policy of the factory. This speaker said, and very rightly, that there should be a much bigger difference between the price paid for choicest and second grade.—"Taranaki Herald" (N.Z.).

The Sow's Capacity for Milk.

A bad milking sow is worse than no sow at all, because she loses money instead of gaining it. It has recently been shown that by drawing milk from one or more teats, when the young pigs are feeding from their dam, the approximate yield can be ascertained, but a good deal of patience and experience is needed to succeed in this procedure. The pigs feed several times daily, and the milk is not let down until they do feed. The milk, too, falls off in quantity from week to week after the fourth week, until in the eighth week or slightly before weaning the quantity produced is not much more than one-half the yield of the fourth week. A sow may produce up to 11½ lb. in a day during the fourth week, and as little as 3½ lb., and, therefore, it is not difficult to see how impossible it is to expect well-grown youngsters where the dam is an inferior milker.—"The New Zealand Farmer."

Shade for Pigs.

During the summer adequate shade for pigs is essential. The ordinary sty, especially if it has an iron roof, is very hot, and some other shade is necessary in the heat of the day. If no trees are present, a wooden shed will answer the purpose. Another important aid to the health and comfort of pigs is a bath in which they can lie in hot weather. To wallow in the mud is the pig's natural method of cooling himself, and if the pig-yards have a frontage to a stream, well and good, though there is an objection to pigs wallowing in a stream, in so far that infection may be carried down from diseased pigs higher up the stream, and as a result contagion spread over a wide area. Unfortunately, the hog wallow usually seen on the pig farm consists of a filthy puddle-hole, into which drains all the excrement from the yards, and in the foul mud of this, the only wet spot available, the pigs are compelled to seek relief. If there is infection of any kind in the yard, it is to be found in just this place. Such wallows should be drained and filled in, and if there is no naturally clean place for the pigs to lie in, a concrete or similar bath should be built. This can then be kept clean, and the liability to infection from contagious disease will be diminished. Comfortable and hygienic conditions are most important in maintaining the health and wellbeing of pigs.

The Biological Balance—Place of Predatory Birds in Rural Economy.

The secretary of the Royal Zoological Society of New South Wales, Mr. A. F. Basset Hull, has issued a warning against interference with the balance of nature. He said that full consideration should be given to the possible costly effects before any group of birds or animals was declared a nuisance.

According to a report from Darwin, he continued, thousands of hawks were to be seen feeding on grasshoppers and insects. Mr. Ion Idriess, the well known author, had recently stated that "countless millions of rats" were infesting the interior, and that the swarms were followed by legions of wild "domestic" cats; further, that sand was drifting in growing quantities from the interior into Queensland and New South Wales. Mr. A. S. Le Soeuf, curator of Taronga Park, Sydney, had claimed that the spread of the mistletoe—a parasite on trees—was due to the destruction of opossums and koalas, which ate the seeds.

Those items, said Mr. Basset Hull, revealed the damage that was caused by upsetting the condition known as the "biological balance" or the dependence of one creature upon another, in which, normally, one was checked in its spread by the other. The practice of destroying hawks of all kinds had led to an increase in both insects and rats; but particularly rats, on which hawks preyed. Following the superabundance of rats was an increase in wild cats, which caused extensive destruction among useful insectivorous birds; consequently grasshoppers and other pests had ravaged pasture lands unchecked.

"It is a foolish thing to destroy birds which are considered to be pests before all the facts have been investigated. It will be found that suspected pests are 90 per cent. valuable, and that their destruction leads to greater damage and loss."

Great areas of sand-smothered country, Mr. Basset Hull said, were caused in many cases by over-stocking. Herbage was eaten, and rabbits and rats destroyed the roots of the plants, so that there was nothing to hold the soil. Eagles principally were rabbit-eaters, yet on many stations these birds were trapped extensively, because it was said that they occasionally took lambs.

Opinions on the question of extending protection to crows and hawks differ considerably, however. Commenting on the recommendation of the Royal Zoological Society to protect or partially protect certain birds, including crows and hawks, Mr. W. T. Merriman, of the Yass District (N.S.W.) Pastures Protection Board, had this to say (as reported in the "Sydney Morning Herald," 15th August) at the last meeting of that body:—Mr. Merriman said that after an experience extending over fifty years on the land in districts where crows had been prevalent, and sometimes very numerous, there was no other conclusion he could come to than that crows were despicably cruel birds, and the losses sustained by men on the land through their depredations were very considerable. If allowed to multiply, the losses from their attacks would increase tenfold, as he know from experience years ago when they were plentiful. Admittedly they might destroy a certain amount of insect life when other food was scarce, but again that they must weigh in the balance the thousands of other much more valuable insectivorous birds of which the crows killed the young and destroyed the eggs during the breeding season. Among the many birds killed by crows were magpies, and he considered the black magpie was one of the greatest agents he know of for destroying maggots in the chrysalis stage. In his opinion, crows, hawks, and foxes were the chief agents in destroying their very valuable harmless insectivorous birds, which had always been a friend to the man on the land. But these were becoming more and more scarce because the crows, hawks, and foxes during the breeding season were continually destroying the eggs and killing their young. The crow was also very destructive on maize crops when the grain in the cob was soft. They were a menace in the orchard—particularly the cherry orchard. They attacked the crop every year, and he estimated a crow would eat and destroy over a pound of cherries a day. The crow was a terrible pest in the poultry yard by stealing numerous eggs and killing chickens. In drought times crows inflicted terrible losses on weak sheep. He well remembered in the great drought of 1902, when crows were very plentiful, they lost 3,000 sheep on their property. This was largely due to crows, which picked the eyes out of the sheep when they were unable to get up, and then it was impossible to save them, as they died in a few days from blood poisoning, caused by the poisoned beak of the crow. During lambing time crows destroyed a great many lambs. He estimated that they killed at least 5 to 10 per cent.

Continuing, Mr. Merriman said he had repeatedly found one eye and sometimes both eyes picked out of the lambs, and quite often the tongue, before the ewe had completely given birth to her young. He had seen mobs of crows attacking lambs

two to three weeks old with their mothers. In his opinion, if they destroyed the crows, hawks, and foxes, then their valuable birds would breed up again and preserve the balance of nature. It was said the crow was a scavenger, but they were largely responsible for the carcases they were supposed to destroy. The crow was the means of encouraging blow flies by killing sheep and lambs for flies to breed in. Anyone who advocated their protection, concluded the speaker, was penny wise and pound foolish.

