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.

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Event and Comment

Prospects of the Coastal Cattle-fattening Scheme.

FAVOURABLE reports of the cattle-fattening scheme on coastal country in the far North, which was inaugurated by the Minister for Agriculture and Stock, Hon. Frank W. Bulcock, in co-operation with Mr. Brice Henry, of Tully, continue to come to hand. Other graziers have since become interested in the scheme, towards the success of which considerable progress has been made. Of the meat exported from the Commonwealth to the United Kingdom in 1936-37, Queensland contributed 45.58 per cent. of the total. The coastal fattening scheme, therefore, promises to have considerable influence on the further development of the chilled beef export industry.

Chilled Beef Export.

IN the annual report of the Queensland Meat Industry Board, it is stated that the shipment of chilled beef from the Dominions is the most interesting development in the world's meat trade since the introduction of mechanical refrigeration. Exports from Empire countries were confined formerly to frozen and canned beef. "This limitation largely was responsible for the relatively small inducement offered for the improvement of beef cattle herds and cattle properties." The

report goes on to state that Empire countries in a relatively short time have made substantial progress in the shipment of chilled beef. The number of quarters shipped from Australia exceeds greatly that from any of the other countries indicated, and there is yet the opportunity for a considerable expansion of the trade from this country. For the year 1936-37, Australian chilled exports represented about 23 per cent. of its total quarters shipped. "Towards the end of 1933 experimental work had progressed sufficiently to enable the investigators broadly to indicate the conditions to be maintained in each phase of the works treatment and overseas transport, to permit of chilled beef being placed in good condition on the markets of Great Britain. In particular, the investigations had shown that, even with a period of storage equivalent to a relatively short voyage of forty-five days from Queensland to Great Britain, extremely strict attention to cleanliness and certain alterations in existing technique in the meatworks, as well as the use in the ships' holds of atmospheres containing 10 per cent. carbon dioxide, were essential to commercial success. . . . The number of chilled quarters prepared at the Brisbane Abattoir for export to England has exceeded 160,000, and, from the standpoint of absence of microbial spoilage, highly satisfactory results have been obtained."

Technical Difficulties Almost Overcome.

ANOTHER important statement of the Queensland Meat Industry Board in its annual report is that technical difficulties in the preparation of chilled beef and of its transport from Australia to the United Kingdom may now be regarded as almost overcome. "Much, however, remains to be done in the regularity of overseas transport and in production before the trade can be said to have become reorganised on a thoroughly sound commercial basis."

The necessity for all Australian works engaged in the preparation of chilled beef for export overseas to observe fully the conditions of the Council for Scientific and Industrial Research cannot be emphasised too strongly, nor can the procedure be successful without the full interest and co-operation of the men employed on the slaughter-floor and elsewhere in the preparation.

"In varying circumstances, particularly in protracted voyages," continues the report, "it has been found that there can be a marked loss of 'bloom,' or, in other words, an absence of the natural brightness of the beef. The factors influencing the rate of loss of bloom appear to include the initial quality of the animal, the treatment to which it is subjected shortly before slaughter, the rates of loss of weight of the beef during each stage of treatment from slaughter to marketing, and the method of carriage, including stowage on shipboard."

These factors are now the subject of detailed study by the Council for Scientific and Industrial Research. It is likely that the results of certain aspects of these studies will shortly be made available.

The factor of ample resting at the works prior to slaughter merits the closest attention. A series of tests carried out by the Board indicates that this practice is of value in the elimination of "fieryness"—a condition which depreciates seriously the value of Australian chilled beef on English markets. It is essential that all parties concerned in the transfer of cattle from the properties to the meatworks should work with the knowledge that the real value of the animal is determined by the soundness of the carcase when the hide is removed.

Dealing with transport, the Board states that the provision of an adequate and regular shipping service must be regarded as essential during progress in the production stage. This service is necessary to give encouragement and stability to cattle producers. It is inevitable that the transport features of a new trade of such an exacting kind can be handled only by experience and co-operation. The Australian Meat Board, working in conjunction with the Overseas Shipping Representatives' Association, has this matter under consideration with the object of effecting a marked improvement in the coming year.

The marketing of beef cattle in Queensland is largely seasonal. In the export of chilled beef the bulk of supplies is available to the United Kingdom in its summer months, the rate of beef consumption being usually then at its minimum. On the other hand, supplies from Queensland tend to fall off very seriously when the demand in English markets is at its best.

"Further improvement in the status of the beef cattle industry will in the main now depend upon improvements within the production stage, particularly in the spreading of the marketing period more evenly over the year," the Board declares. "Progress, no doubt, will be slow in this stage of the business. Better subdivision and watering of cattle properties in the more favourable regions of the State, together with an intensive investigation of pasture improvement and pasture management, should help materially to fulfil the remaining outstanding requirement in the thorough organisation of the chilled beef trade—an extension of the marketing period of well-finished and well-bred young steers."

The Bush Fire Risk—An Appeal.

FARMERS whose properties are adjacent, even remotely, to State forests who plan to burn off grass lands are advised that the Forestry Department is willing to co-operate with them in the strict control of fires lit for that purpose. A co-operative marshalling of the available man power in the neighbourhood has been planned for keeping fires within proper bounds. A general appeal to the people to exercise the greatest care possible to prevent the accidental starting of fires is considered necessary by officers of the Forest Service. The slightest laxity in the throwing-down of glowing matches on roadsides or in the covering-up of camp fires might result in disaster to country homes, crops, and forests. Severe penalties have been prescribed for the careless use of fire, and forest officers must be notified of any intention to burn off pastures or scrub on land within the vicinity of State forests.

Every summer heavy losses occur in country districts as a result of bush and grass fires. It is hard sometimes to prevent such losses, but by far the greater proportion can be avoided if timely precautions are taken. It is possible, for instance, to organise a bush fire brigade and prepare plans for quenching quickly any outbreak. With the hot weather approaching—especially after the dry spring we are having—the formation of such a voluntary corps of fire fighters is worth the consideration of every local producers' association.

The value of bush fire brigades has been proved amply in other States, and by their well-organised action potentially very serious bush fires have been prevented from devastating a whole countryside.

Banana Rust Thrips Control.

N. E. H. CALDWELL, B.Sc.Agr., Assistant Research Officer.

THE banana rust thrips* has been recognised for a long time as a pest affecting cultivated bananas in Queensland. In the last two decades, however, it has become of increasing importance. During this period there has been very considerable development in the banana growing industry in the southern portions of the State, and certain districts from time to time have been subjected to severe infestations of the pest. In the North the banana rust thrips regularly attains serious proportions; but, owing to the slight development of the industry there, particularly as regards fruit for export to southern States, the losses are much less important than in the South.

Distribution in the State.

There now are practically no major divisions of the banana growing areas of the State in which the banana rust thrips is not known to occur. Nevertheless, plantations in many isolated localities, particularly south of Gympie, still continue to produce rust-free fruit, and in some others, the pest population has been insufficient to cause commercial damage to the fruit. Though the insect appears to be spreading gradually throughout the banana-growing areas of Southern Queensland, there is no doubt that the embargo on transferring planting material from infested plantations to clean areas has been, and will continue to be, a very important check on the spread of the pest.

Present Status of the Pest in Southern Queensland.

Following very serious losses in several districts, notably Gympie, Cooran, Pomona, Beenleigh, and Nerang, in 1931-33, the importance of the pest has gradually declined until in the 1936-37 summer there were very few plantations which suffered appreciable financial loss. This has been due partly to a decreased density of the thrips population, with proportionately less severe rust development, and partly to a marked coincidental reduction in the acreage under bananas in the more important infested districts. The history of the pest in Southern Queensland shows that fluctuations between severe epidemic incidence and comparative insignificance must be expected in normal times. Unfortunately, it is not possible to predict the probable rust incidence in any season; but it seems not unreasonable to suppose that the next few seasons may witness another severe outbreak.

Nature of the Injury.

Rust is the common name given to the red or reddish brown discolouration of the skin of the banana fruit (Plate 163) caused by the feeding of both adult and larval banana thrips. This discolouration may be confined to a small area near the points of contact of adjacent fingers, or it may cover the greater part of the surface of each fruit. Usually rust is accompanied to a greater or lesser extent, by surface cracking of the skin. When injury is very severe the rind may split, exposing the flesh of the fruit. The most acute form of rust is due to insect activity during the early stages of bunch development, and it

* *Scirtothrips signipennis* Bagn.

is in association with injury incurred at this time that severe cracking and splitting are most prominent. However, appreciable commercial rust can be caused by insect attacks during the later stages of fruit growth, but, in such cases, anything more than superficial cracking in addition to the discolouration, is rather unusual.

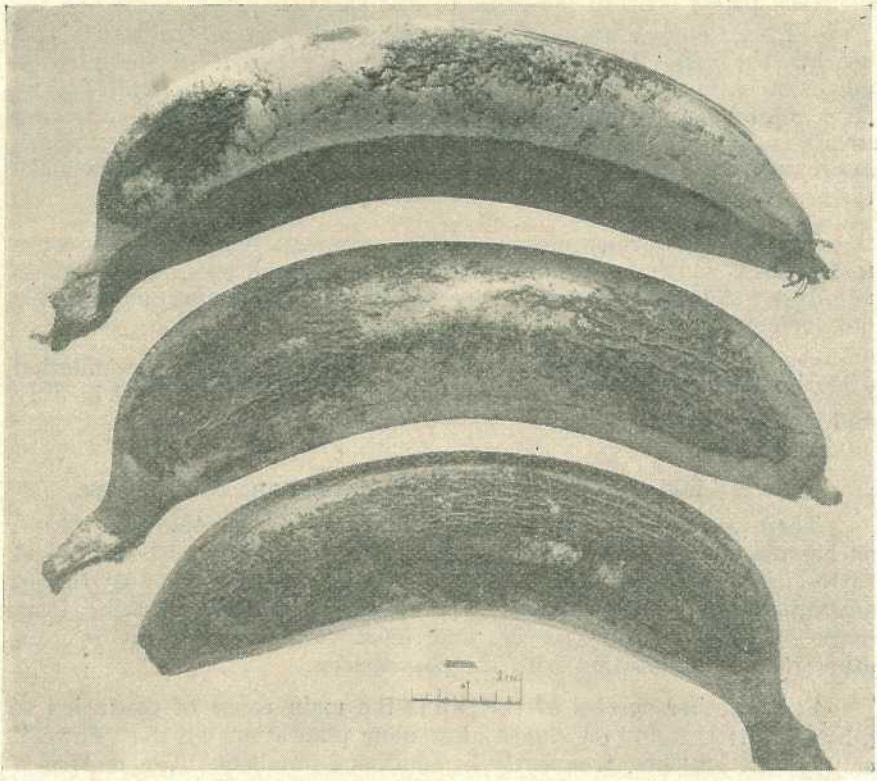

Plate 163.
Injury caused by the Banana Rust Thrips.

Rust of any degree detracts from the appearance of the fruit, though moderate blemishes do not impair its edibility. Severe rust, even without splitting, however, may spoil the flavour, while split fruit has no market value at all. As fruit is bought and sold largely on its appearance, rust blemishes must be kept at an absolute minimum if the grower wishes to avoid the penalties imposed by the trade on "rusty" fruit.

Description of the Insect and Its Life History.

The adult is a slender insect, rather less than one-sixteenth of an inch long, the female being slightly larger than the male. It is golden-yellow in colour with two dark spots on the back towards the anterior end of the body, and a longitudinal dark line down the centre of the back of the posterior half. These dark markings are due to shaded areas on the two pairs of delicate fringed wings, which normally are folded across the back.

The larva is white to yellowish in colour. When first hatched it is approximately one-twenty-fifth of an inch in length, but the mature larva is nearly as long as the adult, and proportionately slightly broader.

The very small egg is laid by the female just beneath the surface of the plant tissue, usually either on the fruit or on the pseudostem in sheltered places beneath the edges of leaf sheaths.

Larvæ and adults may be found on any part of the pseudostem beneath the edges of the leaf sheaths, in the throat of the plant—particularly in and round the funnel leaf—and on the fruit. The larvæ, on becoming mature, enter the soil in which the pupal, or resting stage, is passed. On emerging from the milk-white pupæ, which approximately are the same size as the mature larvæ, the adults make their way back to the plant. Adults are capable of weak flight.

During the warmer months of the year eggs hatch in from seven to ten days, while the larval and pupal stages each last from seven to ten days. Adults may live many weeks. In the colder months the developmental stages are prolonged greatly.

The pest is most abundant during the summer, the peak population being reached between January and April, and the lowest level in July and August.

Insects Liable to be Confused With the Banana Rust Thrips.

There are several other species of small insects commonly found on banana plants, which growers tend to confuse with the banana rust thrips. Another species of thrips* is very like the banana rust thrips, and appears to cause a similar type of injury to banana fruit. It is, however, relatively very scarce; and, moreover, is not known to occur other than in association with the pest species.

Still another species of thrips† is the main cause of confusion to growers. It is found on almost all banana plantations on the "flower" ends of the bunches, frequently in enormous numbers. The male is a pale yellow insect slightly smaller than the banana rust thrips, and does not possess the dark markings of the latter species. It also is noticeably more active. The female is much larger and conspicuously black and red in colour.

The banana silvering thrips‡ is troublesome sometimes in various plantations where the banana rust thrips is known to occur. The injury, however, is quite distinctive, the fruit acquiring a silvery sheen on the exposed surface. Except in a few plantations, this insect is of no great economic importance. As normally it attacks the fruit in spring, both the appearance of the fruit and the time of the year in which the pest is abundant, are excellent diagnostic characters.

No other insects commonly found in banana plantations bear any resemblance to the banana rust thrips, and should not be confused with the pest species.

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* *Physothrips bilongilineatus* Gir.

† *Thrips florum* Schmutz.

‡ *Hercinothrips bicinctus* Bagn.

Selection of Planting Material.

If possible growers should obtain their planting material from plantations where rust is unknown or, failing this, from an area where it is only slight. At all costs heavily-infested plantations should be avoided as a source of supply. Precautions in selecting planting material may obviate or, at least, tend to delay the establishment of the pest in newly-planted areas.

Growers should realise that rust-free does not necessarily mean thrips-free. A small insect population confined to the lower parts of the plants may escape detection even under close examination. Transported to a new plantation and under different seasonal conditions, these insects may be quite sufficient to initiate a severe outbreak of the pest.

Treatment of Planting Material.

Suckers taken from a heavily-infested plantation and pared, and trimmed in an average manner as for banana weevil borer control, are not freed of thrips by treatment in a nicotine sulphate bath (one part of nicotine sulphate to 500 parts of water). The dipping of heavily pared and trimmed suckers may give satisfactory results, but the feasibility of such treatment in practice still requires checking. Nevertheless, paring and trimming, compatible with the commonly accepted standards of safety, do reduce the thrips population on the suckers, and are recommended for this pest as for the banana weevil borer.

For various reasons the use of "bits" as planting material is practised sometimes by banana growers. Theoretically planting material of this type obtained from a thrips-infested plantation is unlikely to harbour these insects. "Bits," therefore, may be of value in establishing new plantations, when the risks of transferring thrips along with the planting material must be minimised, but there is no precise evidence on the point as yet.

Control on Bearing Plantations.

Recent experimental work has shown that the bagging and dusting of the bunch provide a satisfactory economic method of rust control.

The bag must be made of good quality "sugar" hessian, i.e., 11 oz. hessian. Bags 45 inches deep by 27 inches wide are large enough to accommodate normal bunches.

Nicotine dusts give the best results. The nicotine may be present in the dust either as free nicotine or nicotine sulphate, but the actual content of nicotine should be not less than 2 per cent. The physical properties of the dust are most important. A light "fluffy" kind of dust is necessary to secure adequate penetration into all parts of the bunch. Heavy, quick-settling dusts do not give this result. For this reason nicotine dusts, in which some other insecticidal materials such as sulphur have been incorporated, are usually unsatisfactory for the control of the banana rust thrips.

The bunch must be bagged as soon as practicable after emergence from the throat of the plant. The mouth of the bag should be fastened securely round the bunch stalk above the top hand by means of string, wire, or a nail. About a fortnight later the bag should be taken off, fallen bracts emptied out, persistent bracts removed from the bunch, the

"bell" broken off, and the bag then replaced. This operation is necessary to minimise the risk of fungal infection of the fruit.

During the thrips-active season, the dust must be applied to the bagged bunches at fortnightly intervals throughout the life of the bunch, or as an alternative, at weekly intervals for a month after the bunch is thrown, dusting then being discontinued. The former method has given satisfactory results under all conditions experienced in Southern Queensland in the last four seasons. The second has been tried for only one season under conditions of moderate rust incidence, when it was completely satisfactory, and this treatment may, for all practical purposes, prove to be as efficacious as the first.

The first dusting is applied either before or just after the bag is first fitted to the bunch. In the former case both the bunch and the bunch stalk above the top hand can be dusted thoroughly. Quite good results, however, can be obtained by applying the initial dusting through a small hole in the bottom of the bag. All subsequent dustings are given through this aperture. When dusting in this manner, care should be taken to ensure that, by pointing the mouth of the duster more or less directly upwards, the dust is blown right through the bunch from bottom to top.

In all readily available makes of dust gun it is necessary to reduce very considerably the flow from the machine. Without some modification, dusters are liable to discharge excessive amounts of the insecticide which tend to accumulate on the fruit. This may necessitate cleaning before packing.

With small hand dusters of the plunger pump type holding about one-half pound of dust, the aperture of the hopper outlet is usually three-eighth inches in diameter. The dust flow of these machines can be reduced effectively by inserting into the outlet a cork from which a V-shaped section has been cut so that the area of the aperture is one-eighth that originally provided. About six full strokes of the pump are then sufficient for an average bunch. The ideal to be aimed at is to envelop the bunch within the bag in a cloud of dust without depositing more than a film of dust on the fruit. With care and a little practice growers should have no difficulty in performing this operation in a satisfactory manner.

Two other methods of treatment give a fair measure of control. Though not so efficient in the control of rust as bagging with dusting, they have the merit of much smaller cost, and thus may be useful, under certain conditions. For instance, they might well be worth considering early in the season until the trend of thrips activity becomes quite clear.

In the first of these alternative methods, the bags are dispensed with and the bunch is dusted with a nicotine dust at weekly intervals. Longer intervals between dustings are much less efficient. Treatment must be thorough. The dust must be blown into the bunch from all angles, particular attention being paid to the top hands, where thrips infestation is heaviest, especially if the bunch is at all choked. At the same time the dust residue must be kept down to a minimum.

The second alternative method requires the use of a cloak and the application of a nicotine dust at fortnightly intervals. The cloak—a piece of hessian—is wrapped round the bunch as soon as possible after

it is thrown. Thereafter the procedure is the same as with bagging and dusting, the insecticide being blown on to the bunch from the bottom and exposed side, if any. The cloak must be of the same quality hessian as is used for the bags and large enough to envelop the bunch fairly completely.

It is necessary to stress the fact that open mesh, inferior quality hessian, when used either as bags or cloaks, has not proved satisfactory in banana rust thrips experiments.

Whichever control measure is adopted by the grower, every stool in the plantation should be inspected at weekly intervals, or as near thereto as practicable. Thus, even in the case of bagging with fortnightly dustings, the selection of newly-thrown bunches for bagging and dusting should be carried out each week. If this is not done, some bunches will be nearly a fortnight old before the first treatment, by which time they may have developed a certain amount of rust, and what is more serious, acquired a dangerously large thrips population.

Time for Control Measure Application.

The period in which thrips are sufficiently numerous to cause commercial damage to fruit varies considerably from year to year. Normally, growers should be prepared to start control operations during November, but a close watch should be kept on the situation from early October. When bunches less than a month old show appreciable amounts of rust, or are harbouring a large thrips population, control operations should be started immediately. Treatment should not be deferred until "rusty" fruit is being harvested. When control measures are applied first to newly-thrown bunches, those already hanging should not be neglected. November "dumps" (the name describes the characteristic bunches thrown at that time of the year), though they may remain practically clean for some weeks, are very liable to become rusted rather badly by the time they are harvested, and it is not uncommon for October-thrown bunches to be affected similarly.

Dusting may be terminated safely at the end of April, or perhaps a little earlier in some seasons, but the incidental benefits due to bagging the fruit, and to a somewhat lesser extent from cloaking, are so great that growers, where practicable, should continue covering the bunches right through the winter.

The selection of the right time to start control work will depend on the judgment of the grower. Much time and money can be lost by faulty decisions, and growers therefore should familiarise themselves with the appearance and habits of the pest. The insects in the adult and larval stages, the only stages with which the grower need be concerned, are visible readily to the naked eye, while the results of their work are only too obvious. Finally, it cannot be emphasised too strongly that the appearance of the young bunches in the plantation, and not the cut fruit in the shed, is the key to properly applied control measures.

Cultural Points to be Considered in Rust Control.

It is a well-established fact that "choked" bunches develop rust more severely than well-thrown ones. Further, as the fruit in such bunches is compacted and less accessible to dusts, the efficiency of all

control measures is reduced appreciably. Correct methods of cultivation, suckering and fertilizing, designed to promote vigorous growth and well-thrown, quickly-maturing bunches, therefore, are desirable.

A certain degree of rust control sometimes can be obtained by regulating the time of bunching, so that the majority of bunches are thrown during spring or autumn, when thrips activity is less than in the summer months. Cultural difficulties play a predominant part in any such programme, and probable market conditions also must be considered. Bunches thrown in spring escape rust to a large extent, but are marketed when prices are relatively low. Hence, when a plantation can be relied upon to throw good autumn bunches suckering practices should be arranged so that the bunches are thrown in the autumn. Under these conditions bunch treatment for rust control will be necessary only for the March and early April bunches. Bunches thrown during the autumn, however, should be bagged, irrespective of rust incidence. This treatment will ensure the development of well-filled, good quality fruit (despite the cold winter conditions) which will be ready for cutting in the spring when the market is normally buoyant.

Practical Difficulties Associated With Control Measures.

The most effective of the control measures discussed—the bagging with dusting method of treatment—introduces certain practical difficulties into plantation operations, which can be overcome by a little organisation of labour and materials on the part of the owner.

Some method of distinguishing bunches bagged each week is necessary, and the bags, therefore, should be marked with a different numeral for each week. The numbers should be placed on both sides of the bag, and should be as large as practicable, to facilitate recognition at a distance. The use of Roman notation would reduce printing difficulties. The ordinary blacking used in stencilling should be quite satisfactory.

Such a method of numbering bags will simplify the identification of those bunches which require dusting in any one week. It also will greatly assist in indicating the age of the bunch. In practice, a knowledge of the exact age of the bunch as shown by the number on the bag, and the feel of the fruit through the bag, is quite sufficient for an experienced grower to judge very accurately the state of maturity of the fruit without removing the cover.

Incidental Benefits of Rust Control Measures.

The bagging of banana bunches (and to a lesser extent cloaking) has several very important incidental advantages which must be considered in appraising the value of the recommended rust control measures.

The general quality of the fruit is improved very appreciably under all conditions. The fruit matures more evenly all over the bunch and also "fills out" satisfactorily in spite of cold weather. Sun scald—very prevalent when the plants have been more or less defoliated by leaf diseases—is eliminated completely. Cracking of the mature fruit associated with the first cold snap in the autumn is reduced materially. Damage due to incidental pests such as fruit-eating caterpillars, grasshoppers, birds, 'possums, wallabies, and flying foxes, is eliminated almost

completely. Black pit, a serious disease of the fruit occasionally occurring in cold situations, is also controlled by bagging. Finally, if the bag is left on the bunch after cutting, the fruit is protected thoroughly on its way to the packing shed.

The colour of bagged fruit is rather pale, but this does not prejudice marketing. There is, therefore, no need to remove the bag for the last week or so before cutting the bunch in an endeavour to deepen the colour, a practice which frequently results in severe scalding.

Cost of Control.

The cost of the various control measures admittedly is rather high. Bagging with dusting is estimated to cost rather less than 6d. per bunch for both labour and materials, assuming that a bag will serve for two bunches. Dusting alone will cost in the vicinity of 2d. per bunch. The cost of cloaking and dusting will depend on the price of the material used for cloaks, but should be intermediate between the other two methods.

The cost of the bags is the most expensive item. Growers should take every care to preserve them when not in use by ensuring that they are dried thoroughly and stored in a dry place free from vermin. With these precautions, all bags should last for two bunches, and the majority for three. Labour is the next greatest cost. Expense in this direction can be curtailed by efficient organisation. The cost of the dust is relatively slight, as only small quantities of dust are required, particularly when used in conjunction with bags.

The minimum profit which can be expected from the efficient application of rust control measures is represented by the return obtained for the fruit which would otherwise be unmarketable. The cost of control usually will be amply covered by the enhanced prices for the remainder of the fruit, due to the absence of rust and the improved quality. As the wastage in a bad thrips year may represent from 10 to 50 per cent. of the season's total crop, there is no doubt that rust control will pay handsomely except perhaps under extremely depressed market conditions.

A Word of Caution.

The control measures outlined in this article have been designed for conditions in the southern portion of the State. They have not been tested in North Queensland, where conditions are very different in many respects. Their value in these regions still requires investigation.

WHAT IS GOOD FARMING?

Good farming demands the recognition of three basic principles: judicious economy in time, in labour, and in money. The farmer who can direct these successfully will eventually win through. Good farming makes management in every branch of farm production return a profit, and it also leaves a farm at the end of fifty years in a state of productivity as high as, if not higher than, at the beginning.—*W. Watson, General President, Agricultural Bureau of New South Wales.*

Parasites of the Pig.

F. H. S. ROBERTS, D.Sc., Entomologist and Parasitologist, Animal Health Station, Yeerongpilly.

[*First published in Q.A.J., Vol. XLII., Part* 2 (*August,* 1934); *revised October,* 1937.]

External Parasites.

THE principal external parasites of the pig include lice and mites, the latter being responsible for mange conditions.

LICE (*Hæmatopinus suis*). (Plate 164.)

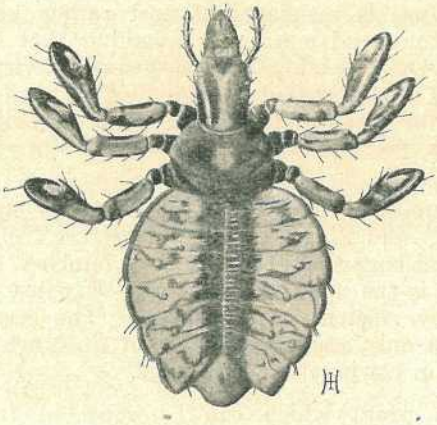


Plate 164.
PIG LOUSE (*Hæmatopinus suis*). Ten times natural size.

Pig lice, *Hæmatopinus suis,* are found everywhere in Queensland where pigs are reared. The species is one of the largest lice known and may measure up to one-quarter of an inch in length. The male is smaller than the female and may be distinguished readily by the presence of a black streak on the underside of the abdomen. The mouthparts consist of a proboscis or beak with which the louse is able to pierce the skin and suck up blood. This continual puncturing of the skin causes considerable irritation, which in time may lower the vitality of the animal to such a degree as to produce an unthrifty condition and render it more susceptible to attack by other parasites and diseases.

Life History.

Eggs deposited by the females are glued to the bristles of the pig and hatch in from 12 to 20 days, usually in about 14 days. The young louse is very similar in appearance to the adult, differing mainly in size. After hatching, the young lice commence feeding immediately, and after 10 to 12 days become mature. Lice may live as long as 35 days and during her lifetime the female lays about 90 eggs.

MITES.

Two species of mites infest the pig, each of which is responsible for a condition of mange. One species causes Sarcoptic mange, the other, Demodectic mange.

SARCOPTIC MANGE (*Sarcoptes scabiei suis*). (Plate 165.)

Sarcoptic mange or common mange is caused by the mite *Sarcoptes scabiei suis*. This mite is very small, at most only one-fiftieth of an inch long, and whitish in colour. The body is rounded with four pairs of short thick legs, and provided with a number of short backwardly projecting spines on its upper surface. The parasites live in galleries under the skin in which the female lays her eggs. These eggs hatch in 3 to 10 days, and after another 10 or 12 days the young mite becomes sexually mature. There is thus a new generation produced at least every 13 days.

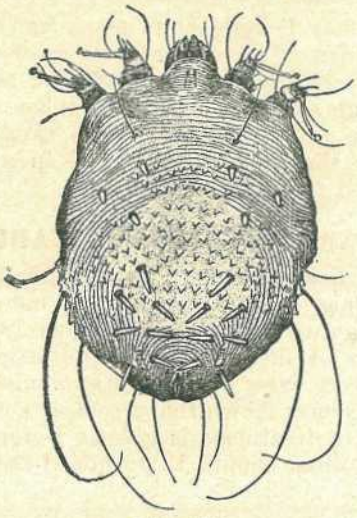


Plate 165.

Sarcoptic Mange Mite—Female. Magnified 100 times.

[*From Farmers' Bulletin* 1085, *United States Department of Agriculture.*

Symptoms of Sarcoptic Mange.

The burrowing of the mites through the skin causes the skin to become inflamed and swollen. At first, these inflamed areas are very minute, but in time they become very conspicuous and, as the mites increase, the lesions gradually coalesce. The irritation causes the animal to rub itself against any convenient object, the areas become raw and bleeding and large scabs are formed. The movements of the pig cause a continual breaking of the scabs, and blood and serum ooze out from the cracks. The bristles on the affected area fall out and eventually none, or only a few, remain. Later the skin becomes hard, thickened, and thrown into folds. In severe cases the animals affected become weak and emaciated and, unless treated, may die.

In the early stages of the disease the lesions occur usually on the head, around the eyes, ears, and nose, and from here the disease spreads along the neck and shoulders until the entire body may be affected.

DEMODECTIC MANGE (*Demodex phylloides*).

This type of mange is caused by a very minute worm-like mite, *Demodex phylloides*, and is much less common than Sarcoptic mange. The mites of Demodectic mange are microscopic in size, measuring only

one one-hundredth of an inch. They spend their entire life in the hair follicles and sweat glands and, when in numbers, cause well-marked lesions. These lesions usually appear first on the snout or around the eyelids, and from there spread slowly over the throat, breast, abdomen, and other parts of the body where the skin is soft and thin. The affected skin becomes reddish and scurfy with numerous small hard nodules. These nodules eventually break and discharge a creamy pus, and many of them may run together to form suppurating cavities.

DIAGNOSIS OF PARASITIC MANGE.

The pig at times may be subject to many varied skin diseases, and for an accurate diagnosis of Sarcoptic or Demodectic mange it is best to submit samples of scrapings from the affected skin for examination. The scrapings, to include the mites, should be taken from the more recent lesions, and should be made deep enough to cause the appearance of blood. The scrapings then should be placed in a tightly-corked tube or bottle and forwarded for examination.

CONTROL OF LICE AND MANGE.

For the control of lice and mange, crude oil or fuel oil will be found satisfactory. The oil may be applied easily by hand, and in view of its adhesive and spreading qualities only comparatively small quantities are required. In the case of lice, a second application is desirable after fifteen days. For severe cases of Sarcoptic mange frequent dressings are necessary; but tests have shown that a complete cure may be expected if careful and persistent treatment is given. Before being treated with the oil, the affected animal should be scrubbed thoroughly with warm soapy water.

No specific cure is known for Demodectic mange, but frequent applications of crude oil check the disease. Animals not responding to treatment should be killed. Animals oiled with crude oil should be kept in the shade as much as possible until the oil has dried, as contact with the sun is likely to cause blistering, especially in the white breeds.

Hog oilers and medicated wallows and dips are recommended frequently as methods of controlling lice and mange. Hog oilers consist of posts wrapped round with oiled ropes or sacking and placed at some convenient spot, the idea being that the pigs will rub themselves against the post so that a small quantity of oil is deposited on or near the area of skin being rubbed. These devices tend to lessen the spread of lice and mange; but, as the pig will rub against any convenient object, are not to be depended upon to effect eradication or prevent the losses caused by heavy infestations.

By taking advantage of the pig's natural tendency to wallow in water, especially during warm weather, the use of crude oil on the surface of the water will be found satisfactory for the control of external parasites. The wallows should be constructed of concrete, and the water, with its film of oil, should be just deep enough to permit the nostrils being kept easily above the surface of the liquid. For pigs of 40 to 80 lb. weight the depth should not exceed three inches, six inches being the maximum for the largest pigs. If the depth is too great the animal will be afraid to lie down. The wallow should be roofed over to prevent the water becoming too hot. The wallow, moreover, should not be kept oiled continuously, but for short periods every ten days, until the desired results are obtained.

Dipping is one of the most effective treatments for lice and mange. For this purpose a concrete bath 40 to 48 inches deep, with a total length of at least seven yards, constructed on the same general principles as a cattle dip should be used. The dip is filled with water, on which crude oil is poured to a depth of four or five inches.

Attention should also be paid to sanitation. As lice will not live for more than three days off the pig, it is not considered that sties which have housed infested pigs would be a source of danger under sanitary conditions. It is always better, however, that such sties should be disinfected and cleaned thoroughly before clean pigs are placed in them.

Mange is highly contagious, and pigs showing symptoms of it should be isolated immediately. Visible lesions of Sarcoptic mange may develop in fourteen to fifteen days; so animals in contact with affected pigs should be isolated for this period. All litter and manure should be cleaned up and burnt and the sties given a thorough disinfection. It should be remembered that Sarcoptic mange is transferable to man; so it is advisable, after handling affected pigs, to bathe and have a complete change of clothing.

Internal Parasites.

No less than seventeen internal parasites or worms affecting the pig have been recorded in Queensland, but fortunately many occur only in small numbers and are not of any economic importance.

FLUKES AND TAPEWORMS.

In Queensland, flukes are unknown in the pig, except for rare instances when the liver fluke of sheep, *Fasciola hepatica*, has been observed in the liver.

The pig does not harbour any species of adult tapeworm but may act as a host for two larval tapeworms which reach maturity in the dog. These larval forms are known as *Cysticercus tenuicollis* and *Echinococcus granulosus*. Only the latter is of importance, as it is the cause of hydatids, which is a serious disease in man.

In the pig, the larval hydatid occurs usually in the liver and lungs, and consists of a bladder of fluid containing numerous minute white specks. Infestation may be prevented by seeing that the pigs are not given access to the fæces of dogs, by boiling all offal thoroughly before feeding it to dogs, and also by the regular treatment of all dogs with an efficient vermifuge to remove the adult worm.

Roundworms.

STOMACH WORMS.

Description and Life History.

Four species of stomach worms are known, of which two species, *Ascarops strongylus* (Plate 166) and *Physocephalus sexalatus*, may be of some importance. Both these worms are whitish in colour, up to seven-eighths of an inch in length, and are found usually at the exit end of the stomach. Their life histories are similar and very interesting, in that the eggs, when passed out in the dung, are eaten by various dung-frequenting beetles. In these intermediate hosts the eggs hatch and the larvæ undergo certain development. The pig can become infested only when it eats the beetle containing the larvæ.

Control.

Control consists in the daily removal of all dung and the clearing up of all litter, &c., which might afford shelter to the beetles. No efficient drug is known which will remove the parasites, but oil of chenopodium, as recommended for *Ascaris lumbricoides,* might be tried.

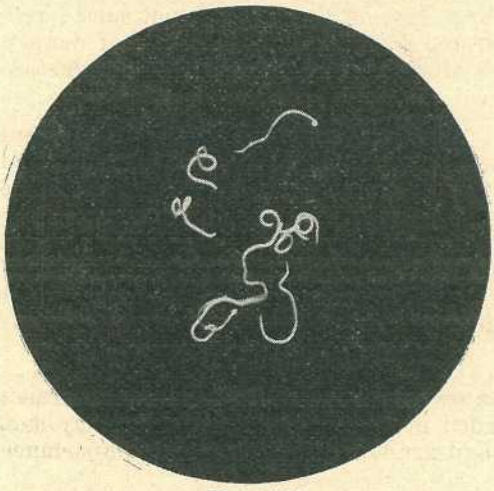


Plate 166.
Stomach Worms (*Ascarops strongylus*). Natural size.

THE LARGE ROUNDWORM (*Ascaris lumbricoides*).

(Plate 167, fig. 1.)

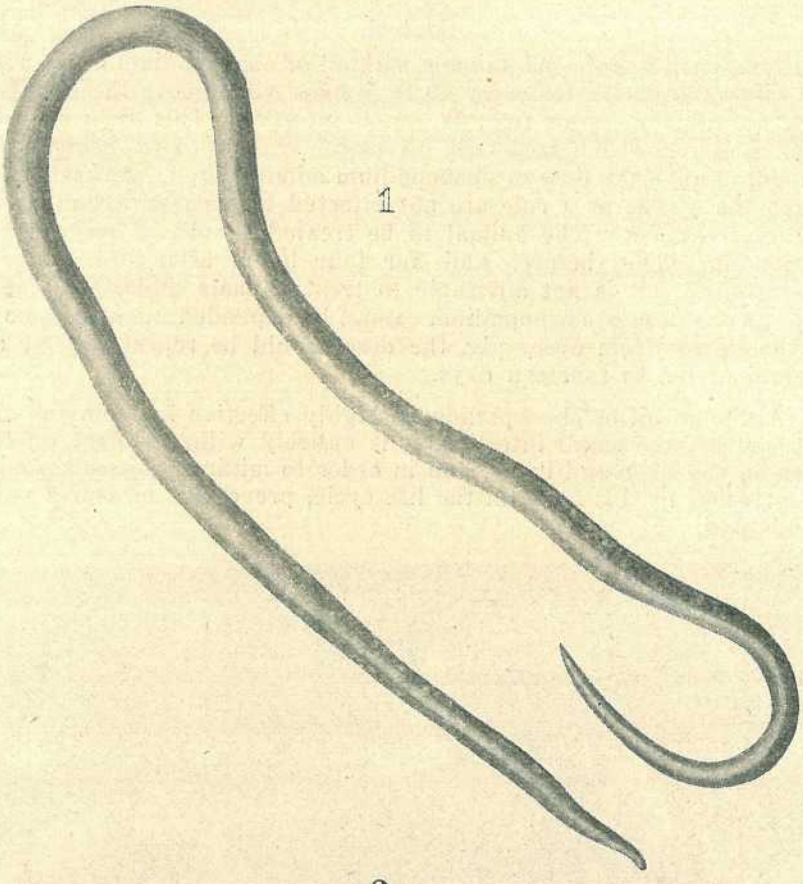
This species is one of the largest roundworms known and may grow up to 15 inches in length. The parasite occurs in the small intestine and frequently in very large numbers.

Life History.

The eggs laid by the female worms pass out in the dung, and under suitable conditions of temperature and moisture become infective in about eighteen days. These infective eggs when swallowed by the pig hatch and set free the young larvæ which bore immediately into the intestinal wall. From there they are carried in the blood stream to the liver, and still continuing their migration reach the blood capillaries, and are moved on to the heart, and from there to the lungs. About ten days after hatching the larvæ leave the lungs, move up the windpipe into the mouth, are swallowed, and reach the small intestine again, in which they settle down and grow to maturity.

Effect on the Pig.

Only young animals up to four and five months of age are affected by the large round worm. The larvæ, burrowing through the liver and lungs, cause serious disorders. Lung destruction may result in a condition of pneumonia, which sometimes may be fatal. A heavy infestation means a stunted and sickly animal, which becomes unprofitable. (Plate 168.) The invasion of the lungs by the migrating larvæ produces occasionally a condition known as "thumps," in which the breathing is laboured and bellows-like. More often, however, destruction of the lung tissue is shown by a short, hard, cough, which is especially prominent after exertion.



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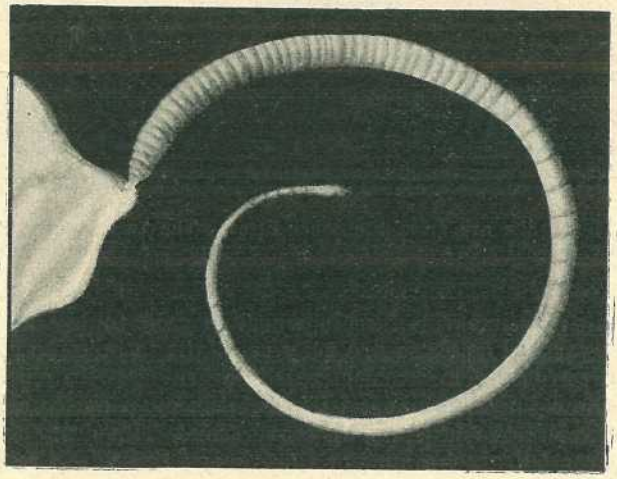


I. W. Helmsing. 1929.

Plate 167.

Fig. 1.—Large Roundworm (*Ascaris lumbricoides*).

Fig. 2.—Thorn-headed Worm (*Macracanthorhynchus hirudinaceus*).

Natural size.

Control.

Treatment of infested animals with oil of chenopodium at the rate of 1 cubic centimetre for every 25 lb. weight will remove the majority of, if not all, the worms from the small intestine. This drug is given with, or is followed immediately by, castor oil, 1 to 4 oz. being used, depending upon the dose of chenopodium administered. Animals over 12 months of age as a rule are not infected to such an extent as to require treatment. The animal to be treated should be starved for twenty-four hours before, and for four hours after, the drug is administered. It is not advisable to treat animals under six weeks old. As one dose of chenopodium cannot be depended upon to remove all the worms from every pig, the dose should be repeated after an interval of ten to fourteen days.

Although oil of chenopodium is highly effective in removing the worms from the small intestine, it is entirely without effect on the larvæ in the liver and lungs, and in order to minimise losses through the presence of this stage in the life cycle, preventive measures must be adopted.

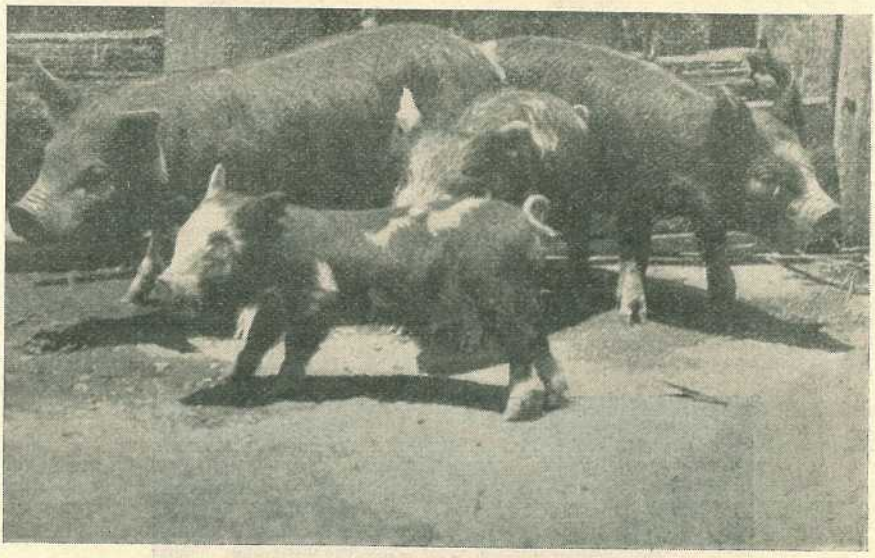


Plate 168.

All these four pigs are from the same litter. The two smaller animals are infested with worms. The two larger animals are worm-free. Note the difference in growth.

During its lifetime the female worm is said to lay as many as 27,000,000 eggs; and as these are very resistant to adverse conditions, the sties and yards become contaminated so heavily with eggs that the animals swallow large numbers of infectious eggs every day. Sanitation therefore is the keynote of prevention. The daily removal of all dung, a good drainage system that keeps the yards and sties as dry as possible, the use of pens with concrete floors, and keeping the animals' food off the ground, are all necessary for the control of this parasite.

A system of pig-rearing in use in the United States has been highly successful in controlling, not only infestation by the large roundworm, but also infestations by other worm parasites. As Ascaris is harmful only to pigs up to four or five months of age, this method aims at keeping the young pigs away from the old contaminated yards till they reach this age. Certain modifications have been made which, it is considered, will make this system more practicable and more effective under Queensland conditions.

Certain of the sties are set aside for farrowing purposes only, and it is essential that these should have concrete floors. A few days before the sow is due to farrow the sty is given a thorough and careful cleansing and finally washed down with liberal applications of a boiling five cent. disinfectant solution. For this purpose any disinfectant with a high tar acid content, 25 per cent. and over, may be used. The solution should be made up, boiled and applied without delay to the floor and walls of the pen.

The sow should be washed with a warm soapy solution, and all dirt and mud crusts removed, particular attention being paid to the feet and udders. She then should be oiled to keep lice worry at a minimum, a second treatment being given after an interval of about fifteen days. In getting her into the prepared pen, she should be hauled and not driven.

After farrowing, the sow and litter are placed either on fresh ground or ground on which pigs have not been running for a number of years. For this purpose three separate pastures are advised. The one to be used by the young pigs should be prepared previously by sowing with a suitable forage crop, and, in order to avoid any wastage of land, the other two pastures could be given over to some profitable farm crop.

The period spent in the pen after farrowing depends on the number of sows farrowing. If only one or two sows are concerned, they and their litters may be placed in the pasture a few days after birth; but a three weeks' period may be necessary so that the young pigs may be strong enough to safeguard themselves against any possible robbing by their older and stronger fellows running in the same pasture. During these three weeks spent with the mother in the pen strict sanitation is necessary.

The young pigs are kept in the pasture till at least four months old. Next year, one of the two other pastures is used for the pigs, thus ensuring that each pasture is without pigs for a period of two years, during which time it is considered that if proper cultivation practices are adopted very little infection, if any, would be left.

In cases where no such pasture land is available, the farmer is advised to remove the top 9 to 12 inches of the old contaminated soil from the yard attached to the farrowing pen and replace it with new, clean soil, preferably sand. Only the young pigs should be allowed to use this yard, the exits from the pen being made too small for the sow to pass through. Strict supervision should be given to the cleanliness of the pen, which every two weeks should be washed down with a boiling 5 per cent. solution of disinfectant.

THE THORN-HEADED WORM (*Macracanthorhynchus hirudinaceus*).

(Plate 167, fig. 2.)

Description and Life History.

The thorn-headed worm is also a large species occurring in the small intestine, the female worms attaining a length of 7 to 16 inches. The parasite is whitish in colour, and its head is provided with an armed proboscis by which the worm attaches itself to the intestinal wall.

The eggs are passed out in the dung, and for the life cycle to be completed must be consumed by certain beetle grubs. The eggs hatch in the intestine of the grub, and the young larvæ forcing their way through the intestinal wall reach the body cavity, where they encyst. The pig, in rooting about, finds the grubs and eats them. The encysted worms are released, attach themselves to the wall of the small intestine of the pig by means of their proboscis, and eventually reach maturity.

Effect on the Pig.

The thorn-headed worm fortunately is not very common, but moderate to heavy infestations sometimes are seen. The worms are moving about continually in the small intestine and reattaching themselves, and consequently severe damage to the intestinal wall is occasioned. The infested animal shows evidence of great pain, may be subject to nervous disorders, and rapidly loses condition.

Control.

There is no drug known that can be depended upon to remove these worms, but the treatment as recommended for the large round worm may lessen the infestation. Strict sanitation must be maintained, and anything that will prevent the pig rooting around and eating the beetle grubs should be considered.

WHIP WORM (*Trichuris trichiura*). (Plate 169.)

This parasite gets its common name from its resemblance to a whip, the anterior portion being thin and thread-like, and the posterior portion comparatively stout. It is found in the caecum or blind gut and adjoining portion of the large intestine, and may measure from 1½ to 2 inches in length.

The eggs laid by the females pass out in the dung, and under suitable conditions of temperature and moisture eventually reach the infective stage. On being swallowed by the pig these infectious eggs hatch, and the young larvæ, making their way to the caecum and large intestine, reach maturity in sixteen to twenty days.

Control.

The whip worm is an exceedingly common species, and a heavy infestation may be distinctly harmful. Repeated treatments with oil of chenopodium may give results; but, owing to its location so far back in the alimentary tract the worm is difficult to reach with vermifuges. The sanitary measures as recommended for Ascaris should be applied for whip worm control.

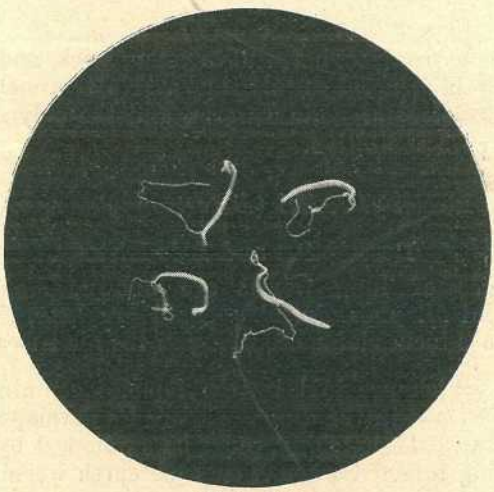


Plate 169.
Whip Worm (*Trichuris trichiura*). Natural size.

NODULE WORMS (*Œsophagostomum* spp.).

Description and Life History.

Two species of nodule worms are liable to infest the pig, namely *Œsophagostomum dentatum* (Plate 170) and *O. longicaudum*, the latter being comparatively rare. Both occur in the large intestine and are whitish or greyish in colour. They may measure up to half an inch in length.

The eggs, in this case, after passing out in the dung, hatch after a few days. The young larvæ feed in the dung for several more days before reaching the infective stage. The larva then is enclosed in a sheath which helps to protect it from adverse conditions. When swallowed by the pig the larva loses its sheath and burrows into the wall of the large intestine, causing the formation of a small nodule. After a period of development, the larva eventually breaks out of the nodule and settles down in the intestine, where it grows to maturity.

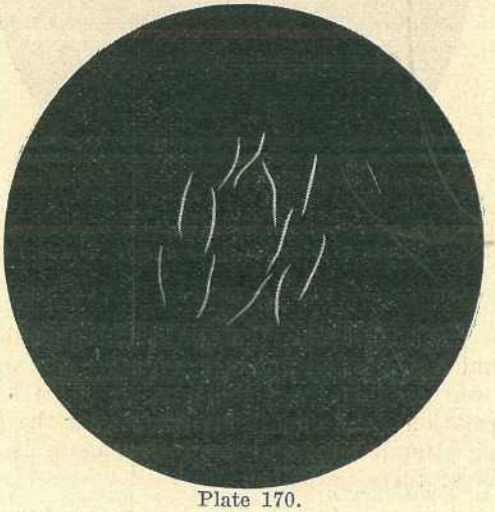


Plate 170.
Nodule Worm (*Œsophagostomum dentatum*). Natural size.

Control.

Nodule worms are most harmful to young stock, and a heavy infestation may result in general unthriftiness. No treatment with drugs is known to be effective for nodule worm, and the only control measures are concerned with sanitation.

LUNG WORMS (*Metastrongylus* spp.).

Description and Life History.

Two species of lung worms are known, *Metastrongylus apri* (Plate 171) and *M. pudendotectus*. Both are long, thread-like worms from 1½ inch to 3 inches long, occurring in the air tubes of the lungs.

The eggs which are laid by the females contain active embryos which are passed out in the dung. Before its development can be completed the larva, after hatching, must be swallowed by an earth worm, the pig becoming infected when it eats the earth worm.

Effect on the Pig.

A light infestation causes no appreciable harm, but when in numbers, and especially in young pigs, the worms may cause a bronchitis characterised by a short, husky cough, and sometimes followed by pneumonia. The infested animals rapidly lose condition and, if bacterial complications arise, may die.

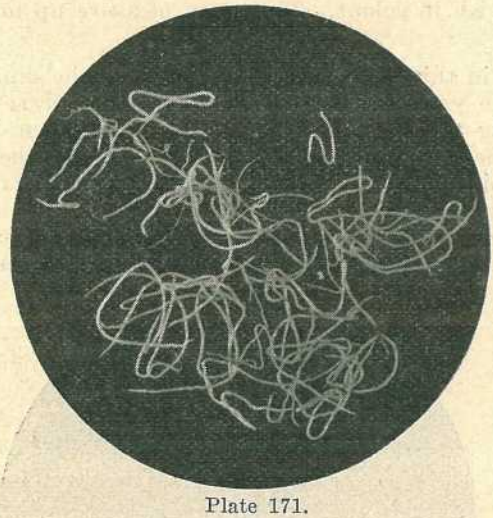


Plate 171.
Lung Worm (*Metastrongylus apri*). Natural size.

Control.

Should an outbreak occur, the unaffected pigs should be removed immediately and the infested animals given good, clean water, nourishing food, and warm quarters. Good nursing is the best treatment for lungworm infestation. All conditions permitting the presence of earth worms must be attended to, and sanitation again is necessary for an efficient control of these parasites.

KIDNEY WORM (*Stephanurus dentatus*). (Plate 172.)

Description.

This parasite is given the popular name of kidney worm because it is found in the vicinity of the kidneys. Mature worms are seen in the flare fat and occasionally in the kidneys themselves, and young stages of the parasite, whilst most prominent in the liver, may occur in the lungs and various other parts of the body. The mature kidney worm has a very distinctive mottled appearance, is relatively stout, and may grow up to two inches in length.

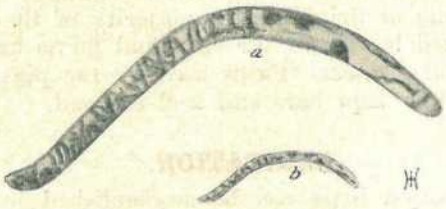


Plate 172.

Kidney Worm (*Stephanurus dentatus*). (*a*) Three times natural size. (*b*) Natural size.

Life History.

Only those females inhabiting the kidneys or kidney fat are sexually mature, and these lay eggs which eventually reach the exterior in the urine. The eggs hatch in one to two days, and five to eight days after hatching the young larvæ are ready to infest the pig. As in the case of the nodule worm, the infective larva is enclosed in a sheath. The pig becomes infected by swallowing these infective larvæ, or infection may occur when the larvæ burrow through the skin. In either case, the young worm eventually reaches the liver, where it remains for some months. After a period of five or six months the worms are mature and, leaving the liver, migrate to the kidney fat, where, if females, they commence to lay eggs.

Effect on the Pig.

Heavy infestations result in an unthrifty animal, owing mainly to the extensive damage to the liver caused by the young worms. The kidney worm is one of the most widespread parasites of the pig in Queensland, and is certainly a cause of serious wastage. The condemnation of pigs' livers and sometimes of infested carcases, and the unthriftiness of infested pigs, is regarded as one of the most serious economic losses the pig industry in Queensland has to contend with.

Control.

Owing to their location in the vicinity of the kidneys, these parasites cannot be removed by drugs given through the mouth, and only preventive measures will bring about a satisfactory control.

As the eggs and larvæ are rapidly killed by sunlight and dryness, yards and sties should be drained thoroughly and kept as dry as possible. All depressions and mud holes, especially those in the shade, should receive attention. Sties should be built of concrete, or else have

slatted floors, which allow the urine to drain through to the ground beneath. All litter should be cleaned up constantly, as the soil so protected forms one of the most favoured sites of the infective larvæ. Yards and sties spelled for six months may be used with safety, as larvæ cannot survive for this period, even under optimum conditions.

The system used for Ascaris control may be applied here with certain modifications. The pastures are prepared as already stated, ploughing and cultivation being very effective in cleaning the land of infection. The food and water troughs in this case, however, are placed on bare, well-drained areas. The food troughs may be shaded, but the surrounding bare areas must be exposed to sunlight as much as possible. After feeding or drinking, the majority of the urine is passed on this bare exposed land, and the eggs and larvæ are killed rapidly by the sunlight and dryness. Paths used by the pigs throughout the pasture also should be kept bare and well exposed.

SANITATION.

Without sanitation little can be accomplished in the control of any parasite. Even though treatment with a drug may be depended upon to remove all worms, there is little advantage in its use if the animals are able to become reinfested immediately afterwards. So far as the pig is concerned, prevention assumes an especially prominent place in worm parasite control, for there is only one species for which an efficient vermifuge is known. This species is the large roundworm, and even here treatment is of no effect against the more harmful phase in the life cycle—namely, the migrating larva. This point emphasises the need of good sanitation, which, by the elimination of conditions favouring the development of the life-cycle stages spent outside the pig, considerably reduces the chances of infestation. The principles of good sanitation are outlined herewith:—

1. *Sties*—In the construction of a sty the farmer should aim at concrete floors. The initial expenditure may be high, but the result is shown in the ease with which such sties may be kept clean and in the subsequent good health of the pigs. Earthen floors in sties should be abolished entirely as it is impossible to keep them clean and dry.

2. *Dung.*—All dung should be removed daily. The dung carries the eggs of those parasites inhabiting the alimentary canal, and its regular removal and disposal is important. If desired for fertilizing purposes, it should be spread out immediately in the pastures. It must be understood that pastures so treated should not be accessible to the pigs; otherwise the dung should be buried under 1 foot of soil. Pig dung is a favoured breeding medium of the house fly, which, when in numbers, not only becomes an annoyance to the animals, but also plays a very prominent part in the spread of disease. The proper disposal of the dung is important from this aspect also.

3. *Drainage.*—Moisture is a necessary factor for the development of the free living stages of all worm parasites, and in its absence very few of these can survive for any length of time. A good drainage system therefore is an essential for good sanitation, and the progressive pig raiser will see that all depressions are filled

in and that mud holes are not permitted. If wallows are considered necessary, they should be built of concrete and cleaned out and disinfected frequently.