The board decided unanimously to protest against any protection of crows and hawks. It also endorsed Mr. W. Merriman's views.

Artificial Insemination of Stock.

Experiences in Russia recall ideas expressed in this country (Great Britain) more than twenty years ago, when the question of importation from Holland was first discussed. Such ideas centred around the possibilities of artificial insemination should direct importation be impractical. The possibilities may again have to be seriously considered.

During the year 1931, 187,000 cows in Russia were treated by insemination. It is said that as many as 400 cows can be inseminated by a single service of a bull. As many as 1,250 cows have been inseminated from one bull in the course of a year. By means of a special process, raw sperm can be stored for eighteen days, and then used with success. The insemination of ewes in Russia seems to have been very successful, as about 90 per cent. of the animals became pregnant. One service of the ram gave, on the average, enough sperm to inseminate six ewes.—The "British Friesian Journal."

Healthy Calves.

In order to produce healthy, thriving calves, we must have in the first place healthy parents, but healthy parents will not insure healthy calves if we do not treat them liberally in the matter of suitable food, and with general good care. It would be very interesting to know the history of all the world's greatest butterfat producers—namely, how they were treated from birth until they reached their first lactation period. It may be pretty safely concluded that one of them ever knew what it meant to be short of good food. It may be pointed out that an indifferently reared calf has sometimes turned out a great milker; but how much greater would she have been had she known very liberal treatment in her younger days?

Calf-feeding is work that requires the closest attention on the part of the attendant, yet it is work that is often done anyhow by anyone. Regularity of feeding and clean drinking pails are two essentials that are too often ignored. Some breeders advocate feeding the calves three or four times daily, and although this plan approaches closer to Nature than the twice-a-day system, I do not consider it necessary. I have generally had good—shall I call it luck—in calf-rearing, and I never fed the calves oftener than twice a day.—Primrose McConnell in the "New Zealand Farmer."

South African Wool.

Mr. J. S. McNab, the well-known Australian sheep classer, who visited South Africa recently, states that merino breeders in South Africa have swung away from masculine sires, and he found the wools are becoming shorter, more wasty in appearance, and the sheep are showing too much fold development. To some extent the benefit of the splendid sires imported from Australia between 1915 and 1924, has been lost. Some breeders known to Mr. McNab would not use certain of the progeny of the imported sires, but preferred the meat, "pretty woolled" sires, and the result has been that flocks have become too tight in the wool, sometimes over wrinkly, smaller in frame, and lacking in constitution. Mr. McNab was one of the first Australian sheep and wool experts to be employed in South Africa before the war. When engaged as expert, he warned sheep farmers that the natural conditions of the country tended to make the wool of merino sheep tone down greatly, become wasty in fibre, and of low yielding capacity. To counteract these tendencies, he advised the use of bold medium quality sires with plenty of body and elasticity in the wool, and it was acknowledged that the subsequent improvement in the South African clip was brought about largely by the general acceptance of that advice, but the improved standard has not been maintained, because less masculine and finer quality woolled sires have been used too freely of late.—"The Australasian."

Stock Losses in America.

Stock losses caused by drought conditions in the United States have been heavy, according to the "American Cattle Producer." Most of the cattle losses occurred in the western States. The Bureau of Agricultural Economics estimates that cattle numbers have been reduced by about 7,600,000 head, which means that three-fourths of the increase from the low point of the production cycle in 1928 has been eliminated within a single year. Sheep numbers also were reduced in 1934, and, as was the case with cattle, the reduction occurred principally in the western States and in the areas of the corn belt, where the drought was most severe. The reduction in sheep numbers has been officially estimated at about 2,600,000 head for the country as a whole. Hay supplies, which usually provide more than half the meal produced in the United States, have been curtailed greatly, too. The 1934 pig crop was about 35 per cent. smaller than the crop of 1933, and a further decrease is expected this year. The pig numbers on farms in the United States on 1st January, 1934, totalled about 57,000,000 head. On 1st January this year the numbers were estimated at 37,000,000 head.

Points of a Clydesdale Stallion—A Breeder's Views.

Addressing a Farmers' Club in Banffshire, Mr. George W. Cowie, who is a well-known Clydesdale breeder, said that no man should have the presumption to go into a judging ring unless he was prepared to give reasons for his decision. He was going to give what, in his opinion, went to the making of a good horse, and he was to limit his remarks to the Clydesdale breed because, after all, there was a differense between breeds of draught horses. He also considered the Clydesdale for quality of bone, muscular development and action, when these things were attended to, to be the best horse, perhaps, in the world.

In looking for a good breeding stallion the first thing that should be found, as indeed it should be in any male of any breed of horse or cattle or sheep, was a masculine appearance, which would be found in its head or crest. The neck should have a nice quick arch and the head should be attached to the crest so that one had a feeling that it was in proportion and not too big or too little. It should be fairly wide at the nostrils and between the eyes and should have a nice flashing eye. That indicated that the horse had grit, stamina, and a good constitution, and it should carry that head proudly.

He did not think any better test could be applied, with regard to the body of a horse being in good proportion, than to stand, say, about thirty yards from it and see if the horse appeared smaller at that distance than when it was close up. If it looked smaller they would invariably find that the horse was built in the right proportions. A good horse largely depended on its legs and feet because it was on its legs and feet that its working like depended. The hind legs were perhaps more important than the fore legs because they were used for pushing while the forelegs were used for pulling.

Another important thing, more important than many gave it credit for, was the quality of its hair. The hair of a good breeding stallion should be silky and straight. Most of these qualities held also so far as the mare was concerned and, in addition, the female should be low, long, and roomy. That did not mean really that her body should be long and spare, but her neck was usually a little longer than that of the male. The mare should also have a mild, motherly eye.

Another thing of importance was action. He would far rather have a horse, 16 cwt. in weight, with his legs rightly placed below his body, and with a nice, free, springy action than one which weighed 20 cwt. with his legs so placed that they walloped about everywhere when he ran, because the light horse would be sure to have a longer working life. The foot was one of the most delicate parts of the horse and the length of its working life often depended on the quality of the horn or hoof.—"The Farmers' Gazette" (Ireland).

A Mouseproof Hay Shed.

At comparatively little extra expense Mr. W. A. O'Neil, of Cowra (N.S.W.), has made his haysheds mouseproof. His method is to line the outside of the shed to about the height of the floor of a lorry with corrugated galvanised iron, the sheets being set upright in about 9 in. of concrete. No door being necessary, the iron sheets could be overlapped at the edges all round, thereby rendering the shed compeltely vermin-proof.