4. *Feeding.*—Food never should be thrown on the ground, but always should be supplied in sanitary food troughs. These are best built of concrete, evenly divided by round iron cross pieces, to prevent the animals lying in them. In yards, such food troughs should be surrounded by a concrete floor raised above the level of the ground and sloping away from the trough. The use of hoppers for dry rations is recommended.

5. The runaways and yards should be kept as free of litter as possible. Accumulations of corn cobs, &c., will protect any infection in the soil beneath from such adverse conditions as sunlight and dryness.

THE ADMINISTRATION OF VERMIFUGES TO PIGS.

It must be remembered that the pig has a peculiarly narrow throat, and great care must be taken when administering drugs. With liquids the danger is somewhat increased, as they are apt to enter the lungs and suffocate the patient. Oil of chenopodium and castor oil, however, may be administered quite safely if the directions given below are followed carefully. The required amounts of the drug and castor oil are measured out and thoroughly mixed. Young animals are set up on their tail and between an assistant's legs, the mouth opened by a spreader or gag, and the vermifuge administered very slowly over the back of the tongue by means of a syringe with a long curved nozzle. *The liquid should be given slowly and ample time allowed for the animal to swallow.* Care should be taken not to force the head up too far.

Animals too big to be handled in this way are best placed in a crate or crush. A leather strap is used to elevate the upper jaw and bring the mouth level with the shoulder tops, the drug then being administered with the syringe in the manner described above. Failing a syringe, an old boot from which the toe has been removed is used occasionally for administering liquids; but with the syringe the work is quicker and each animal is given a full dose.

Oil of chenopodium may also be obtained in capsules. It is not always an easy matter, however, to dose pigs with capsules, and as, in any case, the capsules would have to be followed by castor oil, it is considered that the simultaneous administration of the drug and castor oil is much easier for the operator.

The administration of chenopodium in food is recommended sometimes, but is not considered an effective treatment.

DOCTORING THE CALF.

One of the first signs that a calf is "out of sorts" is loss of appetite. When a calf refuses to take its milk give it a dose of castor oil. A tablespoonful of oil is shaken up with a little milk and hot water until an emulsion is formed. The dose is then poured down the calf's throat.

A bottle of castor oil should be kept always in a handy place. Another bottle with marks filed at tablespoonful levels should be kept for administering the dose. After use the bottle should be rinsed first with milk and then two or three times with hot water.

Sown Pastures and Their Management.

C. W. WINDERS, B.Sc.Agr., Assistant Research Officer.

[*Continued from p.* 280, *Part* 4, *Vol. XLVIII.—September,* 1937.]

(Part IV.)

Couch Grass (*Cynodon dactylon* Pers.).

Origin and Distribution.—Couch grass is widely spread in Queensland as a pasture plant, as a lawn grass, and as a weed of gardens and cultivations. It is probably native to Australia, but is common also in many other countries. It is highly valued for grazing purposes in the Southern United States of America, where it is known as Bermuda grass, and in India, where the name Doub grass is given to it.

Description.—In habit couch grass is a perennial, low-growing grass which produces slender, creeping runners that may reach a length of several feet and which root at the joints. It possesses, in addition to surface runners, thin, underground, creeping stems. The habit of the grass varies considerably according to the nature of the soil and the climate experienced, but it seldom reaches a height of more than 12 inches. The slender flowering stems terminate in between two and five purplish spikes from 1 to 2 inches in length.

Climatic Requirements.—The chief growing period of couch grass is during the summer months. Growth is retarded by cold weather, and is checked almost entirely by severe frosts, but the plants are seldom killed by cold. The grass is extremely drought resistant, though it is not productive under dry conditions.

Soils.—Couch grass requires a fertile soil for its best development, but will grow on an extremely wide range of soil types, from beach sands to dry, alkali soils. It does best on fertile, light loams, particularly on alluvial flats.

Planting.—Flowering heads are produced in abundance during the warmer months of the year, but the heads shatter badly when the seed is formed, and commercial samples of seed often show a germination percentage of less than 30. Good seed, germinating as high as 92 per cent., is available at times, and should be used in preference to cheap, unreliable lines. From 5 to 8 lb. of good seed are sufficient to sow an acre. For planting small areas it is usually preferable to employ rootstock or stem cuttings if they are available, spacing them 18 inches apart in drills struck out at intervals of about 2 ft. Sowing or planting should be carried out during spring or summer.

Owing to its smothering action on most other pasture plants, couch grass is usually not employed in pasture mixtures, but sowings of the grass may be improved by the addition of a suitable legume. In coastal districts the common lespedeza (*Lespedeza striata*) mixes well with couch grass.

Management.—Couch grass pastures are fairly easy to manage, as they are not readily eaten out by stock. However, intermittent grazing is recommended in order to make the most efficient use of the pasture.

Conservation.—Owing to its relatively short growth, couch grass is seldom cut for hay or ensilage.

Feeding Value.—The feeding value of couch grass, particularly when growing on good quality soils, is excellent, and the palatability and digestibility of the grass render it a first-class grazing plant for all classes of stock.

Special Uses.—In addition to its usefulness as a pasture, couch grass may be employed for the fixation of sandy soils or of slopes subject to erosion, and also for green formation on aerodromes, lawns, golf links, &c.

Undesirable Features.—By virtue of its persistent habit couch grass is very troublesome when it invades cultivation areas.

Blue Couch Grass (*Digitaria didactyla* Willd.).

Origin and Distribution.—Believed to be a native of Queensland, blue couch grass is little known outside the State. It is most prominent in the coastal section south of Gladstone, where it has established itself on large areas of cleared or ringbarked forest country.

Description.—Blue couch grass closely resembles the ordinary couch grass in habit, having slender, creeping stems and fine leaves. The seedhead is somewhat smaller and has fewer rays than that of couch grass. The foliage has a bluish tinge.

Climatic Requirements.—The climatic conditions of the South Coast and North Coast districts are best suited to blue couch grass. Its main growth is made during the summer months, and the plant is dormant in the winter. Though it produces well on dry soils in normal seasons, blue couch grass is not particularly drought resistant, and suffers more from dry conditions than does the ordinary couch grass. It is also more susceptible to damage by frosts.

Soils.—Whilst it produces a large bulk of feed on rich soils, blue couch grass is most usefully employed on dry, shallow soils on which grasses of higher value will not thrive.

Planting.—Though the natural spread of blue couch grass must be effected to a large extent by means of seed, the percentage of viable seed in samples collected for examination has been low, and as a consequence seed is unobtainable commercially. Little difficulty is experienced in getting pieces of the runners to strike if planted in wet weather during the warm months of the year.

Management.—The areas devoted to blue couch grass on dairy farms generally are the large paddocks of second-class country unsuitable for the better quality cultivated pasture grasses, and intensive management of these poorly subdivided areas is unwarranted in most instances. Whilst the grass is able to withstand poorly controlled grazing, where subdivisional fences exist some form of intermittent grazing should be practised.

Conservation.—Owing to the difficulty of cutting the matted growth made by blue couch grass on fertile soils, and to the fairly sparse stand on inferior soil types, no conservation of surplus grass is undertaken.

Feeding Value.—The palatability and feeding value of blue couch grass are quite good, though cream production is lower on blue couch grass pastures than on paspalum pastures.

Seed Production.—Collection of seed of this grass is not carried out in Queensland owing to the low percentage of viable seed set.

Pests and Diseases.—Except under lawn or green conditions, pests and diseases are of little importance to blue couch grass.

Special Uses.—Blue couch is widely used for lawns and greens, and where the moisture supply can be kept up in dry weather and heavy frosts are not frequent the grass is admirably suited to these purposes.

Undesirable Features.—The grass shows a tendency to invade paspalum pastures and supplant the paspalum in certain situations. The effect probably is due to soil fertility conditions, and an improvement in soil fertility is indicated if the paspalum is to be retained.

Water Couch Grass (*Paspalum distichum* L.).

Origin and Distribution.—Though water couch is common in many warm countries, particularly in the Americas, and is fairly widespread in wet, tropical and sub-tropical parts of Australia, there is some doubt as to the original home of the grass. If not native to Australia, it certainly has been naturalised for a great many years.

Description.—Water couch is a perennial grass which creeps by means of fairly slender stems that usually root at the nodes. The ends of the otherwise prostrate stems turn upwards, and it is at these extremities that the leaves are most dense. The seed-stalks also are produced from the stem tips. The seed-head is made up of two spikes of small, flat "seeds."

Climatic Requirements.—A moist, warm climate is favoured by the grass, and consequently it is found most commonly along the coastal strip. It is mainly a summer grower, and is cut back by frosts. Extremely heavy or frequent frosts often destroy the grass.

Soils.—Soils abundantly supplied with moisture are essential for the full development of water couch.

Planting.—Seed of water couch is not obtainable on the market, and the grass is propagated by planting pieces of the creeping stems. These strike very readily if planted during the warm months, and spread quickly.

Management.—Because of its habit of rooting freely at the stem joints, water couch is well able to withstand heavy grazing, but intermittent grazing should be practised.

Conservation.—On the coast it is extremely difficult to make a green hay from this succulent grass, but in drier localities a rough-looking hay may be conserved.

Feeding Value.—Whilst the feeding value of water couch grass is fairly good, more particularly for fattening purposes than for milk production, the grass is not a specially good fodder.

Seed Production.—Though a certain amount of viable seed is set, owing to the difficulty of collecting the seed and to the ease with which propagation by means of cuttings may be effected no seed collection is undertaken.

Pests and Diseases.—Water couch is susceptible to attack by the paspalum ergot fungus.

Special Uses.—The grass is a very effective soil binder in damp places.

Undesirable Features.—Whilst useful in certain situations, water couch is a pest under certain circumstances. Once it has invaded a cultivation paddock it is extremely difficult to eradicate, and its presence in bore drains, irrigation channels, &c., is also undesirable.

Buffalo Grass (*Stenotaphrum secundatum* O.K.).

Origin and Distribution.—Though native to the coastal districts of the warm regions of America, buffalo grass is now naturalised in similar areas all over the world. It is quite common in coastal Queensland, either distributed naturally or as a relic of earlier sowings.

Plate 173.
Buffalo grass on an eroded bank.

Description.—Buffalo grass (Plate 173) is provided with surface runners that root and shoot at the joints, and also has underground stems. It spreads freely in all directions, and the runners produce coarse, erect leaves up to 12 inches in length. The seedhead consists of a broad, flat stem with a number of closely appressed flowers scattered over it. The grass forms a very cushiony mat.

Climatic Requirements.—For pasture purposes buffalo grass is of use only in coastal districts. It is chiefly a summer grower, but thrives in shady situations as well as in sunny positions. It is moderately drought resistant, and will withstand a certain amount of frost.

Soils.—A wide variety of soil types will support buffalo grass. It is common on sandy country close to sea beaches, and does well on heavy clay soils. It does not require a high measure of soil fertility for its existence.

Planting.—Seed is formed very sparingly, and stem cuttings are used for propagating the grass. The best time to set these out is in the spring.

Management.—The growth produced by buffalo grass should be utilised at an early stage, since the older growth is of inferior feeding value. Occasional harrowings should be made in order to renovate the turf.

Conservation.—The mat produced is too dense to permit of the grass being mown for hay or silage.

Feeding Value.—Young, leafy growth of buffalo grass has a fair feeding value, but fibre increases rapidly with age.

Seed Production.—Collection of seed is not carried out.

Digitaria Species (Woolly Finger Grass, &c.).

Origin and Distribution.—Woolly Finger grass and related grasses (Plates 174 and 175) are natives of Africa. The whole group has been intensively studied for some years by the South African Department of Agriculture, and over 150 types have been recognised. Several of these have been introduced to Queensland for trial purposes, and numerous farmers and pastoralists have laid down small observation plots. Results to date suggest that some varieties may prove useful in various parts of the State.

Plate 174.
Digitaria Pentzii (Woolly Finger Grass).

Description.—Wide differences in the structure and habit of growth of the numerous types of *Digitaria* exist, and have been classified by research workers. Practically all are creeping grasses, but some form a large tuft before sending out runners; others send out runners (occasionally resembling flower stems) as soon as the plant begins to grow; some form underground as well as surface creeping stems; and various other

types exist. The leaves and runners vary a good deal, as does the seed-head, though the latter is always of the hand-like type. The following descriptions of the most promising forms in Queensland are taken from "The Grasses of Southern Rhodesia," by S. M. Stent and J. M. Rattray:—

Digitaria Pentzii.—This is a shallowly rooted, tufted perennial that sends out fairly long rooting and shooting runners. These runners are very characteristic of this species; the internodes are short, seldom more than 3 inches long, and dense fascicles of shoots are developed from each node, which, if it is able to reach the ground, roots firmly, early establishing a new plant, the internodes soon dying off. The sheaths, especially the basal, and sometimes the leaves, are softly to densely hairy. The Vryburg form is the famous "Woolly Finger grass."

Digitaria seriata or Digitaria Polevansii.—This is a perennial with tall and somewhat bulbous culms (stems), covered with short, densely and softly hairy cataphylls (scales) at the base and springing serially from short, creeping rhizomes. The long, stout surface runners have internodes up to 8 inches long. In its natural state the bare culms and wiry stolons, with long internodes, do not suggest a promising pasture grass, but in Pretoria, where it has been brought under cultivation, excellent results have been obtained with it in this capacity.

Digitaria milanjiana.—This is a very blue grass, with the same creeping rhizomes as *D. Polevansii,* but with the addition of long surface runners with long, reddish internodes and rooting nodes. The long surface runners do not root or form fresh plants as readily as *D. Pentzii.*

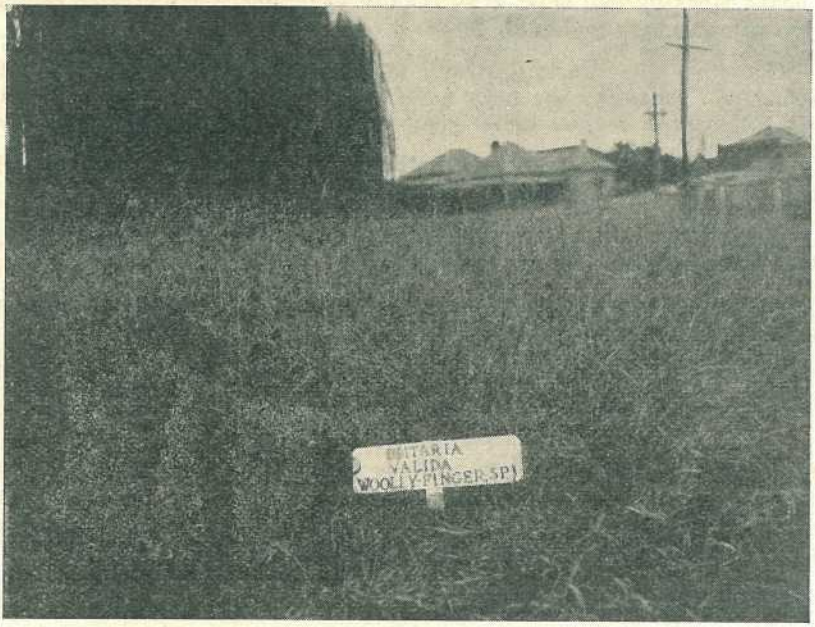


Plate 175.
Digitaria valida (an African Finger Grass).

Digitaria valida.—This is somewhat similar to *D. Pentzii,* but is taller and coarser and has stouter rhizomes. The leaves are short and broad.

Climatic Requirements.—Some of the *Digitaria* types occur naturally in areas of low rainfall, and others in high rainfall regions. All are summer growers. *D. Pentzii* and *D. valida* are reported to give best results in South Africa under a rainfall of 20 to 30 inches per annum; *D. Polevansii* is useful in semi-arid areas, while *D. milanjiana* comes from an arid region. A South African classification of types shows that the high rainfall types have the growing eyes deep under the ground, and the basal shoots are usually brown, hard, and long.

Soils.—In South Africa *D. Pentzii* is said to do best on red loam soils, but can be grown on practically any well-drained soils. *D. Polevansii* prefers sandy soils; *D. valida* thrives on red and shaly soils. The sandy soil types have been shown to possess "swollen nodes and bulbous growing eyes under the soil, whereas those which grow on hard soils have the growing eyes flat against the closely compacted basal shoot."

Planting.—Though most types flower fairly freely, the amount of seed set is very variable. No data are available for Queensland-grown seed, but it is reported that in South Africa the percentage of florets which set seed varies from 0 to 80. Seed has not been collected in any quantity in Queensland, and propagation is carried out by planting rooted pieces of the large tufts or plantlets which are developed at the joints of the runners. The best method of planting these has been described in an earlier section dealing with "Methods of Planting and Covering."

Management.—The pasture types of *Digitaria* are especially resistant to heavy stocking and close grazing, and have good recuperative powers. Intermittent grazing should, however, be practised.

Conservation.—Certain strains are reputed to be suitable for hay-making, but no tests have been made in Queensland. The forms under trial in this State make a dense growth, but can be mown fairly readily.

Feeding Value.—The palatability of most forms is high and the feeding value of young growth quite good.

Seed Production.—As already stated, seed is set in too small a quantity to warrant collection for sowing purposes.

Pests and Diseases.—Though minor pests and diseases cause slight damage in some instances, no serious effect has yet been observed.

Special Uses.—All the *Digitarias,* but more particularly the forms with both underground and surface runners, are effective soil-binders.

Undesirable Features.—The underground stems, which are largely responsible for the persistency of the main types of *Digitaria* under grazing conditions, render eradication of the grasses difficult; consequently the *Digitarias* should not be sown on areas likely to be required later for cropping nor adjacent to cultivation areas.

African Star Grass (*Cynodon plectostachyum* Pilger).

Origin and Distribution.—A native of East Africa, where it is an important grazing grass, this star grass has been introduced with some success to other parts of Africa, and a few years ago was brought to Queensland. Exploratory trials have shown the grass to hold some promise for coastal conditions at least.

Description.—African star grass (Plate 176) is a close relative of the ordinary couch grass, and, like the latter, is a perennial grass spreading by means of runners that root at the joints. There is little or no development of underground runners. Erect or straggling leafy stems are produced from the prostrate runners and form a dense mass of leafy material up to 2 feet in depth. The leaves and younger stems are soft and succulent. The seedheads resemble those of the ordinary couch grass, except that there are generally two whorls of radiating spikes instead of one.

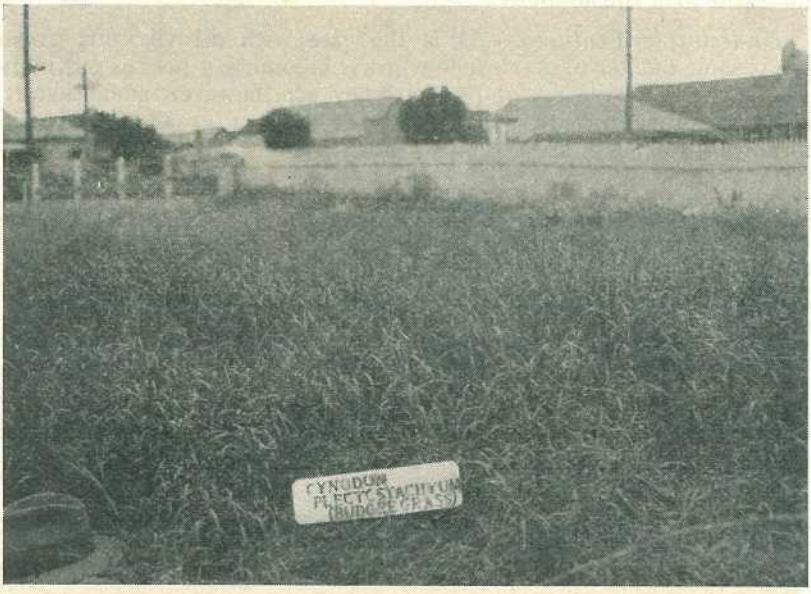


Plate 176.
African Star Grass.

Climatic Requirements.—The grass is mainly a summer grower, and in Queensland has shown promise in areas experiencing between 25 and 60 inches of rainfall per annum. Whilst its drought resistance appears to be moderately high, it is extremely susceptible to frost injury.

Soils.—Fertile loams, including the heavy loams, appear to be the favoured soil types. On light soils growth is less vigorous.

Planting.—Seed is not produced very freely, and the percentage of viable seed is low. In plantings which have been made in Queensland stem cuttings have almost invariably been used. These are best planted in moist land in early summer, the short pieces of stems with roots at the joints being planted in furrows and firmed by tramping.

Management.—Intermittent grazing should be practised. Under dry conditions recovery after grazing or cutting is slow, though where rainfall conditions are satisfactory the intervals between grazings need only be short.

Conservation.—The soft, succulent growth of African star grass is reputed to make a good hay if properly cured, but African experience indicates that a long curing period and frequent turning are necessary to produce a quality hay.

Feeding Value.—Chemical analyses of the grass have shown it to contain a very large proportion of nutrients, and there is no doubt that the grass is of high feeding value. Its palatability to all classes of stock is excellent.

Seed Production.—To date the grass has been established in Queensland by means of vegetative material, and it is unlikely that work aimed at improvement of seed production will be undertaken here for some little time.

Special Uses.—Its creeping and mat-forming habit gives the grass some value as a soil binder.

Undesirable Features.—As is the case with all vigorous grasses, there is some danger of African star grass becoming a pest of cultivation areas. Its aggressiveness and persistency are, however, such that it is not likely to rank with couch grass or kikuyu grass as an almost uneradicable weed.

Plate 177.
Buffel grass.

Buffel Grass (*Cenchrus ciliaris* L.).

Origin and Distribution.—Buffel grass occurs naturally in various forms in tropical and sub-tropical portions of Africa and Southern Asia. It was introduced from India to North-western Australia in 1915, and both African and Asiatic strains have been tested in the various States of the Commonwealth. The grass is still more or less in the testing stage, and further information, particularly with regard to the probable detrimental effect of its burrs on wool, is required before it can be recommended for planting.

Description.—The several forms of buffel grass show a great variation in growth habits, but most are perennial in nature and spread by

means of underground runners. Usually the subterranean stems are fairly short, but a large number of erect shoots is produced. (Plate 177.) The leaves are often rather harsh and hairy, especially in the leafier types. The seedheads, which are of a fox-tail shape, are borne on rather short stems, and the large "seeds" bear a number of bristles, particularly at their bases.

Climatic Requirements.—Buffel grass is a summer-growing grass, and is best adapted to summer rainfall districts. Provided the rainfall is fairly reliable, buffel grass is suited to areas with as low an average annual rainfall as 20 inches. The grass is very drought-resistant, but the leaf growth is damaged by frosts.

Soils.—Well-drained and fairly dry soils of a sandy or loamy nature are preferred by the grass. In clay soils the extension of the underground runners is checked to some extent.

Planting.—Seed was at one time available on the market, but the demand was too small to warrant seed collection on a commercial scale. Germination tests of hand-stripped seed have shown a percentage germination of about 50. Little information is available as to the capacity of the plant to establish from seed. The underground stems are very hardy, and the grass may be propagated by planting small pieces in the spring or summer. Establishment is, however, not particularly ready.

Management.—Buffel grass is well able to withstand heavy grazing and cutting, but sufficient interval between defoliations must be allowed for recovery.

Conservation.—Certain of the strains are of a useful hay type, and two or three cuttings may be made in a season. The quality of the hay is reputed to be excellent. In India the grass has been dried artificially, with the production of a good-quality feed.

Feeding Value.—Some observers report the grass to be unpalatable when green, and avoided by stock. In other instances stock have taken quite readily to the young grass. A good deal may depend upon strain and on soil type. The feeding value of the young growth is good, but the dry, stemmy material is of little feed value.

Seed Production.—The ripe seed does not shatter early, and collection by hand-stripping is easy.

Pests and Diseases.—The grass does not appear to be subject to damage by insect or fungus pests, at least in trial plots.

Undesirable Features.—The bristles attached to the "seeds" of the grass might render it of some danger in sheep districts, owing to the difficulty of removing the seeds from the wool.

Tassel Grass (*Chloris distichophylla* Lag.).

Origin and Distribution.—Tassel grass, which is better known in Queensland as frost-resistant or winter-growing Rhodes grass, is a native of South America that has been naturalised in Queensland for many years. Its most common occurrence is as a weed of waste places, but within recent years it has been cultivated to a slight extent for grazing purposes.

Description.—The grass forms dense tufts and has long, broad, succulent leaves (Plate 178). It does not develop the long surface

runners which are characteristic of Rhodes grass. The seedhead is of the finger type, and the number of rays may be as many as forty-five.

Climatic Requirements.—It is reported that the main natural distribution of tassel grass in Queensland is in the Moreton and Wide Bay

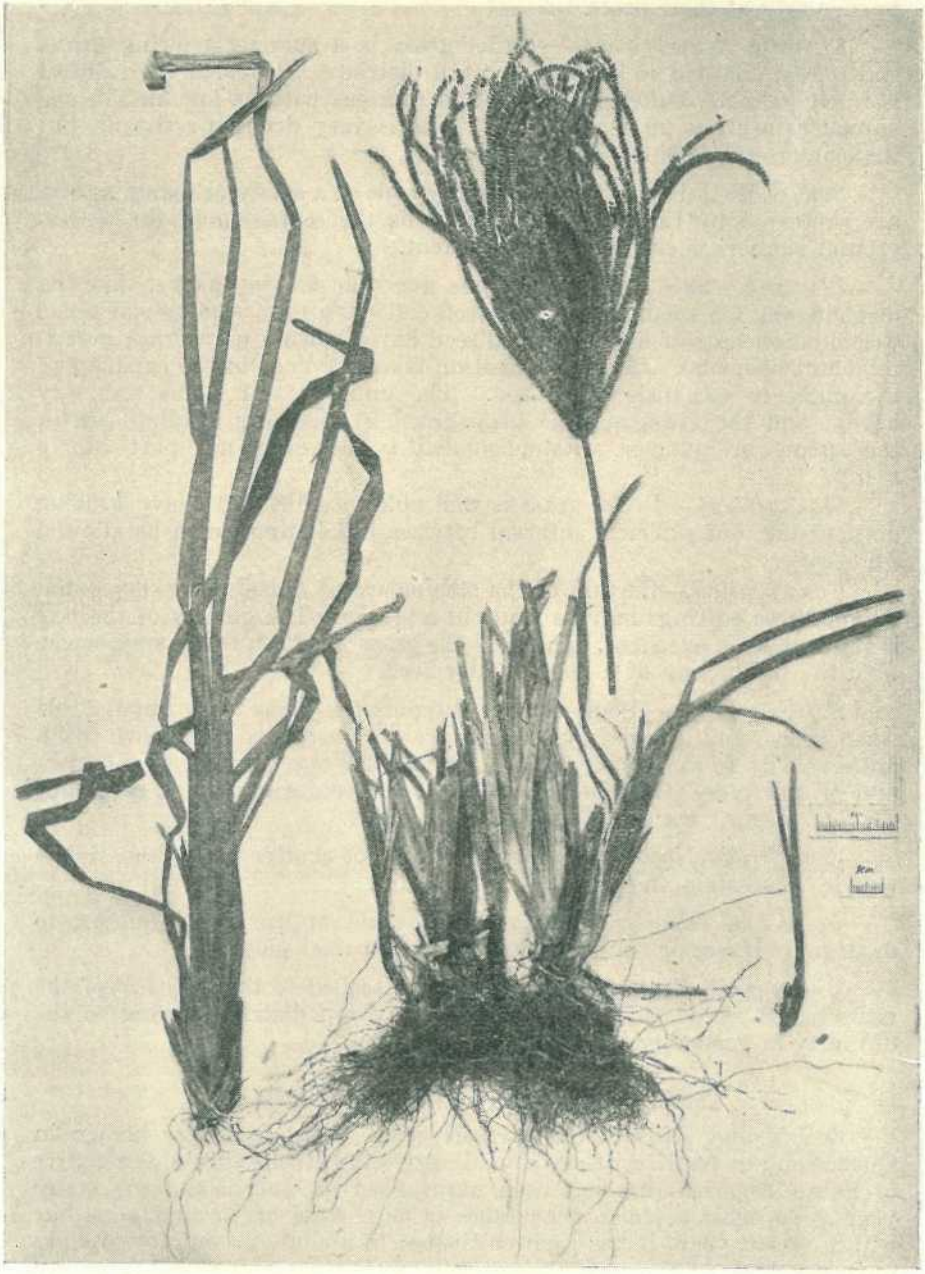


Plate 178.
Tassel grass.

districts, and it is in these areas that it is chiefly cultivated. The grass requires a moderate summer rainfall. It frosts much less readily than does Rhodes grass; but its production during the cool months is not high.

Soils.—A fairly fertile soil is necessary for good results.

Planting.—Spring or summer sowing of the seed is desirable, and the grass should be sown down on cultivated land worked to a fine tilth.