By keping the sides at the height of a lorry floor loading and unloading operations remain unhampered.

Fertility of Twin Lambs.

Discussing the question as to whether where twin lambs occur, one a male the other a female, the ewe will be fertile, in the "New Zealand Farmer" for August, "Himi," an able contributor to that journal, has this to say:—

Sir William Perry, of Masterton(N.Z.), who has had half a century's experience in sheep breeding, says he does not think the ewe's fertility is affected because she happened to be twinned with a ram lamb. It is rathr curious that this condition should vary in different classes of animals. In cattle, cows that are barren because of the fact that they were twin to a bull calf are known as free-martins. The bellow of a free-martin is similar to that of an ox, having more resemblance to that of a cow than that of a bull, and shows that the incapacity to breed, and all the other peculiarities, result from its having the generative organs of both sexes combined in a more or less imperfect state of development; in some the organs of the male predominate, in others those of the female. In many cases a heifer co-twin to a normal bull is normal in external appearance, but has no bulling periods. On an average one in every eight cases of twins (one a male, the other a female) results in the birth of a perfectly normal bull and an equally perfect heifer. This is due to the fact that in such cases fusion of the foetal membranes has not occurred.

Tree Planting in Country Towns—A Suggestion from South Africa.

Discussing plans for the Empire Exhibition in South Africa next year, the editor of "South African Country Life" describes a project for providing a great jacaranda avenue, and, incidentally, mentions a method of tree planting well worthy of the consideration of local authorities in Queensland. The editorial follows:—

Double avenues of jacaranda trees,, nearly half a mile in length, are to be one of the spectacular features of South Africa's Empire Exhibition next year.

Careful inquiries made by the authorities and a certain amount of botanical research have shown that the accomplishment of this scheme—providing a great jacaranda avenue, fully in flower, scarcely a year from the date of planting at Milner Park—which will be unique as a display not only in the Union, but also overseas, is practicable.

With the aid of modern scientific knowledge, the job will be done. Half-grown trees, about an inch and a half to two inches in diameter, will be brought from nurseries at Johannesburg and from the "Jacaranda Capital," Pretoria, whose fame on account of the blossoms has become world-wide.

The avenue is to lead from the main entrance to the Empire Road Extension, straight up the hill, to the mighty 200 ft. tower, which is to be the dominating feature of the buildings.

Lining both sides of the central roadway, which starts at the triumphal gate and leads off in other lanes towards the various industrial, governmental and municipal palaces, "Jacaranda Avenue" will boast of double rows of trees. They should be blossoming just about the time the Exhibition opens, September, 1936, and should last, with good weather, for nearly two months. Probably further extensions to the avenue will be planted along the acres of green lawns and cool ponds with their playing fountains, that will occupy the site of the tin restaurant and other halls now in process of being demolished.

Holes for the avenue trees are to be dug immediately, and the planting will commence not later than the beginning of August. Trees will arrive with their roots carefully tied up. Special soil, suitable for the species, will be placed in the excavations, which will even involve blasting in certain infertile spots.

By the time the opening of the Exhibition is due the 8 to 10 foot trees will have grown substantially and there will be an astonishingly beautiful vista up the hill, especially at night, when the whole of "Jacaranda Avenue" will be floodlit. Arrangements are being made for tourists to get a view of the Exhibition as a whole from the opposite side of the valley, on Parktown West Ridge.

Most of the trees are being planted at 20 ft. intervals, and there will be a certain number of flowering plants. All the excavations will be watered for two or three days before planting takes place, after which, unless there is a drought, practically no attention will be required.

Leading South Africans are to be asked to plant a certain number of the jacarandas at a forthcoming ceremony.

Selection of Dairy Cattle—Some Exploded Theories.

Thus "Himi" in "The New Zealand Farmer" for September:—

Whilst the conformation of a dairy cow and the evidences of constitution that she may possess are still important considerations in selecting members of the herd, the time has long since passed when other "signs" of productive ability—such as the escutcheon and yellow colouring in the ears—were treated with respectful attention. The pigment idea goes back to early Jersey Island history, and the escutcheon theory is a 19th century notion. When Francois Guenon, the son of a French gardener, developed his escutcheon theory, and wrote an elaborate treatise about it, he certainly induced many breeders to think fresh thoughts and attracted a very big band of disciples. His observation that the hair on the udders and thighs grows in opposite directions to the hair on the legs led him on to the "discovery" that great diversity existed in respect to the shape of the areas of upward-growing hair. The elaboration of the escutcheon—the "heraldic shield," the "milk mirror"—followed. Guenon persuaded many agricultural societies in France of the soundness of his theory that the "hair tufts and ovals" were true signs by which to dsitinguish the good and bad qualities of every individual cow. He was amply rewarded with money, medals and decorations from various societies, and a pension for life by the French Government. Nowadays one does not see judges in the showrings examining the escutcheon. And in mating their cattle, breeders are governed by the butterfat backing of the sires and dams, plus the possession of definitely good breed characteristics. The Babcock tester, the scales and exact records of production have simplified matters considerably, and have certainly furnished a more scientific foundation for selective breeding.

But whilst such speculative "signs" as the escutcheon and yellow pigmentation of the skin have enjoyed their little day of perhaps credulous acceptance, there are other tokens which appear to be more enduring. Eyes that are large, bright, placid and alert—as an indication of nervous temperament—for instance. Nostrils that are large, open and well distended—to permit a ready flow of big volumes of purifying air to the lungs—are strongly favoured by the vast majority of judges and demonstrators. Yet even such generally accepted good indicators as big nostrils are sometimes challenged. At a meeting of farmers recently Mr. A. H. McLinden, M.R.C.V.S., lecturer in veterinary science at Massey College, threw a bombshell amongst his audience by calmly stating that large nostrils are not necessary. He backed up the contention by saying that the opening to the windpipe was not half as big as one nostril. Upon this physiological fact the veterinarian was not contradicted, but Sir William Perry submitted the practical evidence that in travelling on a hot day the small nostrilled sheep lagged behind whilst those with open nostrils travelled better. Mr. McLinden said the openings of the larynx are fairly uniform, and he considered the dilatability of the nostril was more important than its size. Subsequently a member of the audience said it was a pity that the dilatability of the larynx itself had not also been discussed. He argued that the greater the volume of air (through big nostrils) that pressed for entrance at the windpipe, the greater the quantity of air the lungs would receive. Finally he invited the writer to gently press upon his nostrils with a thumb and forefinger and to note the instant and increased difficulty of breathing. Judging from the general comments—notwithstanding the esteem with which Mr. McLinden's judgments are usually regarded—it would seem that not many, if any, were shaken in their belief that big, open nostrils are important physical features in live stock.