Management.—The management of tassel grass pastures is complicated by the fact that the grass contains a fairly high proportion of a prussic-acid-yielding glucoside at certain stages. Since the period at which the grass can be safely grazed has not been determined, care in grazing must be exercised.

Undesirable Features.—Because of the danger of stock-poisoning, it is considered inadvisable to sow tassel grass for grazing purposes, particularly as it has little advantage in other respects over various other grasses.

Cowcane (*Saccharum officinarum* var.).

Origin and Distribution.—Cowcane is a variety of sugar-cane used in Queensland almost exclusively for feeding dairy stock.

Description.—Cowcane is a tall, tufted plant which stools freely and produces numerous erect stems, which vary in size and leafiness according to variety. It is perennial in nature, remaining green throughout its lifetime, which usually extends over several years.

Climatic Requirements.—The climatic conditions required by cowcane are similar to those needed by the ordinary sugar-cane—namely, moist, warm summers and frost-free winters. Varieties of cowcane have been produced which are somewhat resistant to frost injury, but planting in protected localities is recommended. The drought resistance of cowcane is high, and during dry times a small acreage of the crop often suffices to keep stock alive for long periods.

Soils.—Cowcane prefers a deep, rich, well-drained soil, and requires to be planted on cultivated land. Low-lying areas subject to waterlogging are unsuitable.

Planting.—As with sugar-cane, stem cuttings, and not seeds, are used for planting purposes. Each cutting or "set" should have three or four well-developed buds, and the sets are planted in fairly deep furrows 4 feet 6 inches apart, the sets being spaced about 2 feet apart in the furrows. The sets are lightly covered at first, and the furrow gradually filled in as the shoots emerge towards the surface. Cultivation between the rows is essential while the plants are still young. Varieties suitable to the district should be used.

Management.—Cowcane is not suitable for grazing, but should be cut and, if at all old, chaffed before feeding to stock. Over 20 tons per acre at the first cutting may be expected in most instances. The canes should be cut off just below the surface of the soil with a cane knife. After the crop has had its first cutting cultivation between the rows should be carried out to promote a good ratoon growth in the spring.

Feeding Value.—Because of its high fibre content, cowcane is not a good feed for cows in production. Its chief value is as a maintenance feed for stock during the months when good pasture is scarce.

Seed Production.—Cowcane does not set seed.

PERMANENT SUMMER-GROWING LEGUMES.

Lucerne (*Medicago sativa* L.).

Origin and Distribution.—Lucerne is a native of Central Asia which has been cultivated for many centuries, and is now grown in practically every country in the world. It was one of the first crop plants introduced to Australia, and is cultivated extensively in all States both for hay and for grazing.

Description.—The lucerne plant is perennial in habit, and possesses a deeply-penetrating taproot and numerous erect leafy stems rising from a crown. The leaves consist of three leaflets, which vary in shape and size according to variety. The most common type in Australia is the Hunter River type, which is suited to most Australian conditions, and has been found superior to imported types so far tested.

Climatic Requirements.—The Australian type of lucerne is mainly a summer-growing plant, but in mild winters makes appreciable growth. It requires a large quantity of moisture to produce a good crop, but can be cultivated quite successfully in fairly dry areas provided ample supplies of subsoil moisture are available to the deep roots. Where the watertable is not too far below the surface, lucerne is particularly resistant to dry and hot conditions. Its frost resistance is high. Generally speaking, it may be said that lucerne can be grown without irrigation in all the agricultural and dairying districts, and under irrigated conditions is suitable to most parts of the State, provided soil conditions are satisfactory.

Soils.—Lucerne prefers a well-drained, fertile soil of good depth, but will grow with some measure of success on a wide variety of soil types, ranging from light sands to heavy clays. Good drainage is essential. A poorly drained soil may be recognised in many instances by the presence of yellow, brown, orange, or grey mottlings, and where these are found within 2 or 3 feet of the surface the soil is likely to be unsuitable for lucerne-growing. Impermeable clay or rock formations at a shallow depth render a soil unsatisfactory for the crop. For its normal development lucerne requires a soil well supplied with lime, and in heavy rainfall districts it cannot be grown satisfactorily unless the natural acidity of the soils is reduced by the application of lime.

Planting.—The purposes for which lucerne is sown in Queensland include the following:—(*a*) As a cash hay crop; (*b*) as a summer hay crop, followed by winter grazing; (*c*) as a grazing crop; (*d*) as the leguminous element in a mixed pasture. The cultivation of lucerne for hay purposes is the subject of a separate publication of the Department of Agriculture and Stock, and will not be dealt with here.

For whatever purpose sown, lucerne must be laid down on a well-prepared seed-bed. Whether it is freshly cleared scrub or forest land, newly broken-up native or cultivated pasture, or old land being thrown out of wheat, the area must receive a thorough preparation in order to germinate and destroy weeds, to conserve moisture, and to provide a good seed-bed. In most instances a winter cereal should be grown in the year prior to that in which lucerne is to be sown. When the crop is removed in early summer a long period is available for preparation of the land for lucerne. A fine seed-bed should be available for April or May planting. Should earlier planting be prevented by unfavourable rainfall conditions, sowing may be made up to the end of July with some prospects of securing a good stand.

The rate of sowing of lucerne for grazing purposes is lighter than that employed when the crop is sown for hay purposes, since the large-crowned plants developed in a thin stand are more desirable for grazing purposes than the small-crowned, spindly plants formed in a dense hay stand. The quantity of seed sown per acre varies with the district. Lucerne is a crop with a high water requirement, and the rate of sowing should be adjusted in accordance with the expectation of the amount of soil moisture which will be available during the periods when growth is especially required. On soils with a fairly high water-table in the more favoured dairying and grazing districts a sowing rate of 8 lb. per acre should prove satisfactory; on fairly dry soils in the semi-arid districts 2 lb. per acre usually suffices. Intermediate country will sustain stands seeded at the rate of 4-6 lb. per acre.

The seed may be sown broadcast by hand or by a hand-operated broadcasting machine, or distributed by means of a wheat drill, with or without a special lucerne seed attachment. A light harrow should be employed to cover the seed to a depth of about ½-inch, or it may be tramped in lightly by a mob of sheep.

Experiments to ascertain the value of a nurse crop for lucerne in dry districts are at present being conducted by the Department of Agriculture and Stock.

In areas where there is likely to be a deficiency of phosphates in the soil it is advisable to sow ¾-1 cwt. of superphosphate per acre with the seed.

Management.—Continuous grazing of lucerne is detrimental to the stand, and the pasture should be divided into relatively small paddocks, which may be grazed intermittently when the crop is approaching the flowering stage. The first grazing should not take place until the plants are 9 or 10 inches tall. Two or more cultivations of the area should be made each year to break up the surface soil which has been consolidated by tramping.

Care must be taken to prevent losses of livestock due to bloating, which are likely to occur in stock unaccustomed to lucerne being permitted to feed greedily on succulent young growth.

Feeding Value.—The richness of lucerne in proteins and other nutrients is well known to all stock-raisers. To provide a balanced ration the lucerne should be combined with some carbohydrate-rich food, such as grass.

Pests and Diseases.—A disease known as Witches' Broom, Little-leaf, or Bunchy-top, is fairly common in lucerne stands in dry areas, and no remedy has yet been discovered.

Perennial Lespedeza (*Lespedeza sericea* Mig.).

Origin and Distribution.—Within recent years this species of lespedeza, which is native to the Orient, has been cultivated in the United States of America, but has not yet become an important fodder plant. Seed has been available in Australia for a few years, and trial plantings have been made by numerous persons in New South Wales and Queensland. Local experience to date has shown the plant to have some promise for grazing purposes.

Description.—Perennial lespedeza is a long-lived leguminous plant somewhat similar in habit to lucerne—that is, it is a tufted plant with many tillers, which come away from the crown year after year. It reaches a height of 2-4 ft., and abundant small leaves are produced along the erect stems and their branches.

Climatic Requirements.—The plant is chiefly a summer grower, and requires a moderate summer rainfall for its development. Its drought resistance is inferior to that of lucerne, and the usefulness of the plant probably would be restricted to areas experiencing an average annual rainfall of over 30 inches. It does not appear to be greatly damaged by cold, though the late-maturing seed crop is likely to be affected by early frosts.

Soils.—Perennial lespedeza appears to thrive on a variety of soil types, and is worthy of trial on cultivations for rotation and soil-improvement purposes.

Planting.—Sowing of this legume should be carried out in the spring or early summer. The seed may be drilled in or sown broadcast. If drilled, 4-5 lb. of seed per acre will suffice; broadcast sowings require 10-15 lb. of seed per acre. The seed should be only very lightly covered.

Management.—Experimental grazings have shown that stock, especially sheep, are fond of perennial lespedeza. The natural tendency of the plant is to develop woody stems, and if it is to be used for pasture or hay this tendency must be counteracted by grazing or cutting in the immature stages. The stand should not be subjected to close grazing or cutting, as the regrowth comes not from the crown but from the joints of the stubble.

Conservation.—In the United States, perennial lespedeza is used as a hay crop, the first cutting being made before the stems become woody. Little information is available concerning the feeding value of the hay compared with lucerne hay.

Feeding Value.—The young growth is relished by all classes of stock, and has a feeding value of a high order. Woody material is neglected.

Seed Production.—For seed production perennial lespedeza should be cut when the seed is ripe, cured, and threshed. It is advisable to scarify the seed to permit of easier germination.

SHEEP'S BURNET (*Poterium sanguisorba* L.).

Origin and Distribution.—Sheep's Burnet is a native of Europe and Mediterranean Asia, where it is known as Burnet Poterium, Salad Burnet, and Garden Burnet. It is not extensively cultivated for pasture purposes in any part of the world. In New South Wales and in Southern Queensland it has some value as herbage in mixed pastures.

Description.—The plant belongs to the rose family, and is a tufted perennial with a deep tap root. Much-divided leaves are formed at the crown of the plant, and a dense type of leafy plant results. Towards maturity the plant produces small globular flower heads at the extremities of long flowering stalks. The large angular seeds are brown in colour.

Climatic Requirements.—Whilst Sheep's Burnet is mainly a spring and summer grower it produces a certain amount of green feed during

the cooler months, consequently it is most useful where a well-distributed annual rainfall is received. It is, however, able to survive fairly long, dry periods, provided they are not excessively hot. Frosts have little destructive effect on the plant.

Soils.—Sheep's Burnet appears to be able to live on a variety of soil types, but does best on deep loams. It produces quite well, however, on somewhat poor soils.

Planting.—The sowing of Sheep's Burnet in pure stands is not warranted by the general value of the plant, but a small quantity sown in mixtures will add variety to the diet. Three or four pounds of seed per acre are sufficient in mixtures. Commercial seed is usually of good quality.

Management.—Sheep's Burnet withstands heavy grazing, and its inclusion in pasture mixtures involves no modification of intermittent grazing practices. Should the original stand of the plant commence to thin out, seeding might be encouraged.

Feeding Value.—Experience of this plant is somewhat variable in so far as palatability is concerned. At least when growing on poor soils the plant has a somewhat bitter taste, but in mixtures stock keep it grazed down. The plant is not related to the clovers, and has not the high protein content usually associated with leguminous plants. Nevertheless, chemical analyses of the plant in the immature state suggest it to have a fairly high-feeding value.

[TO BE CONTINUED.]

PREPARATION OF SEED-BED FOR PASTURE.

Various types of seed-bed, ranging from uncultivated forest land to the onion-bed type, are employed for sown pastures. The seed-bed provided by partly cleared forest land, even though some form of harrowing has been carried out, is very unsuitable for pasture establishment, the competition of native grasses and undergrowth usually proving too severe for the seedlings of sown pastures. Likewise, established pastures of native or other grasses are not receptive of additional pasture plants unless a disturbed seed-bed is provided, and a temporary check given to the growth of the established plants, by drastic harrowing. The ashes resulting from scrub burns provide quite a good seed-bed for pasture plants.

By far the best seed-bed is that resulting from the efficient tillage of fertile soil. Most of the common pasture plants have small seeds and require a seed-bed of fine tilth, and by compacting the soil close to the surface a seed-bed is provided which is favourable to the fine, early root systems of the pasture plants. The seed-bed should contain ample moisture, and in dry districts, particularly, cultural operations throughout the seed-bed, preparation period should be carried out with due regard to the conservation of moisture. Ploughing well in advance of sowing is desirable, and the land should be allowed to lie in the rough state for a few weeks before further cultivation is undertaken. Heavy tine harrows, or a spring-tooth cultivator, will be required to break down the clods. Subsequent working should aim at destroying weeds and compacting the sub-surface soil, and shallow harrowings will assist to this end. If the land becomes weedy and the surface sets hard, a disc harrow may have to be used to destroy the weeds. Rolling prior to sowing may be desirable in cases where the ordinary cultivation has not sufficed to form a fine seed-bed.

—*C. W. Winders.*

A New Weed in Tropical Queensland.

W. D. FRANCIS, Assistant Government Botanist.

RECENTLY Dr. L. G. Miles, of the Bureau of Tropical Agriculture, South Johnstone, forwarded a weed for identification and report. He stated that it was growing in a clean area, not grassed, at Japoon. It has attained a considerable spread and, from its seeding habits and vigorous growth, Dr. Miles thinks it has potentialities as a serious pest.

Upon examination, the plant was found to be *Hyptis capitata* Jacq., a native of tropical America. E. D. Merrill, in his "Enumeration of Philippine Plants," Vol. 3, p. 416, remarks that this species is established now in the Marianne and Caroline Islands, Formosa, Java, Amboina, and the Philippine Islands. According to Merrill, it was introduced to the East from Mexico.

The principal features of this species are its opposite, toothed leaves, square stems, and flowers in very dense globular heads which are borne on a long stalk. The more persistent parts of the individual flowers which compose these heads are the bell-shaped or tubular calyx, which is three-eighths to half an inch long, including the five narrow lobes or bristles about one-twelfth of an inch long at the top of the calyx. Within the calyx are four minute nutlets, which are black or dark in colour, and measure less than one-sixteenth of an inch long. Plate 179 illustrates a dried specimen of the plant.

As there are four seeds to each calyx or outer fruit-covering, and numerous calyxes in each seeding head, it is clear that this plant is a very prolific seed-producer.

If the underside of the leaves is examined with a lens, numerous scattered dots can be seen. These dots are small oil glands. They are not confined to this species, but are often found on other plants of the same family (*Labiatæ*). The oil contained in these glands often imparts a peculiar odour to the plants.

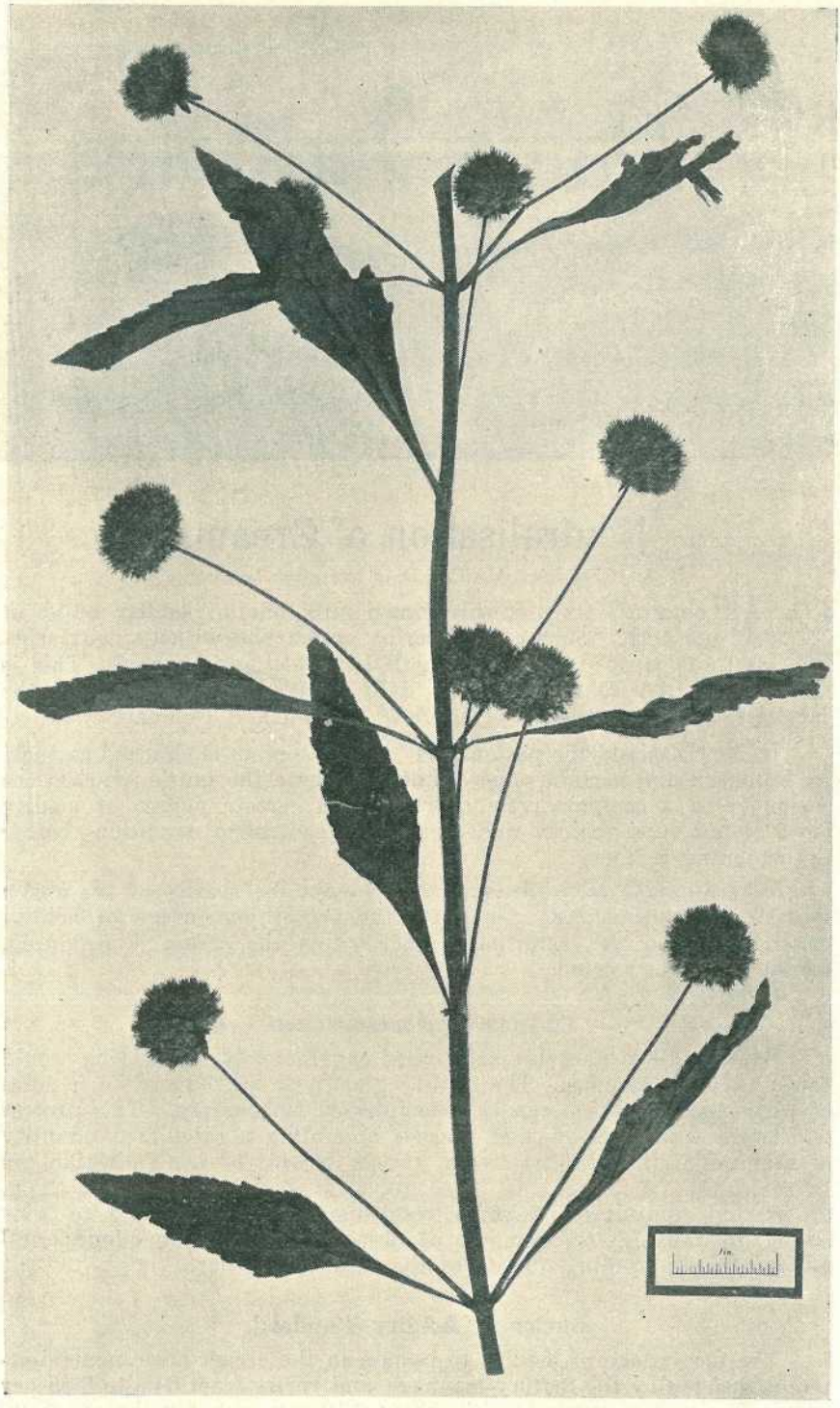
HEXHAM SCENT.

During the past month the Department has received for report a number of specimens of common winter-growing weeds. Among these is the melilot or Hexham scent, a native of Southern Europe, Northern Africa, and Western Asia, but now spread widely as a weed in many warm temperate and sub-tropical countries. As information is always sought about the fodder value of this plant the following notes may be of interest:—

Hexham scent was "boomed" as a fodder in Australia some years ago under the name of King Island Melilot, but experience in Queensland has been that stock do not take very readily to it, and have to become accustomed to its peculiar odour and flavour. It has the great disadvantage of tainting milk and cream rather badly. It is short-lived, being at its best during the spring months, dying-off at the approach of hot weather towards the end of October or early November. As a fodder plant for Queensland during the winter and spring months it is inferior to some of the annual trefoils and clovers—such as the common burr trefoil and cluster clover.

It is a common weed of wheatfields, and if reaped with the wheat and stored for any period the peculiar penetrating odour is communicated to the flour and bread subsequently made. It can be eradicated by ploughing it in, especially in the young stages, when the plant makes a valuable green manure. If cut off near the ground level when it is in flower it will shoot again with numerous short branches, and the cutting will have to be done several times before the root is exhausted. The best time to cut is at the end of the flowering season, just before the seed ripens. In smaller areas hand-pulling or chipping or digging out the weed will prove effective.

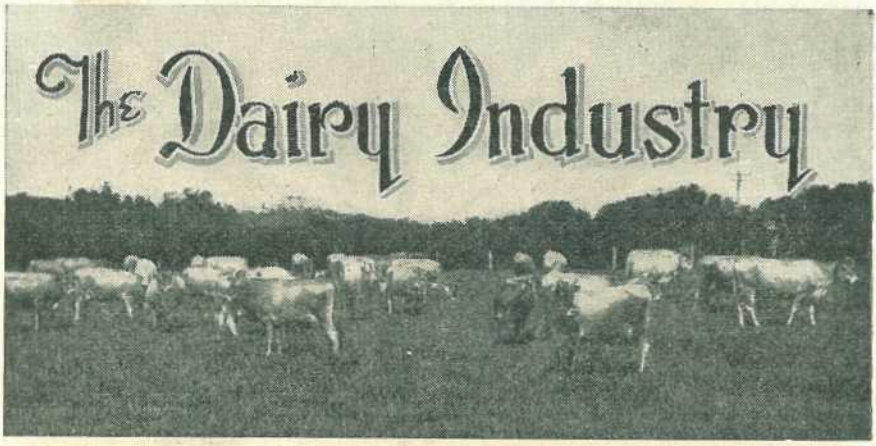
—*C. T. White.*



[*Photo. Dept. Agriculture and Stock.*

Plate 179.

Hyptis capitata, a new weed in tropical Queensland. The inset scale measures 1 inch. The photograph is from a dried specimen.



Neutralisation of Cream.

L. A. BURGESS, A.A.C.I., Dairy Research Laboratory.

CREAM obtained from freshly-drawn milk has an acidity of about 0.12 per cent. Such cream can be pasteurised without neutralisation, as there is no danger of coagulation when it is heated. This is done in certain countries where daily deliveries are made to the factories, notable examples being New Zealand and Denmark.

In New Zealand the pasteurised "sweet" cream is churned as such. In Denmark and certain other countries, where the butter reaches the consumer in a comparatively short time, a certain degree of acidity is developed subsequently under carefully controlled conditions before the churning is done.

Where cream deliveries are less frequent the acidity of the cream is seldom less than 0.25 per cent., the actual percentage of acidity depending upon the conditions under which the cream is produced, stored, and transported.

Objects of Neutralisation.

Sour cream cannot be pasteurised satisfactorily, as heating would cause curdling at once. The acidity first must be reduced to a point at which pasteurisation can be accomplished with safety. This process is termed neutralisation, and consists of adding a calculated quantity of a suitable alkali to the cream. Other objects of neutralisation are to avoid the fat losses due to coagulation of the casein on heating, to prevent undesirable flavours resulting from the heating of sour cream, to assist in the removal of objectionable volatile odours, and to improve the keeping quality of the resultant butter.

Choice of Acidity Standard.

The percentage of acidity to remain in the cream after neutralisation is decided by the factory manager, and varies from 0·05 to 0·25 per cent. The average appears to be about 0.12 per cent. for choice cream, which is approximately that of the freshly separated cream. It generally

is a good policy to aim at a higher residual acidity in lower grade cream, as the acidity test applied to such creams generally indicates more than the true acidity owing to the presence of carbon dioxide. Neutralising such cream to a low degree of acidity therefore could result in over-neutralised or alkaline cream.

The important point in neutralisation is to select definite standards of residual acidity for each grade of cream; and to adhere as closely as possible to those standards until good cause for an alteration is shown.

Accuracy is Required.

Accurate neutralisation depends upon the following factors:—

1. The taking of an accurate sample for the acidity test.

2. The performance of an accurate acidity test.

3. An accurate knowledge of the amount of cream to be neutralised.

4. The accurate weighing of the calculated quantity of the chosen neutraliser.

5. The intimate mixing of the neutraliser with the cream before pasteurisation is attempted.

6. The performance of regular check tests on the neutralised and pasteurised cream.

Taking an Accurate Sample.

This is the most important part of any chemical test as *an analysis can be only as accurate as the sample.* It cannot be emphasised too strongly that the sample taken must be representative of the whole of the cream awaiting neutralisation. It definitely is wrong to take the sample before all the cream has been poured into the vat, before the cream has been diluted or standardised, or before the contents of the vat have been mixed thoroughly. The cream should be preheated to a temperature of 90 degrees to 95 Fahr. in order to emulsify the thick cream thoroughly. A discussion of the standardisation of cream will be found later in this article.

Making an Accurate Acidity Test.

The conditions for accurate acidity tests were given in a previous article ("Queensland Agricultural Journal," June, 1937, Vol. 47, pp. 557-562), and for that reason no detailed discussion here is needed.

Measuring the Cream.

For very accurate work it is necessary to know the weight of cream to be neutralised, but this is not usual in practice. An estimation is made by measuring the volume in gallons and assuming that one gallon of cream weighs 10 lb. Strictly speaking, this is not correct, as a gallon of cream weighs a little less than 10 lb., and the weight of cream is therefore over-estimated. This is one reason why it is usual to find that the reduction of acidity has been slightly more than that desired.

To minimise errors each vat should be provided with a dip stick, which is graduated for that particular vat only. It is only by such means that reasonably accurate neutralisation is possible.

Neutralising Compounds.

A large number of alkaline compounds have been used at various times for the purpose of neutralising cream. Among the more common are sodium bicarbonate, sodium sesquicarbonate, modified sodas, soda ash, lime, calcium carbonate, magnesia, and magnesium carbonate. A number of these are much less suitable than others, and will not be considered.

Sodium Bicarbonate, $NaHCO_3$, is a definite chemical compound, and is obtainable in a high state of purity at a comparatively low cost. It does not absorb water readily from the atmosphere, and is non-caustic. Only when used in excess and subjected to prolonged high heating is there any danger of saponification of fat and excessive fat losses in buttermilk. Its only disadvantage is the large amount of carbon dioxide liberated during neutralisation. Its good qualities, however, have made it the most popular neutralising alkali. One part of lactic acid is neutralised by 0.933 parts of sodium bicarbonate.

Modified Sodas are essentially mixtures of sodium bicarbonate and sodium carbonate. They may be mechanical mixtures of the two compounds in definite proportions, or may be definite crystalline compounds formed by crystallisation of a solution which contains both bicarbonate and carbonate. They also are known as "neutral sodas," which definitely is a misnomer. They are somewhat caustic owing to the sodium carbonate which they contain. Because of this, care must be taken to avoid over-neutralisation in order to prevent saponification of fat. When compared with sodium bicarbonate, there is no justification for claiming a reduction of fat losses, as they have the disadvantages of sodium carbonate in a modified degree. They, however, liberate less carbon dioxide than bicarbonate, and therefore cause less frothing. Each of these mixtures has its own degree of alkalinity, depending on the relative proportions of bicarbonate and carbonate, and hence are usually accompanied by special neutralising instructions or charts. They also find a wide use as cleansers.

Sodium Sesquicarbonate, $NaHCO_3$, Na_2CO_3, $2H_2O$, is really one of the modified sodas, but is a definite chemical compound, which does not absorb or lose water or carbon dioxide on exposure to the atmosphere. It is found, naturally, as the mineral Trona in an impure state; but can be manufactured in a high state of purity at a reasonable cost. The amount of carbon dioxide evolved is only two-thirds ($\frac{2}{3}$) of that evolved by sodium bicarbonate. One part of lactic acid is neutralised by 0·837 parts of sodium sesquicarbonate; nine parts being equivalent to ten parts of sodium bicarbonate.

Sodium carbonate is obtainable in a number of different forms.

Soda ash, Na_2CO_3, is anhydrous sodium carbonate, which readily absorbs both water and carbon dioxide from the atmosphere.

Crystal soda or crystal carbonate, Na_2CO_3, H_2O, is a monohydrate of sodium carbonate, which is more stable than soda ash, but which, nevertheless, absorbs both water and carbon dioxide.

Sal soda or washing soda, Na_2CO_3, $10H_2O$, is the decahydrate of sodium carbonate, and loses water, but absorbs carbon dioxide on exposure. This usually is less pure than the other two forms.

Sodium carbonate is distinctly caustic and, while not considered a suitable neutraliser, it finds wide application as a cleanser.

Lime is used to some extent, particularly for highly acid cream. It usually is used as milk of lime (calcium hydrate), and does not cause frothing. The use of lime is much more difficult than the soda compounds, as the strength and quality of lime varies widely, and each batch of milk of lime made up must therefore be tested to determine its neutralising power and must be kept perfectly mixed until it is required no longer. As it is seldom, if ever, used in Queensland it need not be further discussed here.

Calculating the Weight of Neutraliser Required.

A neutralising chart for the use of sodium bicarbonate, giving the weight of bicarbonate required to neutralise from 1,000 to 5,000 lb. of cream by 0.02 to 0.84 per cent. of acidity has been published by the Department of Agriculture and Stock, and is available for distribution to butter factories. If the demand for sodium sesquicarbonate is sufficient, a similar chart for that neutraliser will be prepared. Commercial firms, particularly those selling modified sodas, also issue neutralistion charts for the neutralisers which they sell.

As the charts are liable to become damaged or destroyed it is essential that the operative performing the neutralising should be able to calculate the weight of neutraliser required.

This depends entirely upon the weight of lactic acid which is to neutralised. This can only be obtained from an accurate knowledge of the amount of cream and the acidity percentage. It is best explainable in stages—

(*a*) Calculate the percentage of acidity reduction required by subtracting the desired acidity from the actual acidity percentage.

(*b*) Calculate the weight of lactic acid to be neutralised by multiplying the weight of cream by the percentage of acidity reduction required and dividing by 100.