Most Milk in Hind Quarters of Cow's Udder.

A professor in America designed a milking machine capable of delivering into separate containers the milk secreted by each of the four quarters of the cow's udder. He found that the two front quarters each produced slightly more than 20 per cent. of the total milk yield. The two rear quarters each produced slightly less than 30 per cent. The milk production from the right and left halves was practically uniform. It can thus be reckoned that 40 per cent. of the yield of milk of a cow comes from her two forequarters, while 60 per cent. comes from her two hindquarters.

Studying the lactation curves of a group of Friesian and Jersey cows, it was found that the general trend in the rate of milk secretion by quarters was quite uniform throughout the entire lactation period. Considering the average of each breed separately, no tendency was observed for either the front or rear quarters to secrete milk richer in fat than the other, even though there was considerable difference in the average yield of milk.

Hygienic Milking Methods.

To avoid unnecessary contamination, the milking yard and surroundings should be kept free from any accumulation of dust and manure by their removal after each milking. For the same reason it is imperative to sponge over the udders, teats and flanks of each cow before commencing to milk. Each bail should be provided with a separate bucket and sponge for this purpose, and the water should be changed as frequently as necessary. A small vessel of water is also necessary in each bail, in which the milker should rinse his hands prior to milking each cow. A hessian towel should be provided for drying the hands, and this should be washed out daily in order to keep it perfectly sweet and pure. There is not yet sufficient appreciation of the damage occasioned through neglect in these all-important preliminaries. One would think the extra comfort derived from milking a clean udder with clean hands would compel their observance. A further essential is the donning of clean overalls before commencing to milk.

Selecting a Dairy Cow.

Following is an extract from a recent publication of the Royal Agricultural Society of England:—

"The problem of judging or estimating the milk and butter producing qualities of cows by their external characteristics is an ever-present one and from time to time additional information is published regarding the degree of relationship found to exist between certain external features commonly studied in the judging of dairy cows and the yield of milk and butterfat of the same cows found from actual records. In "Agricultural Research" in 1927 a report on this subject was reviewed, and more recently a similar investigation has been carried out in France. External features such as length of head, size of barrel and spring of ribs, area of hind quarters, length of tail, size of udder and milk-wells, and amount of waxy secretion in the skin, were all studied, and the general conclusion arrived at is practically the same as that resulting from the previous investigation, namely, that the only accurate means of judging a dairy cow's value for milk and butter production is by the actual records.

"The same problem is being studied from a different angle by a group of American workers. Their method is to study by measurements of size and capacity the external conformation and the size of the internal organs of a large number of dairy cows whose records of milk and fat production are known. It was considered desirable to include a cow of beef type amongst those studied and in a recent report full particulars are given of the conformation, anatomy and skeletal structure of two cows—one a highly specialised dairy cow of the Jersey breed with exceptionally good records of production and the other a noted prizewinner of the Aberdeen-Angus breed.

"Numerous measurements and weights are given for different external features, internal organs and parts of the skeleton for the two animals, and the general conclusion states that, although in external form and appearance the two cows differed greatly, the differences in weight and size of the internal organs, apart from the milk secreting tissue of the udder, were not sufficiently great to indicate significant differences in the work done by the various organs. In skeleton structure the two cows varied somewhat but were generally similar. This similarity is taken to indicate that the evolution of the dairy and beef types, which has been accomplished by breeding and selection, has not materially altered the relationship of the bony framework of the body, but that the difference in type as commonly noted is due to the inherent tendency to produce milk associated with udder development and absence of flesh and fat. Apart from external appearance the most marked difference discovered by the examination of the internal organs was the very much larger amount of milk secreting tissue in the udder of the Jersey, although in general appearance the udder of the Aberdeen-Angus was larger."

A Dirty Milk Strainer Worse than None.

The straining of milk is always an important point in dairy practice, but a dirty strainer (cloth or gauze) is worse than none. It is sometimes noticeable after a bucket of milk has been emptied into a can that certain foreign substances have been intercepted by the strainer. These are left there, and the next bucket of milk is poured over them. When this has been done a few times the substance disappears, dissolved, and washed into the milk. It is of very little advantage to use a strainer in such a way. Very little if any time is lost by either shaking or rinsing the strainer occasionally, and large numbers of objectionable bacteria and other unclean substances would not then be added to the milk.

Plate 182.—Fisher Falls, Innisfail, North Queensland.

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the care and general welfare of babies, has been planed in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable deaths.

THE WEARY NURSING MOTHER.

IT is a joy to watch a lively, healthy baby of about eight months, during a railway journey, for instance, as he plays in the arms of a happy, healthy mother; he is rarely still a moment, twisting, turning, trying to raise himself on his feet, watching with eager eyes people and passing objects, clutching at those of bright hue, if they seem within reach. There is no rest for the mother, she is checking and guiding the little limbs, saving her own and other people's persons and property from damage. Her fellow-passengers are interested, amused, and sympathetic, for all are subconsciously aware that this is education for the babe, a necessary part of his becoming fitted to take his future place in the world physically and mentally. It is evident that a large amount of energy is being expended both by mother and infant.

How different is the picture when the mother is pale, tired, and exhausted by this natural display of energy in her child! Mother-love usually wins the battle against fatigue and irritability, and the babe gets his exercise, but the effort leaves her more and more wearied as the weeks go by. Too frequently she waits until she has weaned her baby, and then seeks medical advice, saying, "I have never felt well since my baby came." She may add, "Although it is weeks since I weaned him, I am still tired and nervy. My appetite is poor and fanciful, and my teeth seem to be decaying."

How can we prevent this unsatisfactory state of affairs? First we must enquire into the cause. Here is a mother who has proved herself adequate from a reproductive standpoint; she has borne and fed her baby naturally, and she is suffering as a result of the process; yet she has not developed any definite illness, for which she would receive rest in bed followed by a holiday as a part of the treatment. She would probably very much prefer such an illness to her long-drawn-out fight against weariness, vague ill-health, finicky appetite, and the irritability, which upsets the household around her. In fact, she deserves as much attention as if she had an acute illness, for hers is a most valuable life in the community.

Her poor health may indeed be the result of unrecognised disease, but in many cases the whole trouble is due simply to an ill-balanced and defective diet. She has probably been living since childhood on the border-line of a deficient diet. This means that some error or errors in diet have been present, not sufficient to cause loss of health, until there came the added calls of bearing and feeding a child. This process is a severe test, which seeks out the weak spots, and she is pushed over the border line into the territory of deficiency disease. If her

supply of iron has been defective, she will have anaemia; if her fresh fruit and vegetables have been insufficient, she will suffer from some degree of scurvy; if her supply of lime, phosphorus, and the necessary vitamin have been defective, her teeth will decay and her nerves be irritable. She is probably suffering from a mild complication of many food deficiencies. How all these may be easily avoided will be the subject of our next article.

FERTILITY OF THE FARM GARDEN.

Now that spring is here, renewed interest will be taken in the garden, which should be a feature of every farm home. Most soils can be made to produce successful gardens, points out a departmental pamphlet, though the process requires time, energy, some expense, and an appreciation of certain fundamental principles, as well as attention to such important matters as seed and plant selection, and insect and disease control.

Intensive gardening demands a higher degree of soil fertility than does ordinary field crop culture. An efficient system of soil management should not only make allowance for the present crop, but should aim at an ever-increasing reserve of fertility. It should determine the necessity and value for the particular soil of organic matter, how most economically to apply this material, then attempt to supplement this where necessary, by liming and the addition of artificial fertilizers.

FERTILIZERS FOR THE HOME GARDEN.

FOR the maintenance of fertility the city gardener has to place his chief dependence on chemical fertilizers, and the grower who lacks information as to the plant food content of his soil, and who desires to grow a wide range of crops of whose requirements he knows little, should play safe by using a high-grade "complete" fertilizer, and give a liberal application. Though he applies more than the plants actually require, the increased cost is so slight that the assurance of having enough is worth the additional expense.

A complete fertilizer is one supplying nitrogen, phosphorus, and potash in forms readily available to plants. A generally applicable complete fertilizer for home garden use consists of a mixture of dried blood, superphosphate and sulphate or chloride of potash. These substances in the proportions by weight of 3, 4, and 1 respectively give a 5-11-6 fertilizer, or one containing 5 per cent. nitrogen, 11 per cent. phosphoric acid, and 6 per cent. oxide of potash. On light-textured soils potash could be increased by using the same substances in the proportions of 2, 3, and 1, when a 4-11-8 fertilizer would be obtained.

Dried blood has many advantages as a source of nitrogen. It does not damage seeds or seedling roots, becomes available when the root system is developing, and is therefore not lost. It is a useful basal form of nitrogen application, carrying plants up to the stage where it may be advantageous to apply forcing soluble nitrogenous fertilizers.

Sulphate of ammonia may be used in place of dried blood in the complete mixture, but should be used in two-thirds the quantity. The use of sulphate of ammonia results in loss of lime from soils, and in time develops strong acidity. These harmful effects are easily overcome by liming, but it is not advisable to use this fertilizer on acid, lime-deficient soils.

The tendency in home gardens is to use quantities of manure without the application of potash and phosphate, and results in a bad nutrient balance, which accounts for the frequent reports of plants producing excessive vegetative growth, with poor flower, fruit, or tuber production. Under such conditions the addition of a mixture of four parts of superphosphate and one of sulphate or chloride of potash would result in a better nutrient balance.

For crops such as lettuce, cauliflower, cabbage, Brussels sprouts, spinach, and celery, where vigorous growth must be maintained, liquid fertilizers can be applied when the plants are well established. The following flowers, provided a complete fertilizer has been used initially, have been found to respond to nitrogenous top-dressing:—Dahlia, chrysanthemum, calendula, Iceland poppy, sweet pea, primula, &c. The soil should be moist before the application of liquid fertilizers.

The most efficient forms of nitrogen for liquid application are nitrate of potash, nitrate of soda, or a mixture of these salts, and nitrate of lime. Sulphate of ammonia, phosphate of ammonia, or a complete liquid fertilizer consisting of nitrate of potash and superphosphate may be used. These substances are soluble in water (superphosphate will leave a considerable residue) and can be dissolved at the rate of 1 to 2 oz. per gallon, and the solution run along the rows from a water-can with the sprinkler removed, or applied with a measure in the case of larger, spaced plants.

If the liquid comes in contact with the leaves, these may be hosed down after the application has been made, to obviate the possibility of injury.

The practice of broadcasting fertilizers is wasteful, since much of it will not come within the absorbing range of roots. When seeds are planted in drills, these should be opened up several inches broad at the bottom and from 1 to 3 inches deeper than the seed is to be placed. The fertilizer is then distributed along the bottom of the row, at the rate of an ounce or two to the yard, the drill filled in to the desired depth, and the planting made.

With large growing plants that are spaced, such as tomatoes, cabbages, and potatoes, a hole a foot in diameter and several inches deep can be made with a spade, and a small handful of fertilizer scattered in the hole before filling in and planting above the fertilizer. Fertilizers for potatoes should be slightly below and in a ring about the tuber, rather than directly beneath it.

A South African Water Garden.

A garden-fringed artificial lake, fed by an artificial waterfall, cascading down the side of the kopje at Milner Park is another spectacle, the construction of which has been decided on for next year's Empire Exhibition.

Some doubt was felt at the outset as to the technical feasibility of constructing a lake on the side of a hill, and as to the possibility of porous sub-soil causing the water to "leak."

Experts connected with the Exhibition Head Office have, however, now given their verdict in favour of the project.

Situate immediately below the existing big Hall of Transport in which the great motor-car display is held at the ordinary Rand Show, the lake will be 1,000 feet in circumference, and cover several acres.

Fed from the municipal mains a skilfully-devised "brook" will flow over the crest of the bluff on which the Hall of Transport restaurant is situated, and will then pass as a realistic spray-laden cataract for 30 or 40 feet to the level of the lake. The water is to flow beneath a bridge before entering the pool and will ultimately drain out in a remote corner of the grounds into an existing storm-water sluit.

Expert advice has been secured from the leading authorities at Johannesburg and Pretoria in connection with the lay-out of a "South African Water-Garden," which will be the first of its kind, and will surround the lake.

Down the side of the hill a mass of ferns are to be planted, which will, together with other plants, give a replica of some of the famous gorges on the slopes of Table Mountain, including species of flowers never before seen in the Transvaal.

Two thousand spectators will be accommodated in an *al fresco* open-air theatre, for which the seats are to be cut into the bluff on either side of the waterfall.