(*c*) Calculate the weight of neutraliser required by multiplying the weight of lactic acid to be neutralised by the parts of the neutraliser required to neutralise one part of lactic acid.

Example—

3,000 lb. of cream containing 0.40 per cent. acidity is required to be neutralised by sodium bicarbonate to 0.12 per cent. (1 part of lactic acid is neutralised by 0.933 parts of sodium bicarbonate).

(*a*) Percentage of acidity reduction required=0.40—0.12=0.28 per cent.

(*b*) Weight of lactic acid to be neutralised $= \frac{3{,}000 \times 0{\cdot}28}{100} = 8{\cdot}4$ lb.

(*c*) Weight of bicarbonate required $= 8.4 \times 0.933 = 7.84$ lb. or 7 lb. 13½ oz.

If sodium sesquicarbonate is to be used for neutralisation the calculation would be the same for the first two steps; but the third step would be as follows:—(1 part of lactic acid is neutralised by 0.837 parts of sodium sesquicarbonate).

(*c*) Weight of sesquicarbonate = 8.4 x 0.837 = 7.03 lb.
or 7 lb. 0½ oz.

In practice there is no necessity to work out each stage as shown above. The last two stages are combined into one equation.

$$\text{Weight of neutraliser required in lb.} = \frac{\text{Acidity reduction required} \times \text{Weight of cream in lb.} \times \text{Parts of neutraliser required to neutralise 1 part of lactic acid}}{100}$$

Applied to the above figures the equation becomes

$$\text{Weight of sodium bicarbonate required} = \frac{0{\cdot}28 \times 3000 \times 0{\cdot}933}{100} = 7{\cdot}84 \text{ lb.}$$

or

$$\text{Weight of sodium sesquicarbonate required} = \frac{0{\cdot}28 \times 3000 \times 0{\cdot}837}{100} = 7{\cdot}03 \text{ lb.}$$

The quantity of neutraliser having been calculated, it should be weighed out as accurately as possible. The days of guesswork passed with the practice of neutralising to low acidities, owing to the danger of over-neutralisation.

Mixing the Neutraliser With the Cream.

Having weighed out the required amount of neutraliser, it should be dissolved completely in water, as in this way it is more quickly and evenly distributed throughout the cream. The quantity of water recommended is 2 gallons for each pound of neutraliser.

There are various ways in which the solution of neutraliser may be added, ranging from very crude manual to modern mechanical methods. It should not be mixed in a cream can and dumped bodily into the cream, as this over-neutralises the cream where the neutraliser is added. A water can is sometimes used, and is much better than a cream can. More modern methods consist of spraying the solution into the cream by means of a steam injector, by allowing it to flow from a vessel some height above the vat or by pumping. A recent introduction is a machine which adds a standard strength neutraliser solution at a predetermined rate to the cream as it flows to the pasteuriser. This machine depends for its successful use on the flow of cream being constant throughout the whole pasteurising process. This is not easy of attainment with some pasteurisers, as, after use for some time, the deposit on the pasteuriser interferes with the flow of cream, and over-neutralisation may result. If this machine is being used, frequent acidity tests on the cream from the coolers should be made to see that the neutralisation is being done accurately.

The temperature of the cream when the neutraliser is added should be 90 deg. to 95 deg. Fahr., and it should be kept constantly agitated during the addition, and for some time before pasteurisation is attempted, twenty minutes being a satisfactory period. Unless this time is allowed, the acidity of the cream will not have been reduced sufficiently for efficient pasteurisation.

Performing Check Tests for Acidity.

This is a part of factory routine which frequently is omitted. Check tests on the cream from the coolers is of great value, because it gives the operator immediate information on the accuracy of neutralisation. The butter maker should perform check acidity tests on the cream daily before churning, as this will not only be a check on the accuracy of the neutralisation, but will be of value in deciding the acidity required for the best grading results for each grade of cream. It is dangerous to take everything for granted, and as there are so many factors controlling accurate neutralisation, such check tests serve the purpose of maintaining the keenness of the operator responsible for neutralisation.

Neutralising Standardised Cream.

Cream standardisation, which is merely a process of dilution to a standard percentage of fat, is of value in reducing processed flavours and in controlling the composition of butter. It sometimes is wrongly done after the acidity test has been performed, and difficulty is experienced in obtaining the percentage of residual acidity desired. The addition of water not only reduces the percentage of fat, but also reduces the percentage of acidity, although the weight of fat and acid remains the same. Take for example the following case:—

Weight of cream	3,000 lb.
Fat	40 per cent.
Acidity	0·40 per cent.
Weight of lactic acid	12 lb.
Desired acidity	0.12 per cent.
Acidity reduction required	0.28 per cent.
Lactic acid to be neutralised	8 lb. 6½ oz.
Bicarbonate required	7 lb. 13½ oz.
Weight of residual acid	3 lb. 9½ oz.

If, however, sufficient water is added to reduce the fat to 30 per cent., the figures are as follows:—.

Weight of standardised cream	4,000 lb.
Fat	30 per cent.
Acidity	0·30 per cent.
Weight of lactic acid	12 lb.
Desired acidity	0·12 per cent.
Acidity reduction required	0·18 per cent.
Lactic acid to be neutralised	7 lb. 3 oz.
Bicarbonate required	6 lb. 11 oz.
Weight of residual lactic acid	4 lb. 13 oz.

It, however, should be emphasised that when standardisation of cream is performed the acidity desired should be lowered by the proportion of added water.

In the case quoted there was 1,000 lb. of added water in 4,000 lb. of standardised cream, the proportion of added water therefore being 1 in 4 or ¼. The desired acidity should be reduced by ¼ of 0·12—that is, by 0·03 per cent. The acidity aimed at in the standardised cream should

therefore be 0·12 — 0·03 = 0·09 per cent. The essential figures then would be—

Desired acidity	0·09 per cent.
Acidity reduction required	0·21 per cent.
Lactic acid to be neutralised	8 lb. 6½ oz.
Bicarbonate required	7 lb. 13½ oz.
Weight of residual acid	3 lb. 9½ oz.

It will be noticed that by this method the weight of lactic acid to be neutralised, bicarbonate required, and residual lactic acid is the same as in the non-standardised cream, but that the percentage of residual acidity is lower. It therefore is essential to proceed as follows in order to obtain check tests comparable with the acidity desired:—

1. Standardise the cream to the desired fat percentage and mix thoroughly.

2. Take the sample and perform the acidity test.

3. Aim at a lower residual acidity than is the case when no standardisation is made.

4. Calculate the weight of neutraliser required on the weight and acidity percentage of the standardised cream.

LUNG WORMS IN CATTLE AND SHEEP.

Lung worms in cattle and sheep may become serious during the late winter and spring months. As a rule only the young animals are affected and lung worms should be suspected in any animal showing loss of condition, accompanied by spasms of coughing, signs of suffocation, and scouring. Such symptoms may also be shown by animals which are suffering from a disease of the lungs brought about by some cause other than lung worms. In calves, for example, there is a type of pneumonia caused by bacteria, in which the symptoms are very similar to those associated with lung worm infestation. As the pneumonia due to lung worm infestation and that caused by the bacteria require entirely different treatments, it is always wise to kill an animal in which the disease is far advanced, and examine the lungs. If lung worms are present they will be seen readily, as they occur in bunches in the air tubes of the lungs surrounded by a blood-stained froth.

If the diagnosis is confirmed, the remainder of the animals affected with lung worms should be removed immediately to warm dry quarters and drenched in order to remove other species of worms which might be present in the stomach. This procedure, whilst it does not affect the lung worms directly, increases the animal's resistance to them. Infested animals should be given a good supply of nourishing food, which also assists in building up the animal's strength.

In very severe cases an injection of certain drugs can be made through the windpipe to expel the worms. This operation is not without risk, and in cases where an injection is desirable the assistance of the local stock inspector should be sought.

Further details regarding the drugs to be used for drenching and for injection into the windpipe may be had on application to the Animal Health Station, Yeerongpilly.

—*Dr. F. H. S. Roberts.*

Herd Testing and Profits.

L. A. BURGESS, A.A.C.I., Dairy Research Laboratory.

THE problem facing all dairymen is how to produce the maximum amount of butterfat at the lowest possible cost, while at the same time maintaining, or improving, the fertility and carrying capacity of the pasture and health of the stock. On the farmer rests the responsibility for efficient pasture management; and on the stock that of producing the maximum amount of fat from the food consumed.

All thoughtful farmers must admit that good cows are essential to success. Many claim that they have good cows, and base their claim on factory returns. This, however, is only evidence that the herd as a whole is good, and not that each individual member of it is producing enough fat to pay its way.

A drop in factory returns is unexplainable to such farmers, and they are in a quandary as to where the remedy lies. The farmer who submits his herd regularly to testing can see, by comparing the production records of mothers and daughters, whether the production is being maintained, whether the right cows are being used for breeding, and whether the herd sire is producing profitable or unprofitable daughters. By these means he is able to remedy any possible fault before it affects his factory returns to any noticeable extent.

The productive ability of a cow can be ascertained only by testing. The figures obtained indicate her ability as a producer, under the existing feeding and management conditions, which are controlled by the weather and the farmer. There is ample evidence available to show that the average herd contains animals which do not produce sufficient fat to pay for the food which they consume.

Herd testing is essentially educational. The figures merely disclose the facts, and the responsibility is upon the farmer to carry out the necessary remedies. A farmer who neglects to cull unprofitable animals has only himself to blame if production is stationary or shows a decrease. Failure to act on the part of the farmer cannot be construed, by any means, as a failure of the system of herd testing.

An actual case of well-applied herd testing is as follows:—

Season 1932-33.—A herd of thirty-four cows averaged 194 lb. of fat, total 6,596 lb. At the end of the season no fewer than twenty-six animals were culled.

Season 1933-34.—The herd, reduced to thirty-one members (eight cows retained from previous season, plus five tested pedigree cows and eighteen springers from tested cows), averaged 307 lb. of fat, total 9,517 lb.

Season 1934-35.—The thirty-one cows averaged 340 lb. of fat, total 10,540 lb.

In this case the actual production from the same grazing area rose from 6,596 lb. to 10,540 lb. of fat. The fat per acre thus was nearly doubled, and, with fat at 1s. a lb., the income rose from £330 to £527.

Herd testing will pay handsome dividends, provided that the farmer does his share.

Improving Cream Quality.

J. S. OGILVIE, Dairy Instructor.

ONE point that should be brought home to factory suppliers is that the men supplying inferior cream are taking money actually out of the pockets of the whole of the suppliers, since all inferior cream must have its effect either on butter quality or market conditions. Even if their cream be classed first or second grade, the deduction made by the factory is not adequate always to cover the loss incurred by the extra time and labour which are necessary when the cream has to be treated separately.

In the majority of cases the production of low-grade cream is due to general carelessness in the washing and scalding of dairy utensils, including milking machines—usually exemplified by a quick, cold water wash at night—to the practice of leaving the skim milk alongside the dairy, failure to remove manure from the yards or surroundings, and to untidy conditions generally. Probably 90 per cent. of the inferior cream is due to the causes stated, and the other 10 per cent. is associated with lack of care for the cream after it is separated—such as mixing hot and cold cream, and neglecting to stir the cream regularly, together with seasonal conditions and factors, such as bad water, food, and weed taints.

During the months of November, December, January and February, owing to the extremely humid conditions which characterise most of the dairying districts of Queensland, bacterial development is so rapid that, in order to supply the choicest quality cream, great care is essential. The dairyman's best insurance against the development of an inferior quality is the rapid cooling of the cream below optimum point as a means of retarding bacterial development—that is, to about 70 deg. Fahr., or lower if possible—and the daily delivery of all cream to the factory for manufacture into butter. Under existing climatic conditions, temperature plays such an important part in cream condition that every degree the temperature of the cream can be lowered is an advantage. In this connection it is essential that the cream cooler should be used and that a cream storage room, large enough, and so ventilated as to maintain as low a temperature as possible at all times, should be provided. Many dairies in Queensland fall far short of the ideal, being no more than boxes, and showing (in extreme cases) a temperature inside as high at 115 deg. Fahr. on a hot day. This temperature, maintained for any length of time, could not fail to cause the best cream to deteriorate rapidly.

A large number of yeasty, fermented and other creams with objectionable odours, have been traced to contamination from insanitary pigsties, dirty dairy buildings, and surroundings, skim milk flumes, and skim milk casks outside the buildings which, as often as not, are in an insanitary condition. The use of wooden casks for the storage of skim milk cannot be condemned too strongly. They should be replaced by galvanised iron tanks on a cement floor, as these are cleansed most easily and efficiently after each separation. Under conditions where gravity can be utilised, the use of wide open flumes to carry the milk to the pig pens is much the better method; these, of course, should always be kept clean.

Many dairymen fail to understand what constitutes boiling water. As long as it is "pretty hot" they consider it will do, not worrying about the fact that its temperature is too low to give it germ-killing efficiency. Often, too, there is an inadequate supply of boiling water, due mainly to only one kerosene tin of water having been prepared, which is part mixed with cold water for washing purposes, the balance being used for sterilisation and drying. Inadequate provision also is made for boiling the water. A set-in boiler should be installed. A copper will be found to be more economical in the long run.

Where conditions allow, a direct water supply should be drawn from a tank attached to the dairy house or some other clean source; avoiding, if possible, the use of the milking shed roof as a catchment area, this being a potential source of contamination. Many dairymen consider that one such tank provides an adequate supply of water for dairy purposes all the year round, and make no provision against dry spells. When a dry spell comes, they cart water from creeks and waterholes, often only a few hundred yards distant. Frequently, however, it would be possible, with the expenditure of a few pounds for a pump or windmill, to obtain an ample supply of good fresh water for all purposes for such permanent sources as wells and running streams. The dairy tank should be well protected against the invasion of frogs, birds' droppings, &c.

The dairyman, forgetting that milk and its products are most perishable, too often leaves the washing up of utensils and the care of cream to children or employees, over whose operations he exercises very little or no effective control.

Supplied with the separator is either a tin tube or galvanised iron wire to keep the separator discs together. This leads only to a general swilling of the discs in the water and not the careful washing of each part separately. The result is that the discs are generally left in a greasy, unhygienic state. To ensure thorough cleaning, they should be washed separately and scalded after each separation, and aired in a clean, dry place.

Numerous cases of second-grade cream arise from the use of milking machines, and are due often to infection from the vacuum line, where the old-style plants are in use. These have a large vacuum tank and line, which are very hard to dismantle and clean, and, more often than not, are not cleansed at all. Under such conditions farmers are advised to install the latest type vacuum line and tank. The high price of rubber inflations and tubes causes the dairyman to use them as long as possible, and this fact is responsible for most of his machine taint trouble. Only when he is shown how the rubbers affect the quality does he see the necessity for replacing these. The frequent replacing of these parts usually results in the production of a higher grade cream which offsets easily the money expended.

The inspector, on visiting the dairy, explains his mission, and asks for, and in practically every instance receives, the dairyman's co-operation. Demonstrating with means to hand, he explains how milk and cream can be deteriorated by the hands of the milker, udder and teats of cows, manures, utensils, and general surroundings, and also when awaiting delivery to the factory. In illustrating these points, and

tracing the cause of low-grade cream, the Government Dairy Research Laboratory is proving of great value. Generally speaking, by far the worst cream received at factories comes from dairies where milking machines are in use, and this seems to be due to a want of knowledge, lack of proper care of such machines, and the failure to appreciate the fact that the bacteria associated with milking machines are of a very virulent and active type, which, on entry to the milk during its passage through the machines, are in an actively growing state, particularly where rubbers are kept in plain water. Under ordinary hand-milking conditions these particular bacteria would take twelve or more hours to reach the stage of development that two or three hours would produce in machine cream.

Desirable Conditions.

The percentage of second-grade cream in most Queensland dairying districts would be reduced to a negligible quantity if the following conditions could be fulfilled:—

1. All tin ware, including cream cans, must be tinned thoroughly and have a smooth surface.

2. All utensils, including cream cans, must be sterilised thoroughly with boiling water and cooled before use.

3. A good, clean, pure water supply should be ensured by the use of tanks, windmills, and pumps. As water is an important adjunct, the farmer who has a water supply laid on to the milking shed and dairy conveniently served with taps will be repaid amply for the little extra expense. It must be pointed out, however, that the roof of the milking shed should not be used as a catchment area for water for dairy purposes, owing to the danger of contamination by dust from the yards. Where any doubt exists as to the purity of the water supply, it should be boiled before being used.

4. Ample facilities for boiling water, such as those afforded by a set-in boiler, should be provided as required by the Dairy Produce Acts.

5. The general use, firstly, of cold water for rinsing; secondly, of warm water and washing soda for the first washing; thirdly, of boiling water for proper scalding; and, finally, the draining of all dairy tinware, and the cleaning of the milking plant, should be regarded as essential. Cloths never should be used to dry the inside of dairy utensils. If boiling water is used, they will dry of their own accord, and should be allowed to cool before being used again.

6. Dairymen should have a better general knowledge of milking plants, especially in regard to their cleaning and handling.

7. The use of any utensil, or separator part, whilst it is in a warm state, caused by the sun or hot water, should be avoided.

8. The practice of cooling the cream to as low a temperature as possible; keeping it in cool, clean, well ventilated surroundings, and stirring it frequently and mixing when cool, should be adhered to. Cream should never be allowed to stand in the sun.

9. All cream from dairy to factory should be delivered daily.

Difficult Parturition.

At this time of year, cases of difficult calving are fairly common, and a few hints as to what to do and what not to do may be of value.

When calving becomes imminent, the cow leaves the herd and seeks a quiet spot. There she will become restless—getting up and lying down—and show evident signs of pain.

As labour advances the back is arched, the hindquarters are drooped, and straining becomes violent and continuous. Meanwhile blood may appear on the vulva and tail, and the waterbags protrude between the lips of the vulva. They increase rapidly and the feet of the calf may be seen within them.

The waterbags furnish a soft uniform pressure for the preliminary distention of the womb and passages, and prepare the way for the delivery of the calf. In normal presentations, it is wrong to break these bags prematurely.

When the cow calves standing up, the navel string breaks when the calf falls to the ground; but, when she calves lying down, the string is broken when she rises. A few hours after calving normally, afterpains commence and the placenta or afterbirth is expelled. If this is not expelled within twenty-four hours, it should be removed by careful traction. A good method is to take two sticks about 2 feet long, between which the end of the afterbirth is grasped, and rotated around them until close to the vulva, when gentle traction is applied, from side to side, and backwards and downwards, care being taken not to break it. A vaginal douche of boiled water at blood heat, to which has been added a mild antiseptic, should be given. A cheap and efficient outfit for this purposes consists of about 4 feet of ½-inch rubber hose and an ordinary funnel. The end of the hose should have its edge pared off with a sharp knife, and, after having been smeared with carbolic vaseline, it is introduced into the vagina, and gently pressed forward as far as the womb. The funnel is then placed in the other end of the hose and held above the cow's back, the douche being poured into it.

It is well, at all times, to allow nature to do its work without interference; but, when calving is protracted, and progress is not being made, a careful examination is necessary.

The operator should wear a clean sleeveless shirt, and his arm should be smeared with carbolised vaseline, or an antiseptic oil. This protects the arm from poisoning and the cow from the introduction of infective material into the passage.

The hand should now be introduced into the vagina and a careful examination made. It may be found that (1) the water bags have burst, and that neither the feet nor head of the calf are presented, or that there is a presentation of (2) one fore foot and head; (3) both fore feet, and head back; (4) head with both fore feet back; (5) one hind foot without the other; or (6) other abnormal presentation.

Whatever part is presented should first be secured by a rope with running noose, so that it will not be lost during subsequent manipulation, and may be readily brought into position when the missing parts are found. If the cow is standing, her head should be turned downhill so that the fœtus, and abdominal organs, lie forward to give more room to bring up the missing head or limb. If lying down, she should be turned over on to the side opposite to that on which the limb is missing. When the missing part is located, no attempt should be made to bring it up during a labour pain, but after the pain has ceased an effort should be made to secure it before the next pain comes on.

If pains are continuous and violent, they may be checked by putting a tight surcingle round the body in front of the udder. If it is found that the passages are dry, pure olive oil may be run into the womb through a rubber tube. If the head is back, the limbs which are presented should be first secured with a rope having a running noose, then the fœtus should be pushed as far back as possible and an attempt made to secure the head with a noose or hook, and to bring it up into the passage. Having brought the limbs and head into a suitable position, traction should now be applied in a downward and backward direction, but only when the cow is straining.

Pulling when the cow is not straining should not be attempted. Patience and care are necessary. The practice of attaching a draught horse or motor car to the fœtus and pulling it out by sheer force is not only cruel, but usually results

in the death of both the cow and the calf. After a protracted calving the cow will be exhausted, and she should be provided with a warm rug and bed, also a few bottles of warm gruel.

Points to remember are:—

Do not interfere too soon.

When interference is necessary, exercise patience and take time.

Do not use force until the fore feet and head or the hind feet are secured in position.

Remember to pull only when the cow is straining.

—W. Dixon, Stock Branch.

RED-WORMS IN HORSES.

Red-worm disease is one of the most serious diseases of horses in Queensland. The disease is caused by the presence of large numbers of red-worms, which inhabit the first part of the large bowel. Those worms vary in size from about ½ inch to 1½ inches in length and, in a freshly-killed carcase, may be found adhering to the membrane on the inside of the bowel. Their reddish colour is due to the fact that the worms suck blood.

If the worms are numerous, the infested animal does not thrive well, the coat becomes rough, and loss of condition and weakness follow. Diarrhœa is frequently present, and in severe cases the blood becomes thin, the eyes become sunken, the whole appearance of the animal becomes very dejected, and finally death may supervene. The symptoms are gradual in their onset, and the disease may thus be in an advanced stage before it attracts the attention of the owner.

The worms do not multiply within the bowel, and each one of the many thousands that may be present has been picked up as a young worm from the pastures. These young worms in the pastures have arisen from worm eggs which have been passed from the body of the horse in the dung. As these young forms may live among the grass as long as four years, a paddock on which horses are permanently grazed may become heavily infested.

The most efficient drug for the treatment of red-worm disease is oil of chenopodium, which may be most easily administered, after mixing with raw linseed oil, by means of a bottle or a drenching bit. The animal to be treated should be starved for thirty-six hours before, and for four hours after the administration of the drug. The oil of chenopodium is given at the rate of 1½ drams for every 250 lb. live weight in 1 to 2 pints of raw linseed oil. Oil of chenopodium is a highly poisonous drug, and those wishing to use this treatment are advised to get in touch beforehand with the Animal Health Station, Yeerongpilly. In areas possessing a high rainfall, three or four treatments should be given during the year.

In addition to treatment, an attempt should be made to prevent reinfestation. For this purpose, it would be better not to graze horses continually in a single paddock, particularly if it is swampy. Attention should be given to the regular collection of manure from stables and yards. Heavy stocking is not to be recommended, and young horses (up to three years) should, if possible, be kept away from pastures that have been much grazed by horses.

—Dr. F. H. S. Roberts.

Winning Pig Exhibits.

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

KEEN rivalry, a fine progressive spirit, and a marked all-round betterment in type and conformation of the breeding stock shown, were the outstanding features of the 1937 exhibition of stud and commercial pigs at the Brisbane Show.

In most of the classes there was a sufficient number of good animals to give the judges plenty of variety, and some stock of really excellent quality were paraded.

The pens of recently imported pigs (Berkshires and Middle Whites), the property of the Department of Agriculture and Stock, and, for the purpose of comparison, the Canadian Berkshire boar, the property of the Department of Public Instruction, added interest to the show.

PRIZE-WINNING STOCK.

Berkshires always are the centre of interest to those favouring this British breed, for it is well known that they have an adaptability to farm conditions, and can be used for cross-breeding for both the local and export markets.

The champion Berkshire boar, Woodbine Lentonius 5th, shown by Wide Bay Stud Piggery, Gympie, is of the long, roomy, deep-bodied type, full of quality. He is a son of that remarkable sow Lenton Patience (imp.) purchased in England several years ago by Mr. F. Bach, of Oakey.

The Queensland Agricultural College was awarded second prize in the over two year boar class, with Grafton Jock. A variation in type was noted in the much more compact reserve champion boar Kapleton Supreme, shown by O. L. Klein. He won in a class of six in which Goodna Hospital secured the additional award.

The younger boars were of excellent type, and included many prize winners.

Plate 180.

Berkshire Sow and Litter, second prize winning group. The sow, "Wide Bay Zella," won reserve championship. The litter, thirteen in number, were lucky in that all travelled safely from Rockhampton and were in good order at completion of Show.

Championship in the female classes went to F. Bach with Bonvale Jewel 2nd, sired by Woodbine Lentonius. A Wide Bay Stud exhibit won the second prize, and M. Porter and Sons gained third award with Roselock Queen.

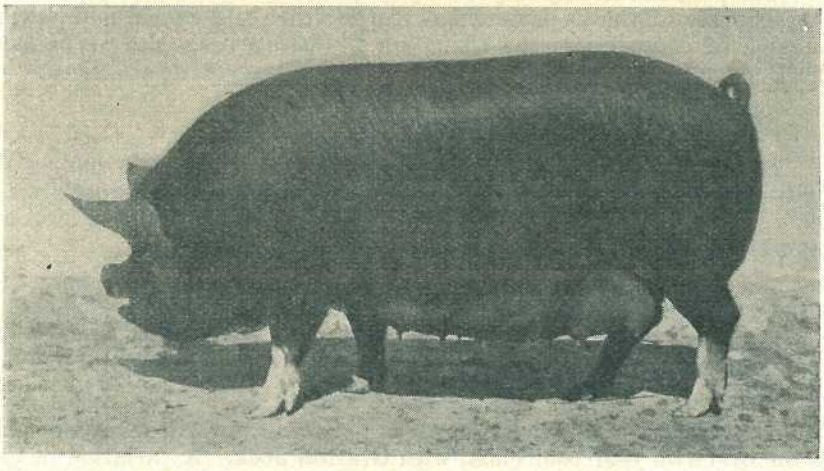


Plate 181.

Reserve Champion Berkshire Sow, "Wide Bay Zella," shown by Mr. A. W. Hodgkinson, of Rockhampton. She is the mother of litter shown in Plate 180.

The reserve champion sow, Wide Bay Zella, shown by A. W. (Jerry) Hodgkinson, with her litter of thirteen, was a winner also in the class for sow and litter in which F. Bach, with Woodbine Amelia and litter, won first award. There were very liberal entries in most of the younger classes, no fewer than sixteen sows being penned in class five months old and under eleven months, and twenty-two in class under five months of age. F. Bach with Thicket Baron 2nd won the boar and progeny prize, and O. L. Klein the breeders' group.

As in the other stud classes, special sashes were presented to the champion winners in each breed by the Australian Stud Pig Breeders' Society, and special ribbons and reserve rosettes by the Royal National Association.

The silver medal presented by the National Pig Breeders' Association of England was awarded to F. Bach's champion sow.

LARGE WHITES.

The total entry of Large Whites was not up to previous years' standard and there was considerable variation of type, nevertheless some excellent quality animals were penned. Some of the senior animals were much too fat and were inclined to be heavy boned in comparison with those selected for premier awards. The champion boar, A. G. Wallace's St. Cloud Bradbury 3rd, was selected from the class under

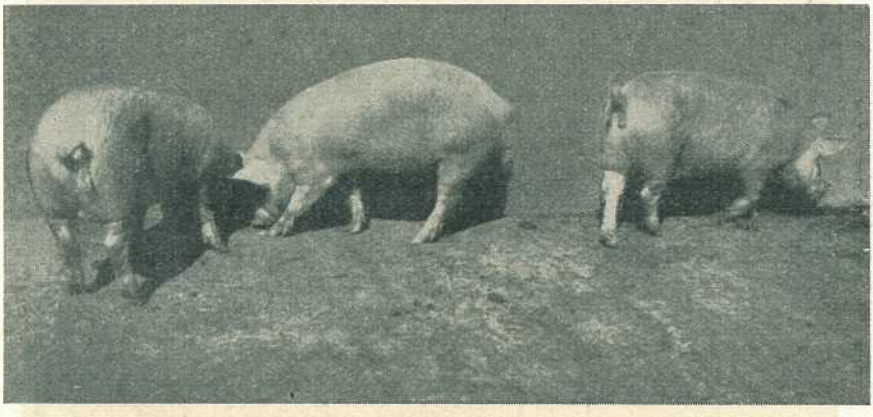


Plate 182.

First prize Light Baconers. Exhibited by Mr. M. G. Bayliss, of Maleny, a choice quality lot of Large Whites, in ideal condition for factory requirements.

seventeen months of age in which the Queensland Agricultural College had the second award with Gatton Samson 55th. Similarly, the reserve champion came from the class under eleven months, in which J. A. Heading, with Highfields Hardshot 7th, was the successful winner. Mittadale Stud Piggery won second award with Mittadale Sam, and A. G. Wallace third, with Rose Mount Chief. Mr. Wallace won first award in class over two years old with Rose Mount Bradbury 3rd, and J A. Heading second with Gatton David. Mr. Heading and W. H. Mumford won the awards in the class over seventeen months and under twenty-four months in each with boars of "Highfields" production.