Water-lilies and aquatic plants belonging to the country are to be placed in the lake and along the stream, which will be the centre of the charming garden, and one of the most popular resorts at Milner Park.—"South African Country Life."

Orchard Notes for November.

THE COASTAL DISTRICTS.

NOVEMBER is somewhat of a slack month for fruit in the coastal districts, as the citrus crop, excepting a few Valencia Late oranges, off-season lemons, and a few lines, is over. Pineapples are also scarce, as the late spring crop is finished, and there are only comparatively few off-season fruits ripening. The main summer crop of fruit in the principal producing districts is only in the flowering stage, though that in the more tropical parts is ready for marketing. It is also a slack month for bananas, as the summer fruit is not yet fully developed, and the bunches that make their appearance are usually poor. They have been slow in developing on account of the comparatively cool weather of winter and early spring, when the suckers were more or less at a standstill. Young suckers should, however, be making vigorous growth now, and the plantation will require constant attention to prevent the stools being overcrowded with too many suckers. Keep the land well worked and free from weeds of all kinds, as good growth now means good bunches in the autumn and early winter. Where there is a danger of the soil washing badly with heavy rain, rows of Mauritius, velvet, or other suitable beans should be planted at right angles to the fall of the land, as the growth they make will tend to hold the soil, and thus save any from being washed away. When planting beans of any kind, either to prevent washing or for green manuring, don't forget to manure them, as thereby you will get a much greater yield, and as none of the manure is removed from the soil, as the crop is allowed to lie and rot on the ground, it is all made use of eventually by the permanent crop.

A good all-round manure for a bean crop is a mixture of 1 cwt. of sulphate of potash and 4 cwt. of basic superphosphate or finely ground phosphatic rock to the acre, and if the soil is deficient in lime a dressing of not less than half a ton to the acre will be found very beneficial, as all leguminous plants require lime to yield their maximum return both of haulm and pulse. The pineapple plantations require to be kept in a state of thorough tilth, and no weeds must on any account be allowed to grow. If blady grass makes its appearance it must be stamped out, as once it gets established in the rows it is only a short time before it takes control, and the plantation is ruined, so that it can only be brought back into profit by taking out the pines, killing the blady grass, and, after thoroughly and deeply working the land, manuring it and replanting.

The planting of pineapples and bananas can be continued throughout the month, taking care to see that the land is properly prepared and that the advice given in previous monthly notes is followed. Young papaw plants that have been raised in the seed bed can be set out now, as also can young passion fruit. Citrus orchards require to be well looked after; the ground must be kept in a state of thorough tilth, and if the trees show the slightest sign of distress, owing to lack of moisture in the soil, they must be given a thorough irrigation if water is available for this purpose. The trees should be carefully examined from time to time, so as to note when young scale insects of any kind are hatching out, and when this is noted they should be sprayed with a weak emulsion of a miscible oil consisting of one part of oil in forty parts of emulsion, as this is quite strong enough to kill any young scales before they develop their protective covering. As stated in these notes previously, no oil sprays should be used when the trees are suffering from lack of moisture, as they are then likely to do more damage than good to citrus trees. If scale insects are very bad, and it is important that the trees are sprayed, a weak lime-sulphur spray, or even a soap and tobacco or weak resin wash, will kill the young scales as they hatch out. In the earlier districts a keen lookout must be kept for the first appearance of the mites, which are the direct cause of the darkening of the skin of the fruit known as "Maori." The first indication of the trouble is that when the sun is shining on the young fruit it appears to be covered with a grey dust, and if the fruit is examined with a good lens, it will be seen to be covered with large numbers of small yellowish slug-like insects which are living on the skin. Spraying with sodium of potassium sulphide washes, as recommended by the Department, or with a weak solution of lime-sulphur, will destroy these insects and prevent the fruit from turning black. Borers of all kinds should be looked for and destroyed wherever found. Water sprouts, if not already removed, should be cut away. Vines will require careful attention, and the vineyard should be kept in a state of thorough cultivation. Spraying for downy mildew and black spot should be continued, if necessary, as well as sulphuring to prevent oidium.

Fruit fly must be systematically fought whenever seen, and special care must be taken to gather and destroy any early ripening peaches or other fruit that may be infested. If this is done systematically by all growers, as provided by the Diseases in Plants Acts, there will be many less flies to attack the later crops of mangoes and other fruits.

Leaf-eating insects of all kinds should be systematically fought wherever seen, by spraying with arsenate of lead, and potatoes and tomatoes should be sprayed with a combined spray consisting of Bordeaux or Burgundy mixture and arsenate of lead, so that diseases such as early blight and Irish blight may be prevented and leaf-eating insects, which frequently cause very heavy losses to these crops, be destroyed.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

KEEP the orchards and vineyards in a thorough state of cultivation, so as to keep down all weed growth and conserve moisture in the soil. This is important, as if a long spell of dry weather sets in, the crop of summer fruit will suffer severely from the lack of moisture. Citrus trees should be irrigated where necessary, and the land kept in a state of perfect tilth. Spraying for codlin moth should be continued, and all pip fruit trees must be bandaged at the beginning of the month; further, the bandages must be examined at frequent intervals and all larvæ contained in them destroyed. The neglect to spray thoroughly and to attend to the bandages properly is responsible for the increase in this serious pest in the Granite Belt, and growers are warned that they must pay more attention to the destruction of this pest if they wish to grow pip fruit profitably. Fruit fly may make its appearance in the cherry crop; if so, every effort should be made to stamp out the infestation at once, as, unless this is done, and if the fly is allowed to breed unchecked, the later ripening crops of plums, peaches, apples, pears, apricots, and Japanese plums are bound to become more or less badly infested. Combined action must be taken to combat this the most serious pest of the Granite Belt, and growers must realise that, unless they take this action and see that careless growers do no breed the fly wholesale, they will never keep it in check, and it will always be a very heavy tax on their industry. Rutherglen bug is another serious pest in this district, and is propagated by the million by careless orchardists. The best remedy for this pest is to keep the orchard clean and free from weeds. Brown rot in fruit should be watched for carefully, and, on its first appearance in a district, all ripening fruit should be sprayed with the sodium sulphide wash.

All kinds of leaf-eating insects should be kept in check by spraying with arsenate of lead, and all grape vines, potatoes, and tomatoes should be kept sprayed with Bordeaux or Burgundy mixture, the former for black spot and downy mildew, and the latter for early and late (Irish) blight.

Farm Notes for November.

Field.—Farmers are commencing to realise that quick-maturing wheats which possess a degree of rust resistance are more dependable than the slow-growing and often rust-susceptible kinds, which are gradually giving place to these and mid-season varieties.

Growers are advised to make every preparation to work up the surface of the ground immediately after the removal of their crops, so that the soil may be put into good condition to receive any rain which falls, the conservation of which is the best guarantee for the success of the next succeeding crop. Such initial preparation also encourages the early growth of all foreign and weed seeds, and permits of their eradication by the implements used to produce the desired soil mulch. In such manner paddocks are kept clean and the purity of crops is maintained. The careful preparation of areas intended for maize-planting cannot be too strongly impressed upon growers. Deep and thorough ploughing, followed by cross-ploughing and subsequent cultivation of the soil, must precede sowing if success would be attained; and all efforts must be concentrated to obtain a good surface mulch. failure to follow up the subsequent sowings by harrowing prior to the appearance of the young plant conduces to weed growths and very often entails, by neglect of this operation, subsequent hand-hoeing between the plants in the drills. Harrowing should be discontinued before the plant breaks through the surface, otherwise damage will accrue to the tender shoots of the young plants. When the young maize plant

has hardened up it may, with advantage, be lightly harrowed in the direction of the drills, but such practice must discontinue once the plant has attained a height of 6 inches. Close cultivation by inter-row cultivation implements is necessary after every shower to conserve moisture and to prevent weed growth, care being taken to ensure each cultivation being shallower than the preceding one, and so prevent damage to the root system of the plant, which is extensive. Inter-row cultivation should cease with the advent of the cob on the plant; and, if proper attention has been given to the crop, it should, at this period, be unnecessary. Where crops are planted on the check-row principle, inter-row cultivation is facilitated, and more even crops result.

The French millets (red and white), owing to their rapid maturing qualities, form excellent intermediate or supplementary crops, and are suitable for present sowing. Their value for fodder and seed purposes is worthy of more general recognition at the hands of the average farmer.

Past dry periods have impressed upon us the necessity of providing during good seasons against the return of less favourable ones, and in this connection the cultivation of quick-growing fodder plants appeals to us. Many varieties of useful classes of fodder can be cultivated over a large portion of this State; chief of which, perhaps, are the sorghum family for grain and fodder purposes. Of the latter, Sudan grass has much to commend it, and is fast becoming one of the most favoured by stockowners. Grain sorghums, of which Feterita, Red Kaffir, and the various Milos are examples, should occupy a more prominent position for purposes of horse and pig feeding, and are particularly suited to those localities which are unsuitable for maize production. Some varieties of sorghums have strong frost-resisting qualities, and lend themselves to those localities where provision for some form of succulent fodder is necessary during the winter months.

CARE OF NEW-BORN FOALS.

The market value of sound, well-bred horses to-day, both heavy and light, certainly justifies every care being taken in rearing. The most common direct cause of loss among foals is, undoubtedly, blood-poisoning through the navel cord, though poor condition of the dam, due to improper feeding or lack of exercise during pregnancy, may also be a contributing factor, by resulting in deficient vitality in the offspring.

It should be the aim of the breeder to produce and raise vigorous foals that will develop into strong, useful horses, with plenty of staying power. For this it is a first essential that the mare be managed and fed in an intelligent fashion, particularly during the latter months of gestation. Over-feeding and pampering during pregnancy should be avoided, and care taken to ensure sufficient exercise.

While the pregnant mare should be given no chance to overstrain herself at work—as by "backing" a heavy load when in shafts, it is equally important to provide regular exercise, up to the final three or four weeks, at least. In the case of a farm mare, this may best take the form of working in chains, as at ploughing, or ahead of another animal which is in shafts when on carting work. The desirability of preventing any sudden fright or violent galloping towards the end of the gestation period is obvious.

For the mare's diet as she approaches parturition there is nothing better than good oats—preferably crushed, scalded bran, and long hay, supplemented by a few roots or a little green fodder.

Foaling is best arranged to take place in a roomy loose-box, thoroughly cleansed and disinfected for the occasion, and well bedded with fresh straw.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF AUGUST IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1935, AND 1934, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Aug.,	No. of Years' Records.	Aug., 1935.	Aug., 1934.		Aug.,	No. of Years' Records.	Aug., 1935.	Aug., 1934.
North Coast.	In.		In.	In.	*Central Highlands.*	In.		In.	In.
Atherton	0·88	34	1·76	0·29	Clermont	0·69	64	0·21	Nil
Cairns	1·73	53	2·85	0·53	Gindie	0·64	36	..	Nil
Cardwell	1·26	63	1·92	1·96	Springsure ..	1·05	66	0·40	0·16
Cooktown	1·22	59	1·40	0·23					
Herberton	0·65	49	0·75	0·37					
Ingham	1·43	43	0·86	1·29					
Innisfail	4·87	54	11·31	1·56					
Mossman Mill ..	1·39	22	0·83	0·87	*Darling Downs.*				
Townsville	0·51	64	Nil	0·27					
					Dalby	1·20	65	0·94	0·95
Central Coast.					Emu Vale	1·08	39	0·46	0·51
					Hermitage	1·17	29	..	0·74
Ayr	0·58	48	Nil	0·22	Jimbour	1·16	47	0·68	1·23
Bowen	0·66	64	0·05	0·59	Miles	1·11	50	0·81	0·26
Charters Towers ..	0·54	53	Nil	0·62	Stanthorpe	1·78	62	0·74	2·46
Mackay	1·04	64	1·00	0·42	Toowoomba ..	1·65	63	0·95	1·40
Proserpine	1·35	32	1·54	1·03	Warwick	1·45	70	0·62	0·85
St. Lawrence ..	0·80	64	1·06	Nil					
South Coast.									
					Maranoa.				
Biggenden	1·10	36	1·11	1·31					
Bundaberg	1·29	52	0·59	1·64					
Brisbane	1·98	84	1·64	1·26	Roma	0·91	61	0·59	0·07
Caboolture	1·53	48	2·21	1·63					
Childers	1·22	40	1·19	1·59					
Crohamhurst ..	2·15	42	4·96	1·20					
Esk	1·48	48	0·82	1·56					
Gayndah	1·16	64	0·83	1·80					
Gympie	1·71	65	1·73	1·42	*State Farms, &c.*				
Kilkivan	1·44	56	0·59	0·98					
Maryborough ..	1·70	64	1·16	2·02	Bungeworgorai ..	0·74	21	..	0·21
Nambour	1·82	39	4·62	1·59	Gatton College ..	1·12	36	0·51	1·01
Nanango	1·33	53	1·35	2·23	Kairi	0·91	21	..	0·30
Rockhampton ..	0·83	64	0·52	0·46	Mackay Sugar Experiment Station	0·89	38	0·68	0·27
Woodford	1·67	48	2·63	0·47					