The Large White sow, Staghorn Belle, shown with a large, thrifty litter, by A. G. Wallace, a New South Wales exhibitor, attracted considerable attention, and was a centre of interest throughout show week.

In the female classes, the champion sow was Highfields Pear 29th, shown by M. G. Bayliss. She also secured the special medal presented by National Pig Breeders' Association. The second prize was allotted to Mr. Wallace's Staghorn Belle, which also was shown in the sow and and litter class.

The reserve champion sow was J. A. Heading's Highfields Peg 13th, sired by the former champion Gatton David There were many fine-quality sows in the younger classes.

The boar and progeny prize went to Gatton David and his progeny, shown by Mr. Heading, who was also awarded the trophy for the breeders' group.

MIDDLE WHITES.

In the Middle White male classes the Salvation Army Training Farm, at Riverview, secured the championship with Armagh Hero 1st, a competitor in the class in which H. O. Rees secured second award.

A new exhibitor, J. H. Teague, gained first award with Turo Hivite in the class for boars over seventeen and under twenty-four months. One of T. M. Wallace's boars was placed also in the same class.

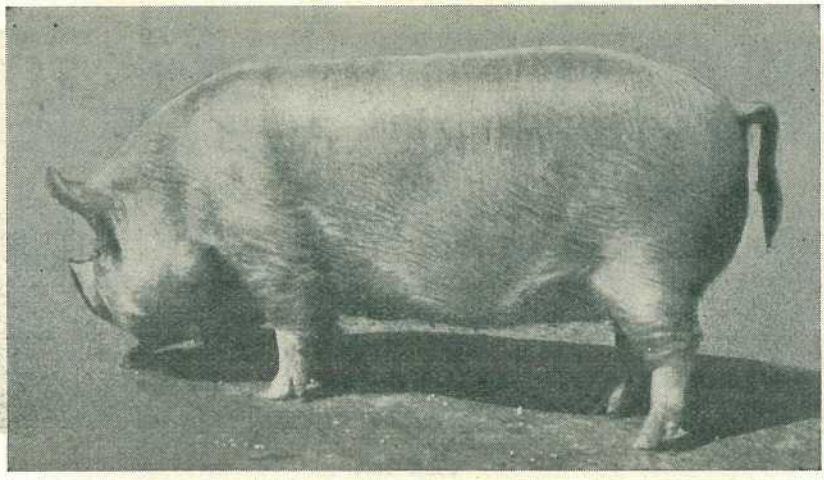


Plate 183.

Mr. J. H. Teague's Champion Middle White Sow, "Turo Boronia 2nd," who secured for her owner a coveted award on the occasion of his first penning an exhibit at the Royal National.

The reserve champion boar was T. M. Wallace's Armagh Peer 3rd. The champion sow was J. H. Teague's Turo Boronia 2nd, the reserve being Gladesville Blossom shown by T. M. Wallace.

The Middle White breed in Queensland has improved greatly in recent years, and it is hoped that the importation of unrelated strains, and the distribution of the progeny of the imported stock, will do much more to assist in building up this breed. Mr. Wallace secured both the boar and progeny prize and the trophy for breeders' group.

TAMWORTHS.

An increasing tendency for Tamworths to become too compact and to carry too much condition for their size and age makes the judging of this breed difficult.

The championship in the male classes was won by M. Moffatt with a grandson of that remarkable old boar, Whittingham Red Start (imp.), a boar whose progeny have realised over £1,000, in addition to producing a very large number of prize winning and useful breeding animals. The reserve champion was Lawn Hill Rex, shown by F. Thomas, a new exhibitor from the Beaudesert district. Wide Bay Stud obtained first award in the class for boar two years and over with South Burnett Starlight. Wollongbar Sunstar, shown by P. V. Campbell, was placed

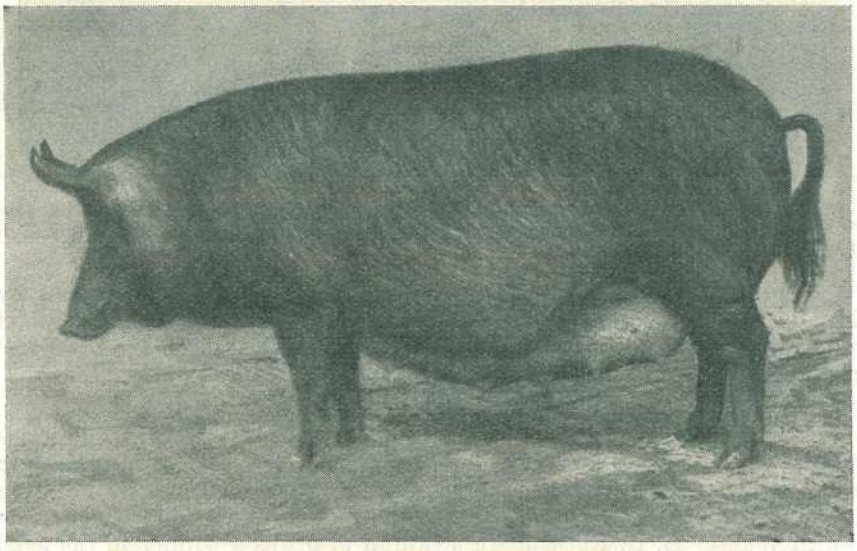


Plate 184.

Mr. J. Barkle's Champion Tamworth Sow, "Wattledale Lydia Pet," a deep-bodied, roomy matron of modern type.

second. In the class for boars under seventeen months but over eleven months, the boar Wattledale Wonder, shown by Mr. Barkle, secured the award, and was afterwards purchased for a Government Stud in Western Australia. O. L. Klein's exhibit won the second award. Mr. Barkle obtained many of the awards in the younger boar classes, sharing these with Messrs. Campbell, Moffatt, and Champney.

The Tamworth sows and litters were the best seen at any Australian show, an indication that, if properly handled, this breed will continue to maintain its reputation for prolificacy. P. V. Campbell secured first and E. M. Melville second awards, with sows and litters that were hard to beat.

The champion sow, Wattledale Lydia Pet, was a very fine animal, and should develop into a grand breeder as she lengthens out and becomes deeper in body. Mr. Barkle also secured reserve champion with the champion's dam, Ascot Vale Lydia Pride, a really good sow,

which has reared excellent litters. E. L. Melville and the Wide Bay Stud shared awards in the class for sows eleven months old and under seventeen months, in which Mr. Campbell's exhibit also was placed.

Plate 185.

Mr. P. V. Campbell's prize winning Tamworth Sow and Litter. The sow, "Wattledale Lydia Pride," was giving her litter liberal supplies of milk, and is herself a really good mother.

The first prize sow in the under five months old class, shown by Mr. Barkle, also has since been sent to Western Australia. Mr. Campbell won in the boar and progeny class, and Mr. Barkle secured the breeders' group award.

WESSEX SADDLEBACKS.

The Wessex Saddleback breed is making steady progress, and this year's exhibits were the best that have been seen at any Australian show so far. The championship was won in the male classes by Pensilva Monarch 2nd, shown by Bruce P. Stephens, of the Richmond River, New South Wales. E. B. Ruthenberg's exhibit also was a winner in the aged boar class. The reserve champion boar was R. Turpin's Pensilva Jumbo 3rd.

The sows and litters were good, the awards being gained by R. Turpin, the original importer of this type, whose entries, with those of Messrs. Stephens, Ruthenberg, and Sellars, also were awarded prizes.

YIELD OF CARCASE IN PORK AND BACON PIGS.

The loss of weight in transit of a pig from farm to factory, and then during dressing, varies very much, and it is not possible to say exactly what weight a pig will lose.

Factors which affect the amount of loss are:—The size of the pig—the larger pig will lose a lower percentage—the manner in which the pig had been fed; the length of the journey from farm to factory; the conformation and condition of the pig and the amount of food contained in its alimentary tract when it is weighed alive.

In tests it has been shown that under conditions similar to those ordinarily ruling in Queensland, pigs weighing 150 lb. to 200 lb. alive on the farm lose about 10 per cent. of this weight in transit to the factory, and then another 20 per cent. in dressing. Lighter pigs, weighing 100 lb. to 140 lb. alive, usually lose approximately 33 per cent. by the time they are dressed. Whilst these figures possibly are a fair average, individual pigs vary considerably according to the factors already mentioned.

As a rough guide in estimating dressed weight from live weight, farmers usually take seven-tenths of the live weight for baconers and two-thirds of the live weight for porkers.

—*L. A. Downey.*

A Substitute for Milk in Pig-feeding.

L. A. DOWNEY, Instructor in Pig Raising.

ONCE again at this time of the year most pig raisers are faced with the problem of feeding pigs with little or no milk. It is known generally that meatmeal is a good substitute for separated milk in the pig's diet, but unless it is used carefully, meatmeal may prove an expensive food.

Meatmeal, which is a by-product of abattoirs and meatworks, is sold under several trade names and some varieties contain a small percentage of bonemeal. It is a wholesome food, convenient to use, and costs from 9s. to 10s. 6d. per 100-lb. bag, Brisbane, the higher-priced brands containing a higher percentage of protein.

As meatmeal is so expensive in comparison with pig foods grown on the farm, it should not be used more freely than is necessary.

Separated milk, which meatmeal replaces, is used according to its availability, pigs sometimes receiving milk as their sole diet, but actually pigs will thrive on very small quantities of milk used in combination with grain and other foods such as pumpkins and sweet potatoes; the milk supplies a large part of the protein necessary to balance the ration. Each pig from the time of its weaning until the baconer stage and each dry sow should receive a minimum of three-quarters of a gallon of separated milk daily, and each sow with a litter double that quantity.

When these minimum quantities of separated milk are not available, meatmeal may be substituted, using ½ lb. of meatmeal to replace each three-quarters of a gallon of separated milk.

Pigs thrive on a mixture of milk and meatmeal, or meatmeal alone as the protein-rich portion of the diet. The quantities used should not exceed from ¼ to ½ lb. daily per pig from weaning to baconer stage, according as to whether good lucerne is available or not; and ½ lb. for each dry sow and 1 lb. daily for each sow with litter.

By feeding a constant quantity of separated milk or meatmeal, and increasing the grain and other foods according to the pig's appetite, the nutritive ratio is widened automatically as the pig grows and satisfies its requirements.

In cases where pigs have access to good young pasture or green crops, the minimum quantity of separated milk or meatmeal stated above may be reduced by up to 50 per cent., depending on the quality of the green foods.

Meatmeal may be fed dry or mixed with milk or water.

"A PIG PRODUCER'S PARADISE."

"Climatic advantages which enabled the growing of abundant and cheap food all the year round and the keeping of pigs in the open with a minimum of expense makes Queensland what would be regarded by many less favourably situated countries as a pig producer's paradise." That was what a Southern pig farmer said to his neighbours when he got back home from a Queensland tour which included the Darling Downs, Gympie, and Mary River districts, where the conditions are, to his mind, the very best for large-scale pig raising. Of the pigs slaughtered for export last year, more than half were contributed by Queensland.

Export Bacon Pigs at the Brisbane Show.

TO encourage the production for export of the most desirable class of pig meat the Royal National Association provides attractive classes in its schedule each year. This year the class for export baconers suitable for the English trade provided for the judging of the pigs alive and as carcases.

The prize money for the class amounted to £40, of which £25 was provided by the Department of Agriculture and Stock, by direction of the Honourable the Minister, Mr. F. W. Bulcock.

The results of the competitions are so interesting and instructive to pig raisers that they are presented here, together with the comments of the judges, Messrs. E. J. Shelton, Senior Instructor in Pig Raising, and L. A. Downey, Instructor in Pig Raising. Mr. Downey judged the live pigs, and Mr. Shelton and Mr. Downey judged the carcases.

The schedule required entries of three baconer pigs, either pure-bred or sired by a pure-bred boar, each 180 lb. to 220 lb. live weight, most suitable for the English market.

The pigs were judged, firstly, alive on the showground on the 16th August as a pen of pigs using a score card, which, it was expected, would give exhibitors a little indication of their value, in the opinion of the judge. Notes made by the judge at the time of judging the live pigs are shown on the award sheets. The pigs were kept at the showground during show week, and then transported to the Brisbane Abattoir, where they were slaughtered on the 25th August. During the time the pigs were held at the showgrounds and at the Brisbane Abattoir they were fed; but there is a possibility of some of them gaining weight and of others merely maintaining their weight, or even losing. Probably the thin pigs became thinner and the fat pigs became fatter during the period.

After the pigs were slaughtered and dressed, and the carcases chilled, they were judged on the system of measurements as provided by English authorities for use on Empire pigs being supplied to the United Kingdom. This system of valuation has been standardised, after several years of research work, by three eminent scientists and one of Smithfield's leading authorities in the pork trade; it is based on measurements and standards which leave practically nothing to the individual opinion of the judge.* The system of valuation is closely related to consumer requirements, and so it can be taken as the most exacting and reliable guide to carcase quality. The marking standard of this English system is severe; and so it is a good carcase which gains 50 per cent. or more of the maximum marks. Measurements are taken in millimetres rather than inches to avoid fractions; 25 millimetres equals 1 inch.

When it is possible to judge carcases, there is little, if anything, to be gained by judging the pigs alive, for in the live pig the judge must use his imagination to some extent, and in the class under review it must be considered somewhat fortuitous that the pens awarded first and second alive gained the same awards in the carcase competition.

There were nine entries in the competition, and full details of the awards to individual pigs and to each entry are given in the attached sheets.

* For further information of this system of carcase judging, see the Pig Breeders' Annual, 1936-37, or the "Queensland Agricultural Journal," August, 1937.

The class as a whole appeared to be a fairly good lot, although there were a number of entries which were obviously too thick—that is, too fat and short in relation to their weight—and there was sufficient difference between the best and the worst to provide a good object lesson to interested people.

Criticism during show week by breeders of pigs and others was interesting in that the bulk of opinion was that some individual pigs were much too thin. The carcases, however, revealed that most of the pigs were too fat rather than too thin, and the only pig which was too thin was actually only 3 millimetres below the ideal for backfat measurement and gained 17 marks from a maximum of 20, which was the fifth highest award for the whole twenty-seven pigs. This particular pig gained the highest score in the carcase judging, with 94 marks from a possible 115. This seems to indicate that general opinion favours a live pig which is actually too fat for the English trade, for which Australia is catering.

The carcase values of individual pigs may be seen from a study of the award sheets and the accompanying photographs, each telling a useful story.

Comments on the Individual Entries.

Entry No. 432, Large Whites, entered by Mr. S. S. Appleby, Maroon, were good baconers, one pig being noted as a little slack when judged alive. Actually this pig, although slightly thin, gained the greatest total when judged as a carcase. These pigs were good in most respects, their weakest feature being the eye of meat, which could have been thicker. This entry won both the live pig and carcase competitions.

Entry No. 433, Tamworth x Berkshire pigs, were entered by Mr. H. C. Badke, Beaudesert. They were noted alive as being too short and thick, and the carcases revealed this to be the case, as the three pigs gained only 30 per cent. for backfat thickness, and 11·6 for body length in proportion to weight, even though they were very lightweight carcases. This indicates that they were more of the porker type pigs than of the heavy baconer type.

Entry No. 434, Tamworth, entered by Mr. P. V. Campbell, Lamington, were considered to be too short and fat in the middle, and too long in the legs when judged alive. Their carcases lost points on the hams, and gained only 31·6 per cent. for backfat and 13·3 per cent. for body length, in proportion to weight. One of these pigs, weighing 161 lb., gained the lowest award for leg length, its leg measuring 612 millimetres.

Entry No. 435 were Mr. M. Gnech's Berkshire x Tamworth. They were noted as being too short and thick at the live judging. Their carcases scored well in many respects, but lost heavily in backfat and body length. These pigs probably would have made good heavy porkers, or light baconers, but were over-conditioned at heavy bacon weights.

Entry No. 436 were Large Whites, shown by Mr. J. A. Heading, Murgon. At the live judging they were noted as good but somewhat thick, and were placed sixth, being 5 points behind the third prize pen. Their carcases scored very well in most respects, gaining well in streak

and backfat, but receiving only 23 per cent. for body length. However, their consistency in all other points brought them up to third place in the carcase competition.

Entry No. 437, Mr. E. L. Melville's Tamworths, were noted as a good pen, but too leggy and somewhat slack underneath. Their carcases gained 92·8 per cent. for eye muscle, which is particularly good. However, two carcases in this entry failed badly in being too fat and too short. They also were too long in the leg.

Entry No. 438 were Mr. E. B. Ruthenberg's Wessex Saddlebacks. These pigs were noted as being a good pen with one pig somewhat slack underneath, and one being over-conditioned. The carcases scored fairly well in all points excepting backfat, where two of them lost heavily through being too fat, the other pig scoring 16 out of 20 marks on this feature. This entry gained third place in live judging; but through two of the carcases gaining only one point from a possible 20 for backfat, the entry went back to fifth place in the carcase judging.

It is interesting to note that the general opinion on this pen at the showground was that one of the pigs was unfinished. Its carcase, however, gained 80 points, as compared with 62½ and 59½ gained by the other two pigs which were too fat.

Entry No. 439 was a pen of Wessex, exhibited by Mr. R. Turpin, Lowood. This pen gained second prize alive and second prize as carcases. The noting on this pen, when judged alive, was that they were a good lot but somewhat leggy and slack underneath. The remark about their leg length was not borne out by the measurement on the carcases; but the slackness underneath, apparent in the live pigs, probably can be associated with the marks gained for the streaks, which were not all that could have been desired. These carcases were consistently good, and one of their best features was their good thickness of eye muscle. Each of these pigs showed "seedy cut" in the belly.

An interesting feature about one pig in this entry, whose carcase weight was 163 lb., was its good body length. It was the longest bodied pig in the competition, measuring 836 millimetres, and gaining 18 marks out of 20 for this feature. This pig had 15 pairs of ribs, more than any other pig in the competition, and it also had 16 well-placed teats. This might be taken as an indication that good body length is associated with a large number of well-spaced teats.

Entry No. 440 were Berkshire x Large Black, exhibited by Mr. J Vellacott, Boonah. These pigs were noted, when judged alive, as being too thick for their weight, and they were placed last in the live awards. Their carcases gained fair marks in most respects and 89·5 per cent. for hams; but, in two of the most important features—namely, backfat and body length—they lost heavily, being much too fat and too short in comparison to their weights. These pigs' carcases all had a dark pigmentation on the skin.

Whilst it would not be wise to draw inferences regarding the comparative merits of various breeds for heavy bacon from the few pigs included in this report, individual breeders will be able to arrive at their own conclusions regarding the trend of "type" within their breeds.

TABLE I.

	Maximum Marks.	Catalogue No. 432. Tattoo W1.				Catalogue No. 433. Tattoo W3.				Catalogue No. 434. Tattoo W4.			
		Weights on 25-8-37.			Total Per Cent. of Three Pigs.	Weights on 25-8-37.			Total Per Cent. of Three Pigs.	Weights on 25-8-37.			Total Per Cent. of Three Pigs.
		150	165	145		131	132	140		183	141	161	
AWARDS FOR LIVE PIGS.													
Condition	70		67		95·7		52		74·2		58		82·8
Uniformity and type	20		18		90·0		12		60·0		15		75·0
General appearance	10		9		90·0		5		50·0		6		60·0
Total	100		94		94·0 First		69		69·0 Seventh		79		79·0 Fourth
Judge's comments on live pigs	..	Good one pig a little slack underneath.				Too short and thick.				Somewhat short in middle and too fat; too long in legs.			
AWARDS FOR CARCASES.													
A. By inspection—													
Skin—Smooth and fine	5	5	5	5	100·0	4	4	4	80·0	4½	4½	4½	90·0
Fat—Firm	10	10	8	10	93·3	9	9	8	86·6	9	9	9	90·0
Hams—Well-filled and fine-boned	8	4½	8	4½	70·8	5	6	5	66·6	4½	4½	4	54·1
Shoulders—Light	7	5½	5½	7	85·7	4½	4½	4	61·9	5½	7	6	88·1
Streak—Thick, full of lean meat	12	11	11	11	91·6	5	5	5	41·6	7	5	7	52·7
B. By measurement (in mms.)—													
Eye muscle of loin—Thick	28	[45] 19	[40] 13	[43] 17	58·3	[42] 17	[43] 18	[34] 3	45·2	[52] 24	[37] 9	[45] 18	60·7
Back-fat thickness—Correct proportion to weight	20	[18] 17	[28] 12	[24] 16	75·0	[29] 1	[23] 16	[38] 1	30·0	[33] 4	[31] 1	[27] 14	31·6
Body—Long, in proportion to weight	20	[811] 17	[807] 10	[800] 17	73·3	[695] 2	[705] 4	[712] 1	11·6	[786] 1	[733] 6	[742] 1	13·3
Leg length—Short, in proportion to weight	5	[546] 5	[556] 5	[570] 4	93·3	[544] 5	[514] 5	[528] 5	100·0	[574] 5	[583] 2	[612] 1	53·3
Total	115	94	77½	87½		52½	71½	36		64½	48	64½	
Total (three carcases)	345		259		75·07 First		160		46·37 Eighth		177		51·01 Seventh
Grand Totals (live pigs and carcases)	445		353		79·3 First		229		51·01 Eighth		256		57·5 Sixth

NOTE.—Measurements for eye muscle, back-fat thickness, body length, and leg length are in millimetres, indicated by the [black] figures.

TABLE II.

	Maximum Marks.	Catalogue No. 435. Tattoo W5. Carcase Weights on 25-8-37. 155	149	152	Total Per Cent. of Three Pigs.	Catalogue No. 436. Tattoo W6. Carcase Weights on 25-8-37. 152	150	142	Total Per Cent. of Three Pigs.	Catalogue No. 437. Tattoo W7. Carcase Weights on 25-8-37. 150	161	151	Total Per Cent. of Three Pigs.
AWARDS FOR LIVE PIGS.													
Condition	70		50		71·4		55		78·5		57		81·4
Uniformity and type	20		12		60·0		14		70·0		14		70·0
General appearance	10		5		50·0		6		60·0		6		60·0
Total	100		67		67·0 Eighth		75		75·0 Sixth		77		77·0 Fifth
Judge's comments on live pigs		Too short and thick.				Good, somewhat thick.				Good; leggy, and a little slack underneath.			
AWARDS FOR CARCASES.													
A. By Inspection—													
Skin—Smooth and fine	5	4	4	4	80·0	4½	4½	4½	90·0	3½	3½	3½	70·0
Fat—Firm	10	10	10	10	100·0	7	7	7	70·0	7	7½	7	71·7
Hams—Well-filled and fine-boned	8	8	7	7½	93·7	5½	5	5½	66·6	4	4	4	50·0
Shoulders—Light	7	3½	3	3	45·2	4½	4½	4½	64·3	6	6	6	85·7
Streak—Thick, full of lean meat	12	7	7	7	58·3	10	10	10	83·3	9	9	9	75·0
B. By Measurement (in mms.)—													
Eye muscle of loin—Thick	28	[48] 22	[44] 18	[45] 19	70·2	[49] 23	[45] 19	[47] 21	63·1	[51] 25	[52] 25	[54] 28	92·8
Back-fat thickness—Correct proportion to weight	20	[30] 4	[35] 1	[29] 7	20·0	[23] 18	[24] 18	[18] 18	90·0	[33] 1	[32] 1	[26] 14	26·6
Body—Long, in proportion to weight	20	[728] 1	[706] 1	[728] 1	5·0	[751] 5	[733] 2	[742] 7	23·3	[743] 4	[764] 4	[780] 11	31·6
Leg length—Short, in proportion to weight	5	[503] 5	[512] 5	[522] 5	100·0	[546] 5	[564] 5	[558] 5	100·0	[587] 3	[590] 3	[580] 3	60·0
Total	115	64½	56	63½		82½	75	82½		62½	63	85½	
Total (three carcases)	345		184		53·33 Sixth		240		69·56 Third		211		61·15 Fourth
Grand Total (live pigs and carcases)	445		251		56·4 Seventh		315		70·7 Third		288		64·7 Fourth

NOTE.—Measurements for eye muscle, back-fat thickness, body length, and leg length are in millimetres, indicated by the [black] figures.

TABLE III.

	Maximum Marks.	Catalogue No. 438. Tattoo W8. Carcase Weights on 25–8–37. 151	152	146	Total Per Cent. of Three Pigs.	Catalogue No. 439. Tattoo X7. Carcase Weights on 25–8–37. 157	170	163	Total Per Cent. of Three Pigs.	Catalogue No. 440. Tattoo X8. Carcase Weights on 25–8–37. 157	168	161	Total Per Cent. of Three Pigs.
AWARDS FOR LIVE PIGS.													
Condition	70		58		82·8		67		95·7		50		71·4
Uniformity and type	20		15		75·0		16		80·0		12		60·0
General appearance	10		7		70·0		8		80·0		5		50·0
Total	100		80		80·0 Third		91		91·0 Second		67		67·0 Eighth
Judge's comments on live pigs		Good; one a little slack underneath, and one over-conditioned. Bone coarse.				Good: somewhat leggy and slack underneath.				Too thick for their weights.			
AWARDS FOR CARCASES.													
A. By Inspection—													
Skin—Smooth and fine	5	3	3	3	60·0	3½	3½	3½	70·0	3½	3½	3½	70·0
Fat—Firm	10	9	9	9	90·0	7	7	7	70·0	7	5	6	60·0
Hams—Well-filled and fine-boned	8	3	4	4½	47·9	6	5½	6½	75·0	7½	7	7	89·5
Shoulders—Light	7	4½	4½	4½	64·3	5	4	6	71·4	3	3	3	42·8
Streak—Thick, full of lean meat	12	6	6	6	50·0	8	8	8	66·6	7	7	7	58·0
B. By Measurement (in mms.)—													
Eye muscle of loin—Thick	28	[43] 17	[42] 16	[45] 19	61·9	[53] 27	[50] 23	[46] 19	82·1	[42] 16	[42] 15	[47] 20	60·7
Back-fat thickness—Correct proportion to weight	20	[33] 1	[32] 1	[24] 16	30·0	[26] 14	[31] 7	[22] 20	68·3	[37] 1	[36] 1	[32] 1	5·0
Body—Long, in proportion to weight	20	[793] 14	[780] 11	[782] 13	63·3	[798] 13	[802] 7	[836] 18	63·3	[724] 1	[709] 1	[762] 1	8·3
Leg length—Short, in proportion to weight	5	[548] 5	[552] 5	[560] 5	100·0	[546] 5	[587] 5	[563] 5	100·0	[528] 5	[537] 5	[551] 5	100·0
Total	115	62½	59½	80		88½	70	93		51	47½	52½	
Total (three carcases)	345		202		58·55 Fifth		251½		72·89 Second		154		44·64 Ninth
Grand Total (live pigs and carcases)	445		282		63·3 Fifth		342½		76·9 Second		221		49·6 Ninth

NOTE.—Measurements for eye muscle, back-fat thickness, body length, and leg length are in millimetres, indicated by the [black] figures.

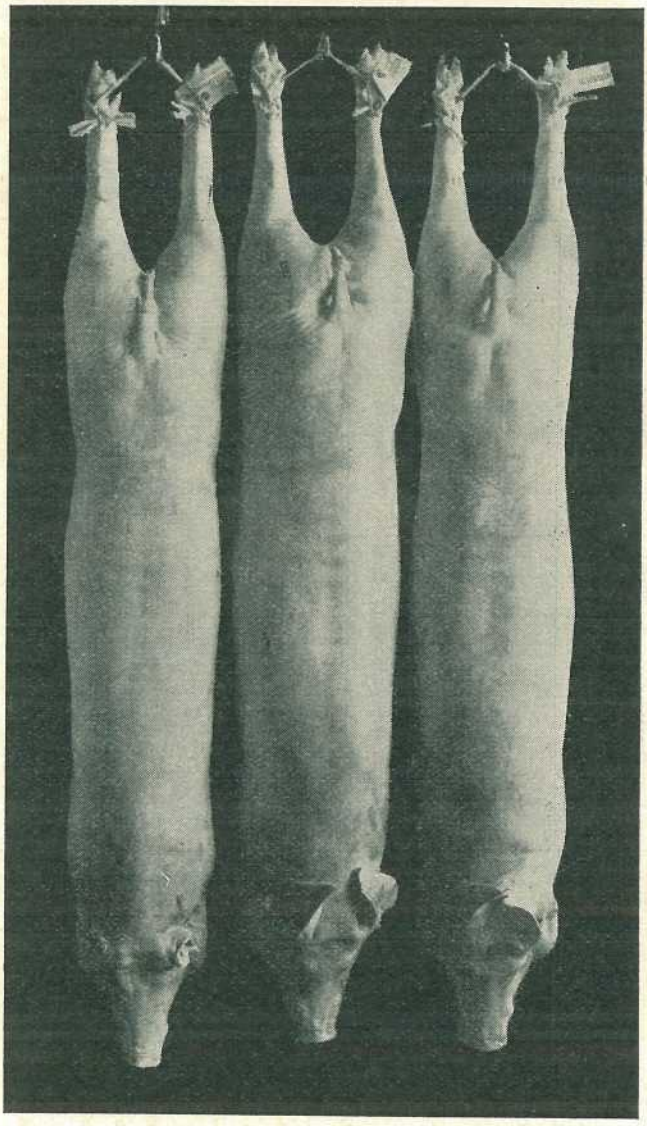


Plate 186.