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—AUGUST, 1935.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.				Total.	Wet Days.
		Max.	Min.	Max.	Date.	Min.	Date.		
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	30·01	80	63	84	1	53	1,2	140	4
Herberton	..	71	50	81	1, 2, 30	27	5	75	9
Rockhampton	30·16	76	53	84	2	42	6	52	6
Brisbane	30·20	70	50	78	31	43	11	164	9
Darling Downs.									
Dalby	30·19	69	41	78	2, 31	30	1	94	5
Stanthorpe	..	62	35	70	8, 31	19	18	74	7
Toowoomba	..	65	43	75	2, 22	30	5	95	7
Mid-Interior.									
Georgetown	30·04	84	57	91	30, 31	36	5	Nil	..
Longreach	30·13	76	46	84	28, 31	36	5	6	1
Mitchell	30·19	69	39	78	28	27	17	131	4
Western.									
Burketown	30·05	84	59	92	3	46	5	Nil	..
Boulia	30·11	78	50	89	1, 28	41	5	18	2
Thargomindah	30·16	71	..	86	28	..	..	75	3

ASTRONOMICAL DATA FOR QUEENSLAND.

Times Computed by D. EGLINTON and A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	October. 1935.		November. 1935.		Oct., 1935.	Nov. 1935.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	a.m.
1	5·34	5·51	5·3	6·9	7·3	8·18
2	5·32	5·52	5·2	6·10	7·44	9·16
3	5·31	5·53	5·2	6·10	8·32	10·19
4	5·30	5·54	5·1	6·11	9·26	11·23
						p.m.
5	5·29	5·55	5·0	6·12	10·22	12·28
6	5·27	5·56	4·59	6·12	11·23	1·32
					p.m.	
7	5·26	5·56	4·59	6·13	12·28	2·35
8	5·25	5·57	4·58	6·14	1·35	3·41
9	5·24	5·57	4·58	6·15	2·42	4·50
10	5·23	5·57	4·57	6·16	3·48	6·1
11	5·22	5·58	4·57	6·17	4·55	7·7
12	5·21	5·58	4·56	6·17	6·5	8·10
13	5·20	5·58	4·55	6·18	7·14	9·10
14	5·19	5·59	4·54	6·19	8·24	10·1
15	5·18	5·59	4·53	6·20	9·29	10·46
16	5·17	5·59	4·53	6·21	10·29	11·25
						a.m.
17	5·16	6·0	4·53	6·21	11·23	12·0
18	5·15	6·0	4·52	6·22	a.m.	
19	5·14	6·1	4·52	6·22	12·11	12·30
20	5·12	6·2	4·52	6·23	12·51	12·58
21	5·11	6·2	4·51	6·23	1·27	1·29
22	5·10	6·3	4·51	6·24	2·0	1·57
23	5·9	6·3	4·51	6·25	2·29	2·30
24	5·8	6·4	4·50	6·26	2·59	3·4
25	5·7	6·5	4·50	6·26	3·27	3·41
26	5·6	6·6	4·50	6·27	3·59	4·26
27	5·6	6·6	4·50	6·28	4·31	5·16
28	5·5	6·7	4·49	6·29	5·5	6·12
29	5·4	6·7	4·49	6·30	5·43	7·13
30	5·4	6·8	4·49	6·31	6·31	8·5
31	5·3	6·9			7·23	

Phases of the Moon, Occultations, &c.

5 Oct.	☾ First Quarter	11	40 p.m.
12 ,,	○ Full Moon	2	39 p.m.
19 ,,	☽ Last Quarter	3	36 p.m.
27 ,,	● New Moon	8	15 p.m.

Perigee, 11th October, at 2.36 p.m.
Apogee, 23rd October, at 11.24 p.m.

In the early morning hours near the middle of October the beautiful planet Venus will exceed the brilliance it displayed during the first week or two of August, when, however, the time, shortly after sunset, was much more convenient for popular observation. When at its brightest Venus may be seen in the day time, if sufficient care is taken to shield off the sunlight and to locate Venus at the distance from the Sun, which can be estimated by the time given for the planet's rising and setting.

Mercury will be passing from east to west of the Sun on the 18th, but instead of a transit of the Sun's face Mercury will be one degree (twice diameter of Moon) south of the Sun.

Soon after the Moon rises at 3 a.m. on the 24th the nearness of Venus, 3 degrees north, will form an interesting spectacle.

Mercury sets at 7.45 p.m., one hour 54 minutes after the Sun, on the 1st; on the 15th it sets 34 minutes after the Sun (invisible).

Venus rises at 3.48 a.m. and sets at 3.37 p.m. on the 1st; on the 15th it rises at 3.14 a.m. and sets at 2.59 p.m.

Mars rises at 8.54 a.m. and sets at 10.45 p.m. on the 1st; on the 15th it rises at 8.42 a.m. and sets at 10.35 p.m.

Jupiter rises at 7.57 a.m. and sets at 9.16 p.m. on the 1st; on the 15th it rises at 7.10 a.m. and sets at 8.35 p.m.

Saturn rises at 3.19 p.m. and sets at 4.14 a.m. on the 1st; on the 15th it rises at 2.20 p.m. and sets at 3.17 a.m.

The Southern Cross will be at its highest point, XII., at midday, and at its lowest position, VI., at midnight on the 1st, but one hour earlier on the 16th. By subtracting the observer's latitude from 30 degrees the distance below the horizon of the Cross when at VI. can be fairly ascertained; thus at Warwick it will be just about 2 degrees, at Brisbane 2½ degrees, and at Townsville 11 degrees. Its disappearance will be about 2 hours earlier at Brisbane and Warwick and 3 hours earlier at Townsville.

4 Nov.,	☾ First Quarter	9	12 a.m.
11 ,,	○ Full Moon	12	42 a.m.
19 ,,	☽ Last Quarter	10	36 a.m.
26 ,,	● New Moon	12	36 p.m.

Perigee, 8th November, at 8.48 p.m.
Apogee, 20th November, at 4.0 p.m.

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

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

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