Catalogue No. 432—Mr. S. S. Appleby's carcases of Large Whites, which gained first prize. Carcase weights, from left to right, 145, 165, 150 lb. Note the great length in proportion to weight, giving a long, narrow appearance. This entry gained the highest points for body length.

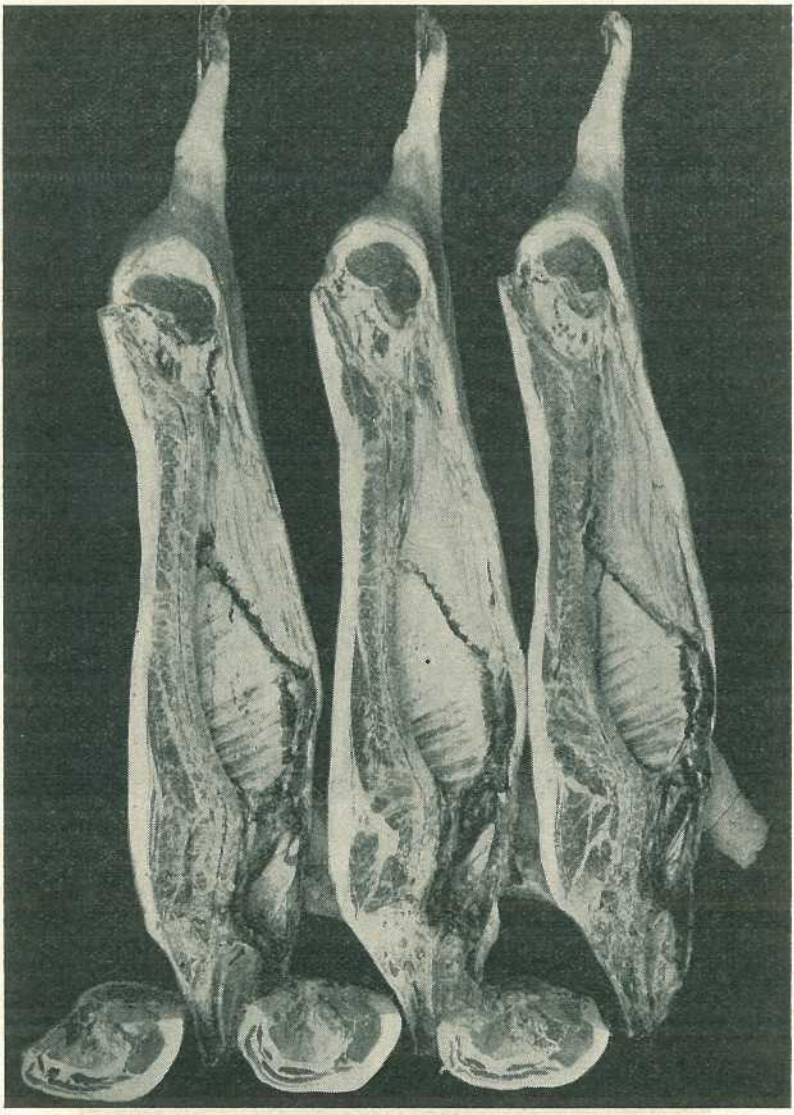


Plate 187.

The cut carcases of entry No. 432, as shown on the opposite page. Carcase weights, from left to right, 145, 165, 150 lb. Note the light covering of back fat and the thick, lean streak. This entry gained second highest award for back fat and the highest award for streak.

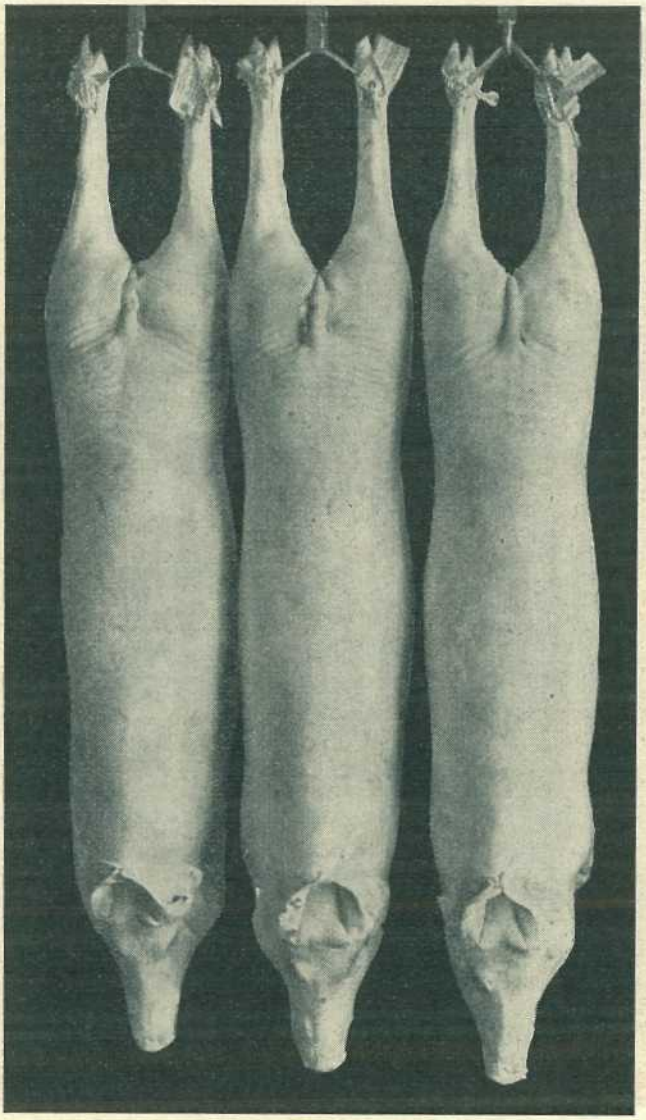


Plate 188.

Catalogue No. 433—Mr. H. E. Badke's Tamworth x Berkshire carcases, weighing, from left to right, 140, 132, 131 lb. These carcases were too short in relation to their weight. They were placed eighth in the carcase judging.

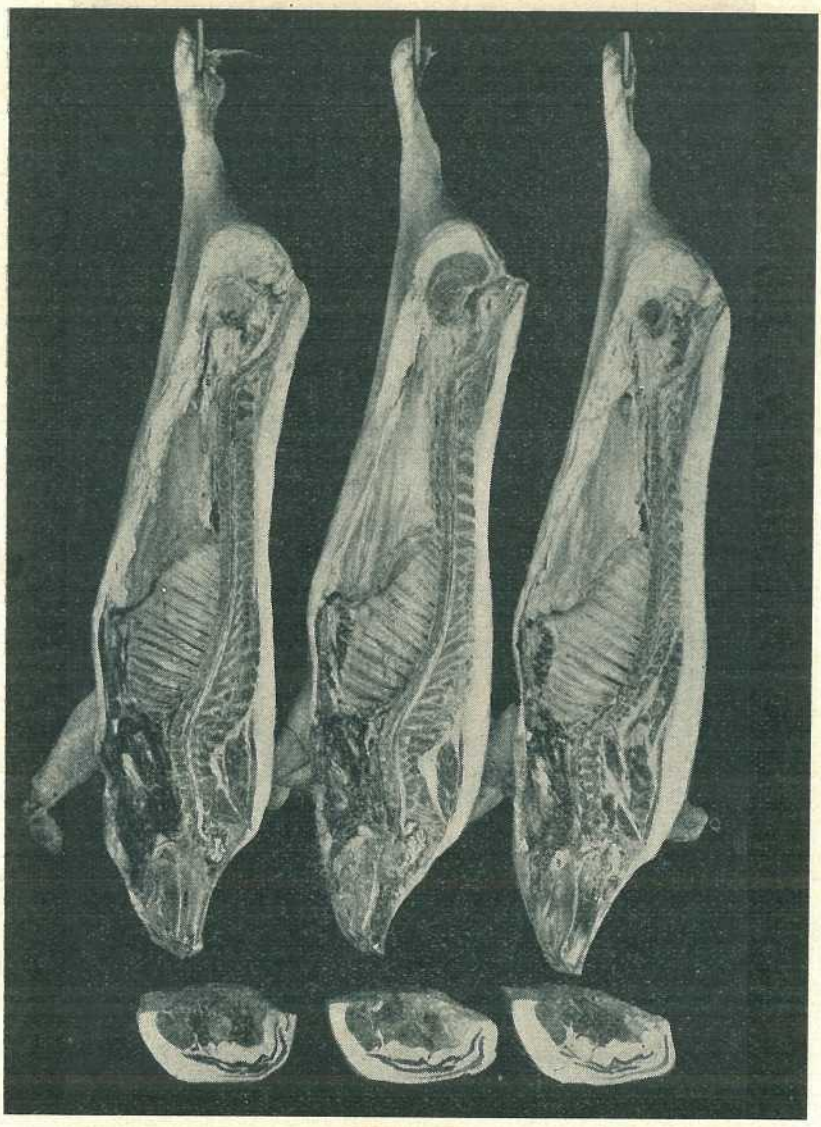


Plate 189.

The cut carcases of entry 433, shown on the opposite page; the weights, from left to right, are 131, 132, 140 lb. It will be noted that these carcases are comparatively fat.

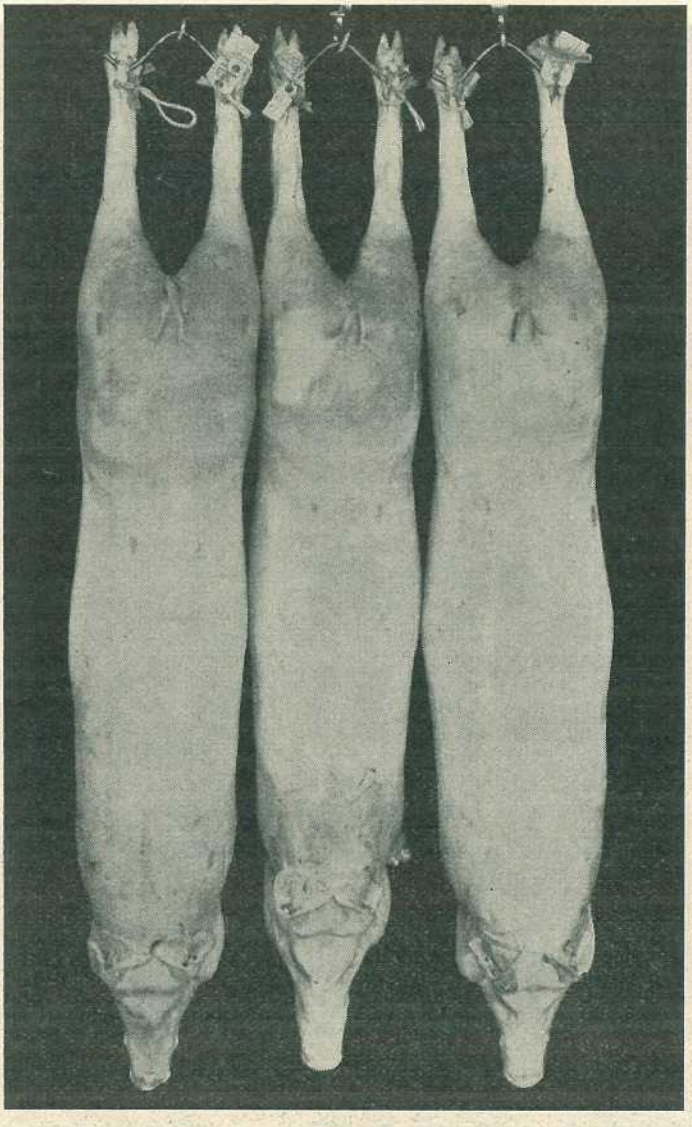


Plate 190.

Catalogue No. 434—Mr. P. V. Campbell's carcases of Tamworths, whose dressed weights are, from left to right, 161, 141, 183 lb. These carcases had particularly light shoulders, but were much too short in the body, and carried too much fat. They were placed seventh in the carcase awards.

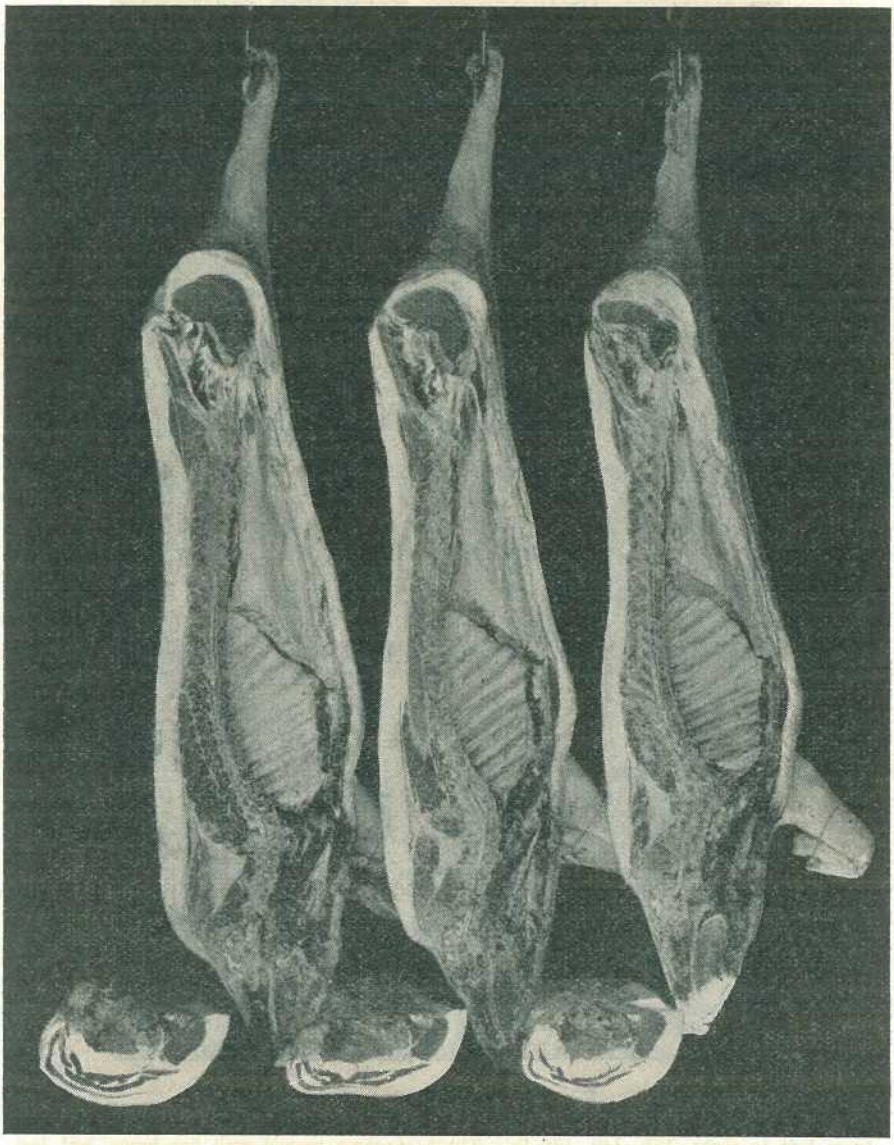


Plate 191.

The cut carcases of entry No. 434, shown on the opposite page; weights, from left to right, are 183, 161, 141 lb.

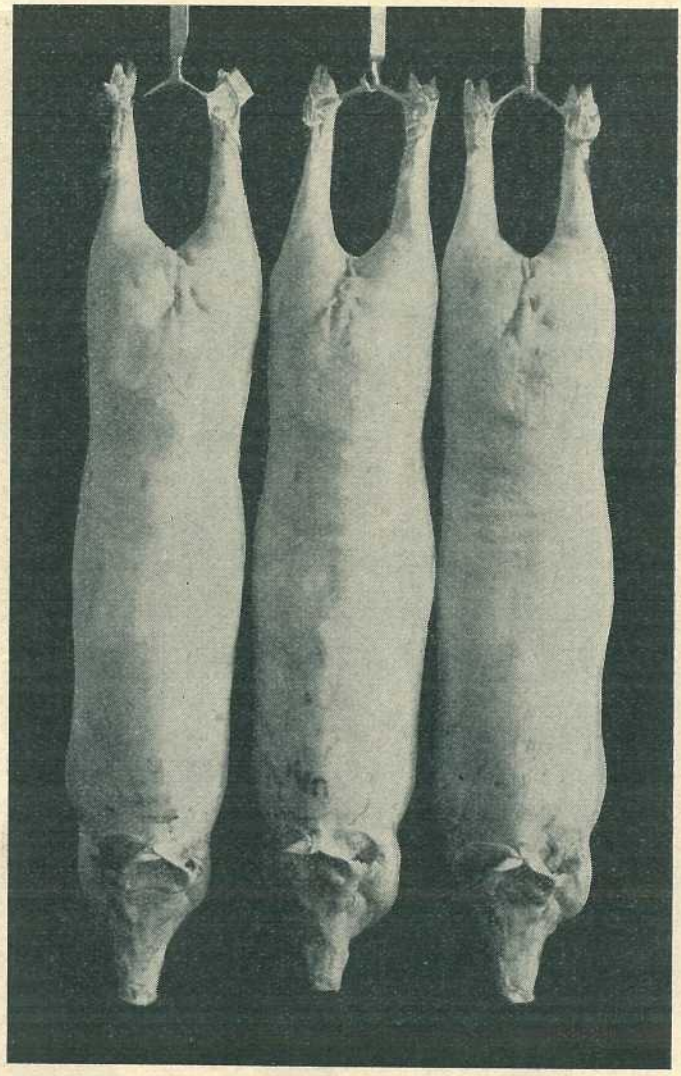


Plate 192.

Catalogue No. 435—Mr. M. Gnech's Berkshire x Tamworth carcases, weighing, from left to right, 155, 149, 152 lb. These carcases scored well for hams, but lost because the bodies were not long enough in proportion to their weights. They were placed sixth in the carcase competition.

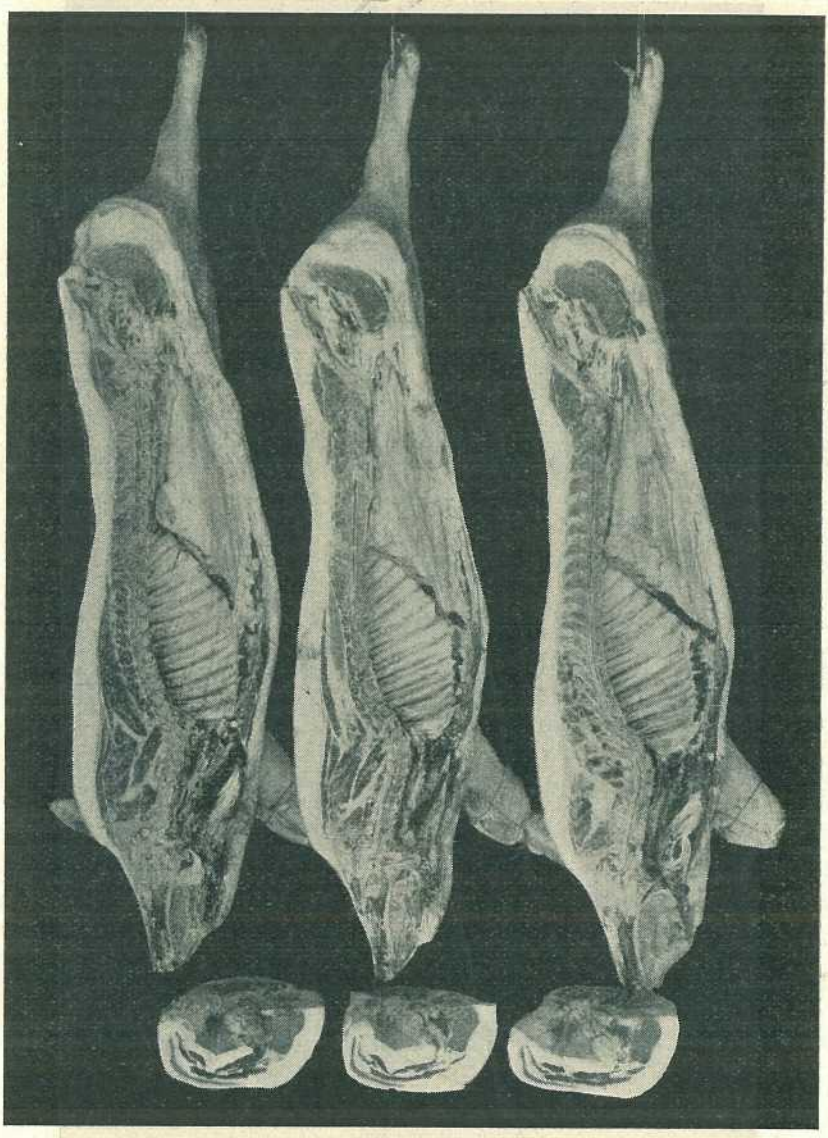


Plate 193.

Cut carcases of entry 435, shown on the opposite page. Carcase weights are, left to right, 155, 149, 152 lb. Note the excessive amount of fat, which was responsible for the weight being out of proportion to the body length.

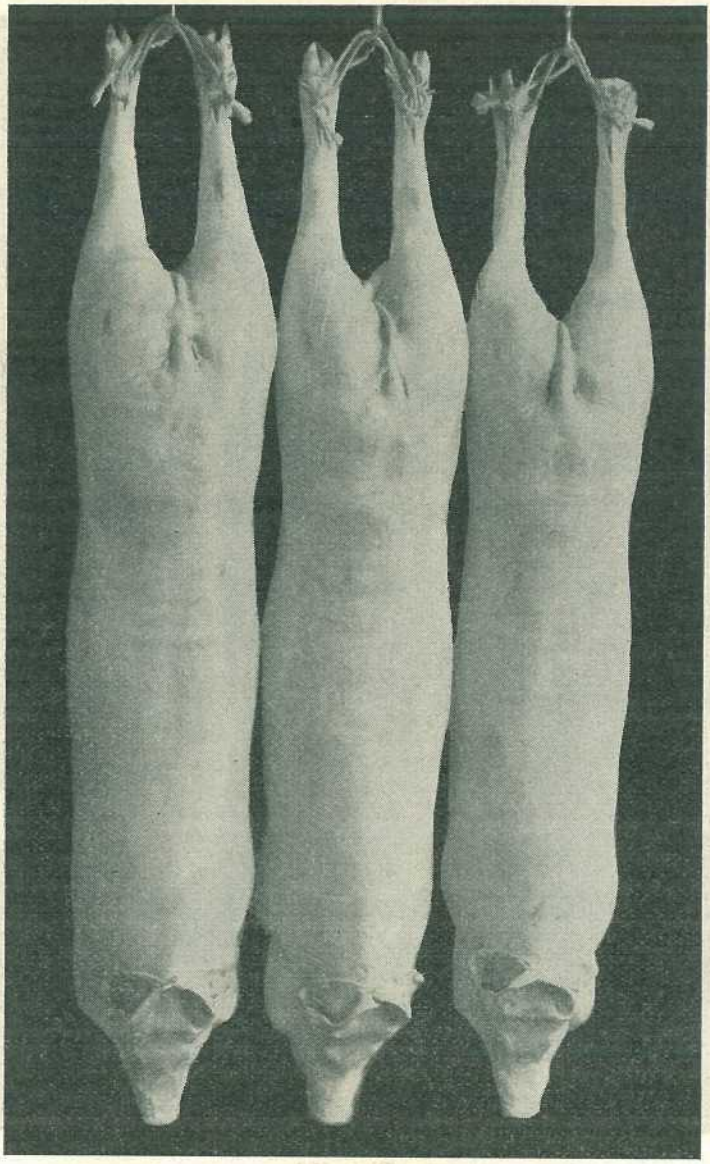


Plate 194.

Catalogue No. 436—Mr. J. A. Heading's carcases of Large Whites, which won third prize. Their weights are, left to right, 152, 150, 142 lb. These carcases scored fairly well throughout, gained the highest points for amount of back fat, but were too short for their weight.

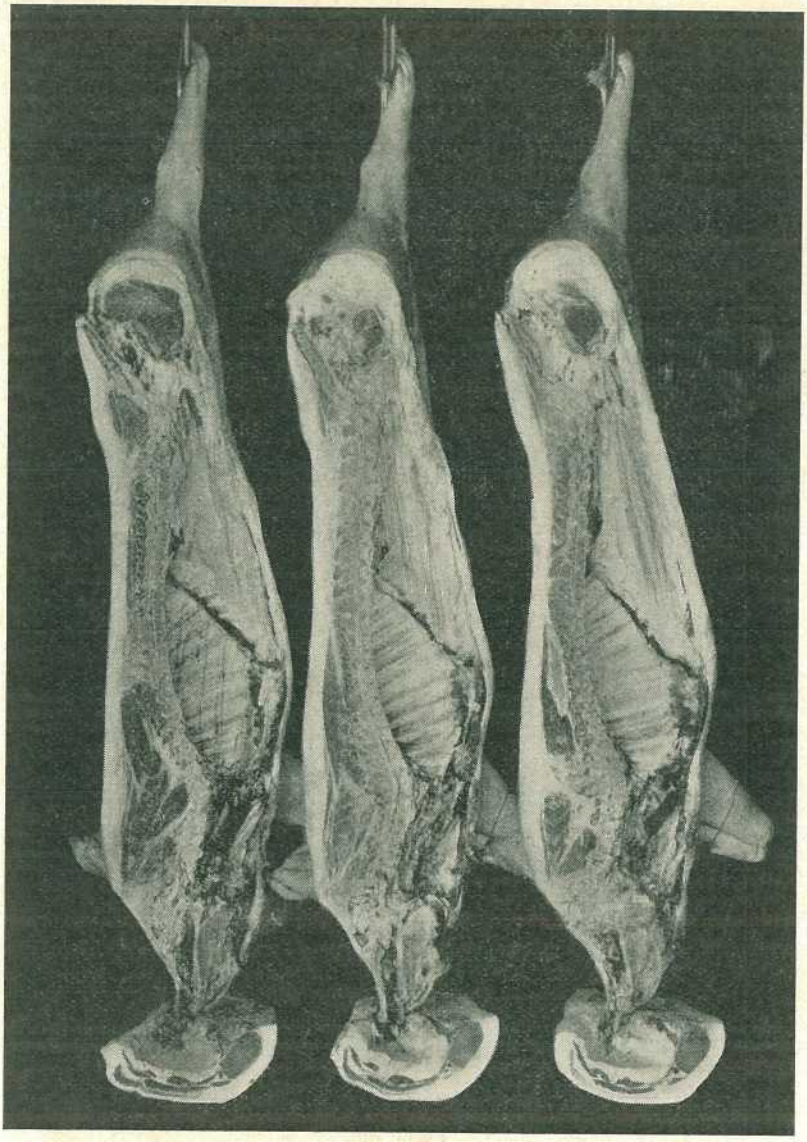


Plate 195.

The cut carcases of entry 436, shown on page 466, the weights being, from left to right, 142, 150, 152 lb. Notice the light covering of back fat and the good streaks.

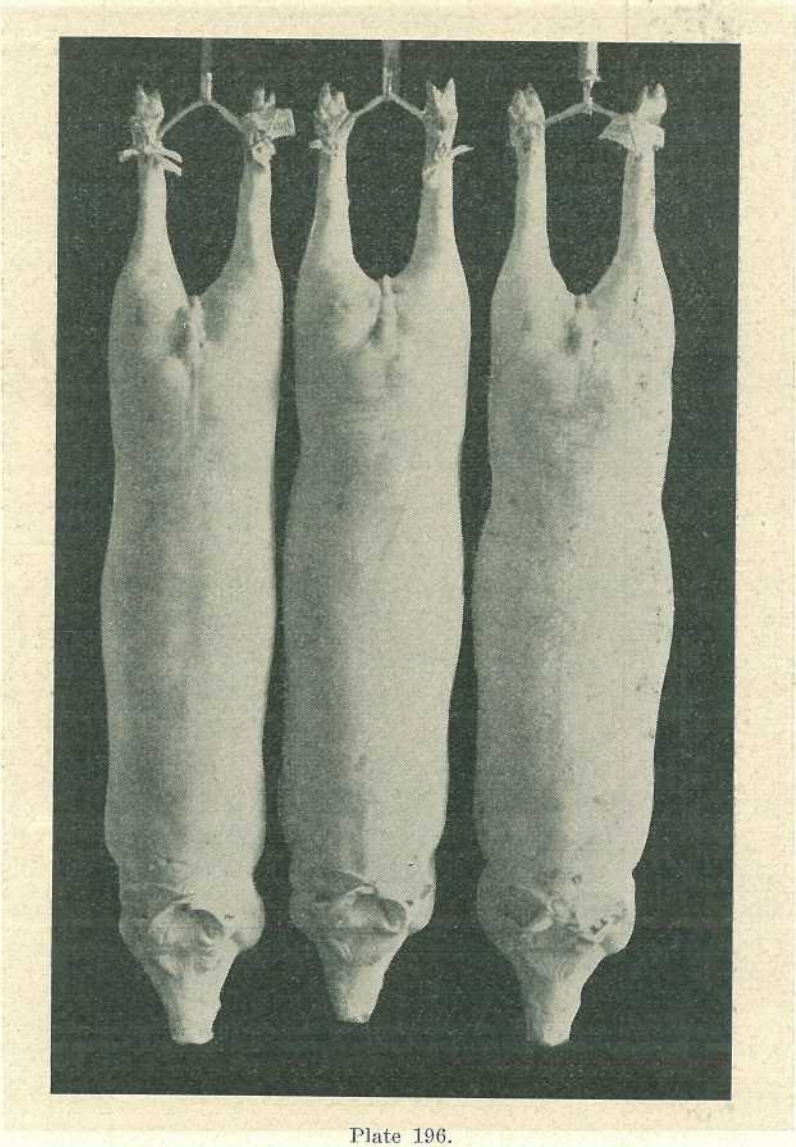


Plate 196.

Catalogue No. 437—Mr. E. L. Melville's Tamworth carcases, weighing, from left to right, 151, 161, 150 lb. These pigs scored fairly well in most features, but carried too much back fat. This entry gained fourth place in the carcase judging.

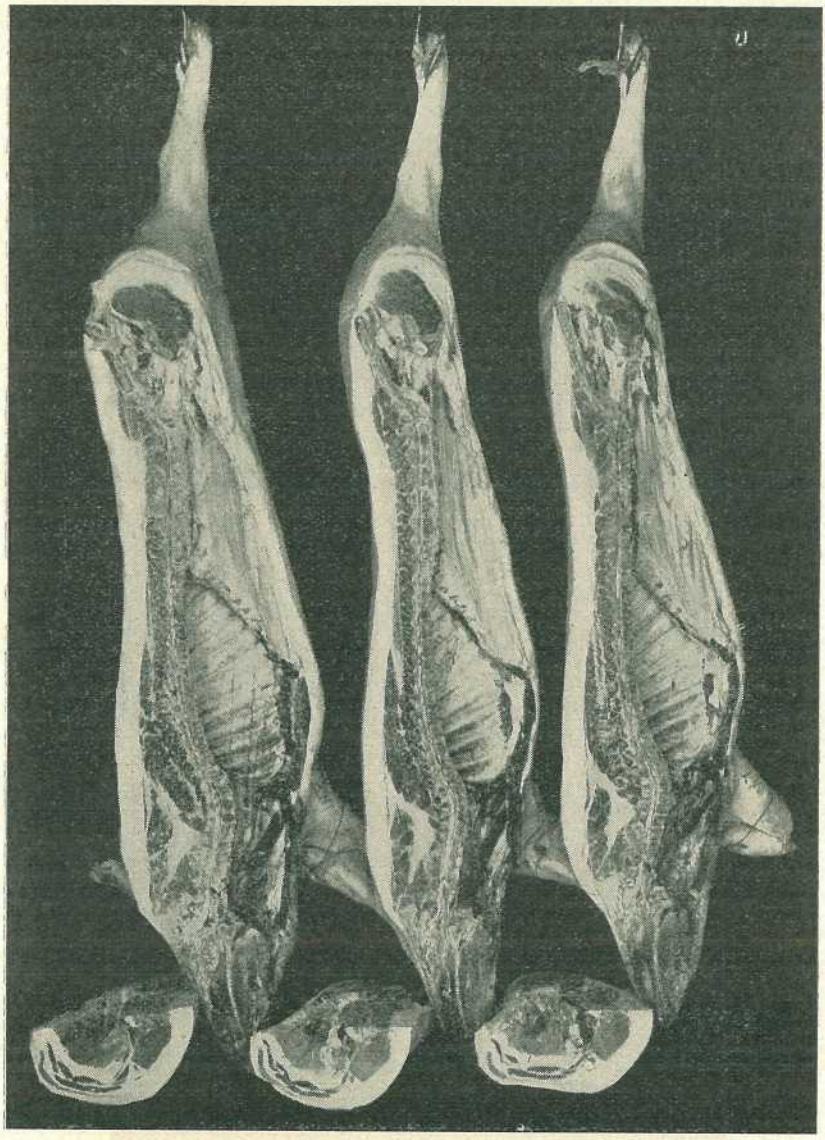


Plate 197.

The cut carcases of entry No. 437, shown on the opposite page. Weights are, from left to right, 161, 151, 150 lb. Note the thickness of the eye muscle. This entry scored 92.8 per cent., the highest award, for this particular feature, but lost points for carrying too much back fat.

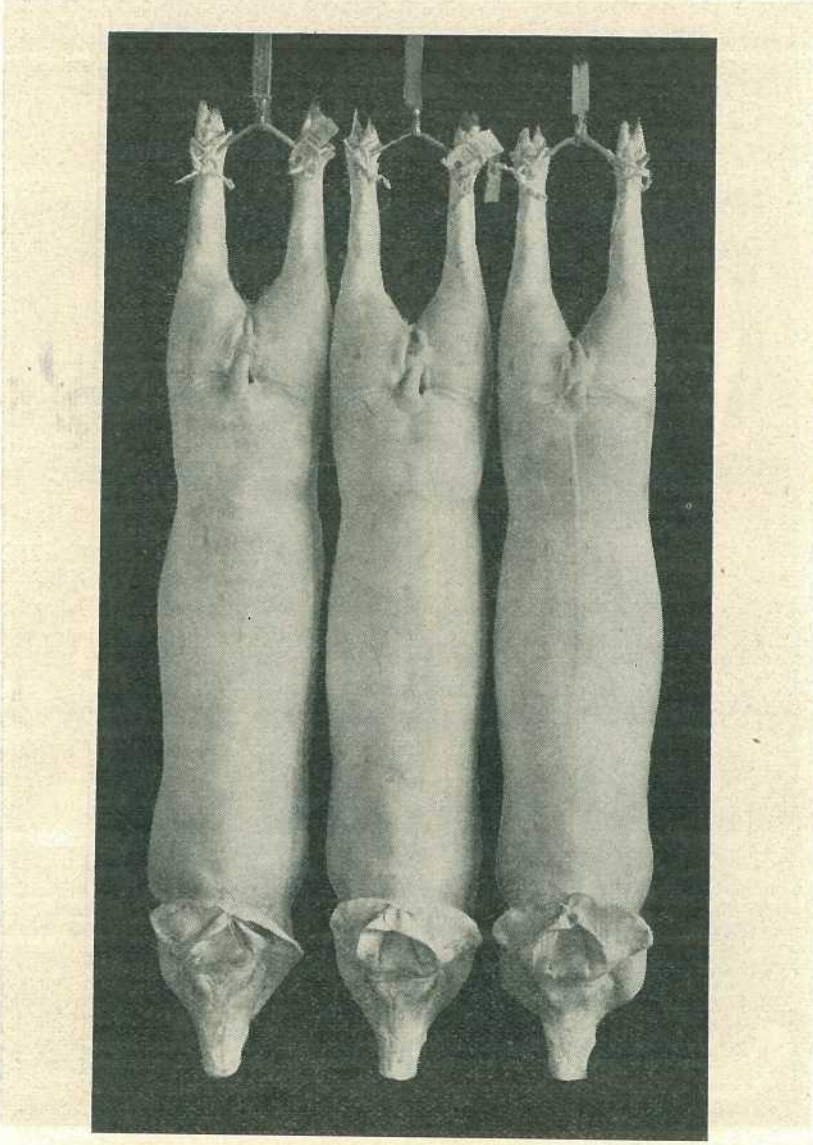


Plate 198.

Catalogue No. 438—E. B. Ruthenberg's Wessex carcases, weighing, from left to right, 146, 152, 151 lb. These were good carcases, but lost points through two of them being over-fat. This entry gained fifth place as carcases.

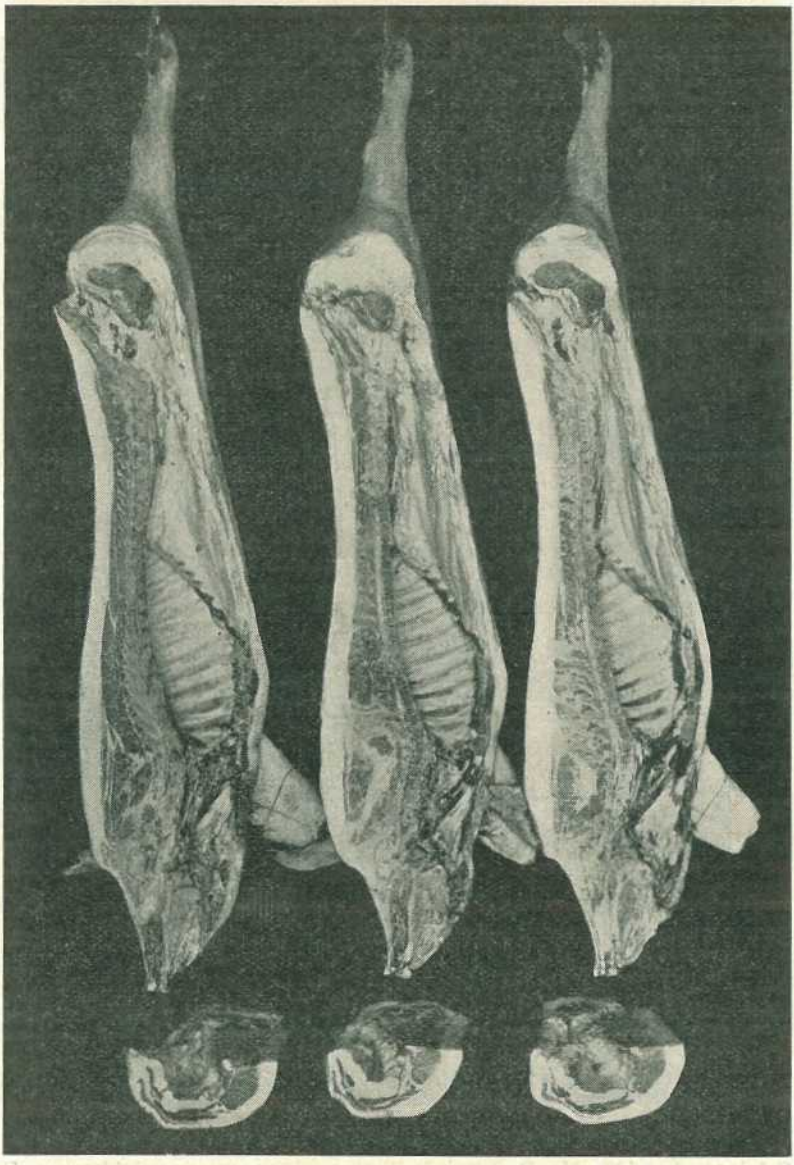


Plate 199.

The cut carcases of entry 438, shown on opposite page; the weights, from left to right, being 146, 151, 152 lb.

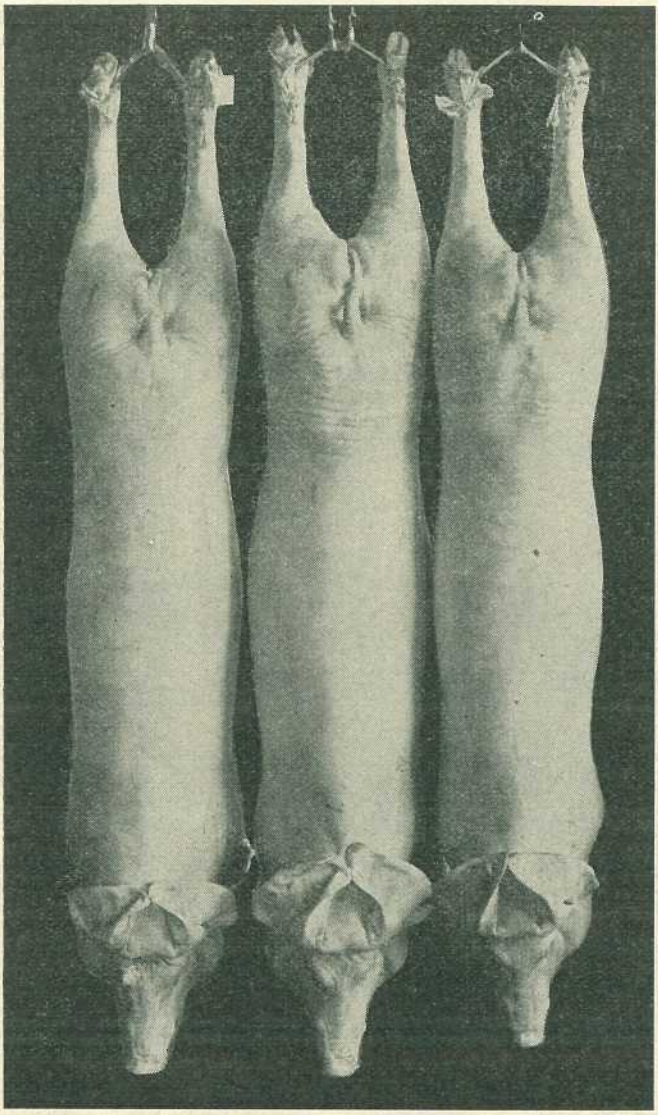


Plate 200.

Catalogue No. 439—Mr. R. Turpin's Wessex, whose carcase weights were, from left to right, 163, 170, 157 lb. This entry gained second prize, and were consistently good.

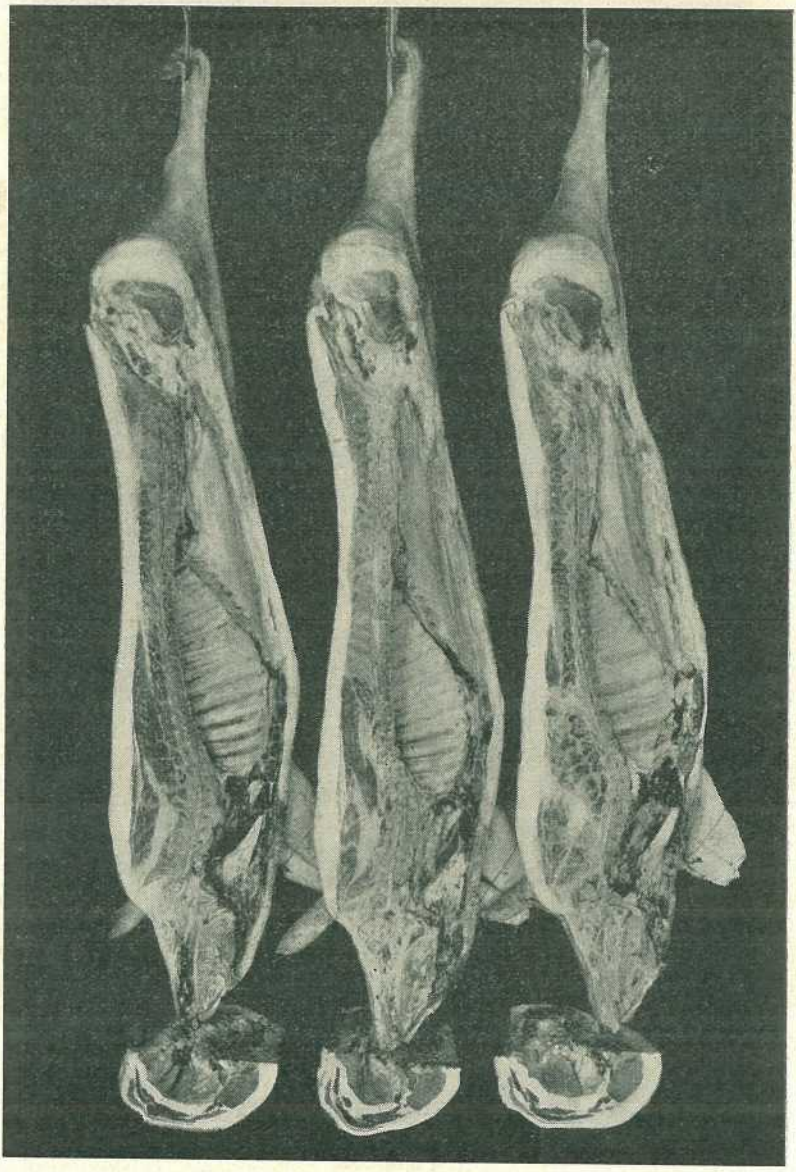


Plate 201.

The cut carcases of entry 439, shown on the opposite page, their weights, from left to right, being 157, 163, 170 lb. The carcase weighing 163 lb. scored the possible points for back-fat thickness, and 18 points out of 20 for body length.

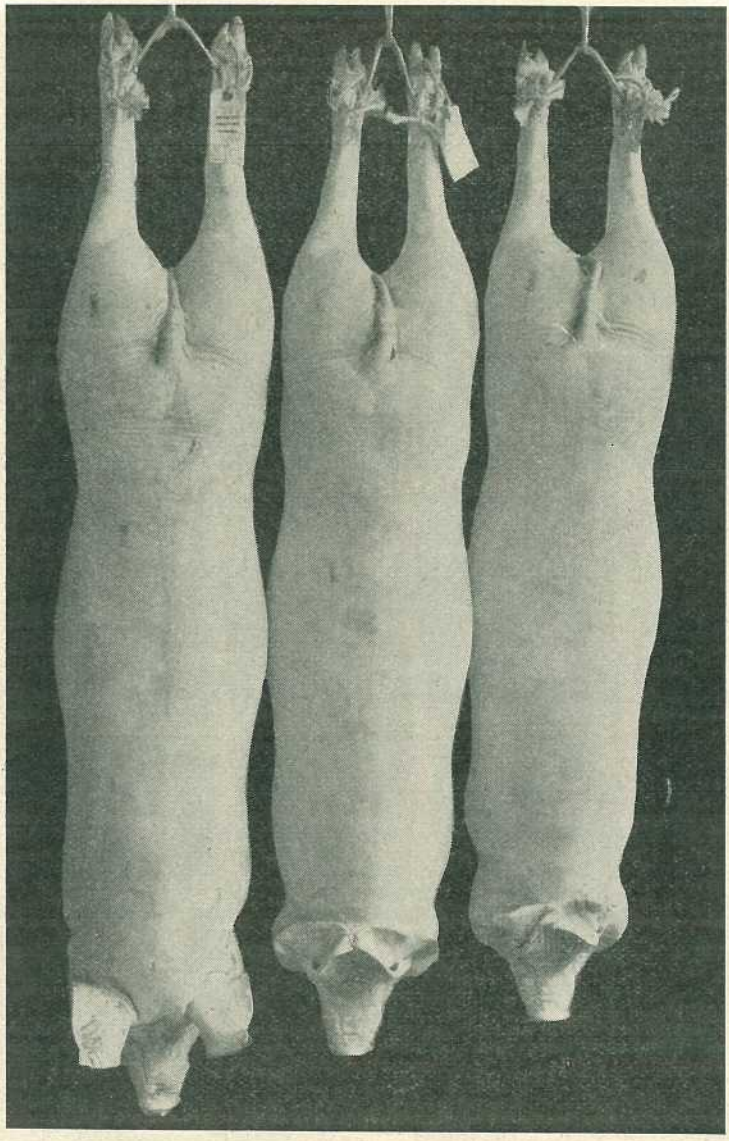


Plate 202.

Catalogue No. 440—Mr. J. Vellacott's Berkshire x Large Black carcases. Their weights were, from left to right, 161, 168, 157 lb. These carcases were good in the hams, but excessively heavy in the shoulders, and the bodies were much too short for their weights. They were placed last in the competition.

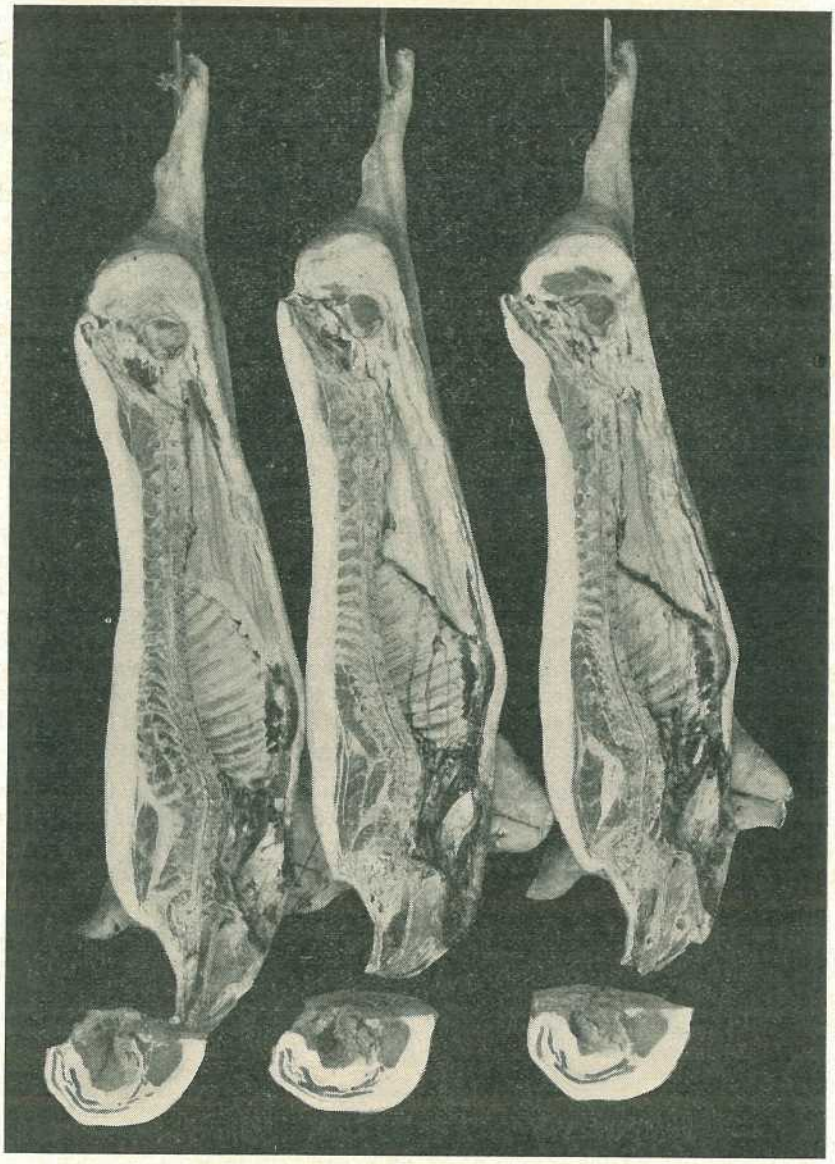


Plate 203.

The cut carcases of entry 440, weighing, from left to right, 161, 157, 168 lb. Note the very large proportion of fat to lean, which caused these carcases to score low points.

Housing Cockerels.

P. RUMBALL, Poultry Expert.

IN the rearing of any large number of cockerels, either for stud or table purposes, one of the outstanding problems is that of providing satisfactory housing. It happens frequently that cockerels are injured by fighting amongst themselves. Generally speaking, fighting is more prevalent among light breeds, such as white leghorns, than among Australorps and other heavy breeds.

The rearing of a large number of cockerels of a similar age could be arranged to great advantage by the provision of a special house. The type of house recommended is one in which the roof reaches approximately 2 feet from the ground. For efficiency, economy, and simplicity of construction, a building of the gable-end type should meet requirements. The size, naturally, will depend on the number of birds to be accommodated. A building 12 feet long by 8 feet wide will accommodate, as a maximum, 100 white leghorns or 80 Australorps. Approximately 1 square foot of floor space is allowed for each bird. Hens, however, should be provided with double that area under the same system, and the small space proposed for the cockerels is only practicable because of the fact that they will occupy the house only for a short period.

In the construction of such a building, the four corner posts may be 3 feet, and the two centre posts 7 feet high. By using 8 feet iron the roof will extend to within 2 feet of the ground. The gable-end should face to a point between north and east. This will permit of the front being left uncovered, while the rear or westerly end should be covered with iron to within 2 feet of the ground. Perches are the only fittings necessary. These should be all on the same level, and 3 feet above the floor. They should run lengthwise, and should be spaced 2 feet apart. Such spacing would obviate fighting on the perches.

It is essential for a building of this type to be erected in the centre of a large netted run, or at a distance from other buildings if the birds are to be reared on free range. In addition, it is advisable to erect a number of perches in different parts of the run. Such perches should be 3 feet high and situated away from boundary fences.

The advantages of this system of handling cockerels are that there are no corners or walls in the building, and on being chased the bird can escape easily by getting on a perch. An old cock bird placed in the pen, before the cockerels are three months of age, will assist materially in preventing the young birds from fighting.

JUNIOR FARMERS' CLUBS.

Farmers in the making—the members of School Project Clubs—have many practical results to show for their youthful enthusiasm. In another State recently a young member topped the lamb sales with his stock. Another established an Australian record with 183 bushels of maize per acre, and yet a third gained the potato yield record. The movement is of great importance to a primary producing country like Queensland, since on the industry and efficiency of the next generation of farmers will rest the future of our land industries. The boys—and girls, too—are taught to call science to their aid, and to take advantage of modern knowledge and methods. At the cattle judging competition at a recent show, a judge of long experience remarked:—"If at their age I had known as much as these boys do, I would have been numbered among the great breeders long ago."

Care of Growing Pullets.

J. J. McLACHLAN, Poultry Inspector.

PULLETS are the principal source of profit during the period from March to June. Laying pullets are very easily upset—in fact, any slight alteration in feeding or management will be likely to bring about a cessation of egg production. For that reason, any proposed alteration in feeding or management should be made before the birds commence to lay.

Pullets should be so fed that their growth is continuous. If dry mash is fed there must be ample feeding space—1 foot of feeding space for each ten birds is recommended. The hoppers should be constructed so that the feed does not jamb and leave the trough empty; hoppers wider at the bottom than the top achieve this objective. There must be ample mash always before the birds. Any shortage will retard growth, or, if they are laying, cause a cessation of production. Should the wet mash feeding system be adopted, it is most advisable to give one full meal of mash early in the morning, followed by a smaller meal at midday. These meals should be fed approximately at the same hour each day. In feeding adult birds, the general practice is to supply only the morning meal of mash; and, if it is desired to adopt this practice for the pullets when they are mature, it is essential that the mid-day meal of mash be discontinued before they commence laying. Chaffed green-feed or soaked lucerne chaff could be fed at midday to replace the meal of mash.

Growing mash should be fed until the pullets are about four months old, and then a change made to laying mash. Making a change at this age has the advantage of not affecting the birds. Should the change be left until the pullets have commenced laying, it is essential that the process be gradual, and at least one week taken to complete the change.

As a general rule the evening meal consists of grain—wheat or maize, or a mixture of these cereals. If it is desired to make a change in the grain ration this should be done prior to the start of production; or, if later, the change should be a gradual process.

Irregular supplies of water will retard growth or affect production to a greater degree than any other factor. Therefore, a strict watch should be kept to see that the pullets have a constant supply of clean, fresh water, and that it is situated in a cool, shaded place.

Pullets that are being reared in colony houses or temporary quarters must be moved to the permanent houses before they commence laying. Should this work be delayed until after they have commenced laying, there would be a general cessation of production. The number in each unit is an important factor. Pullets will make more uniform growth and production will be highest when kept in relatively small groups. Groups above 100 are undesirable.

Under no circumstances should pullets be overcrowded. One of the most common faults in poultry management is that a large number of pullets are reared without making the necessary provision for their accommodation.

THE CHICKEN SEASON.

A large proportion of the chickens that will be hatched during the coming few months will be culled during the various stages of growth, as being unsuitable for production in the future. Some of the culling may be necessary on account of the parentage of the individual, but by far the greater number of culls will be due to the lack of care, attention, and feeding.

Owing to the high cost of poultry food, the improper feeding of the chickens, particularly during the early days of life, is likely to be responsible for a greater percentage of culls than any other cause. Foods that are most suitable for chickens during this period are relatively costly, and efforts may be made by many to economise by substituting foods which, while they might prove satisfactory for older stock, are not entirely suited for the growth of young chickens.

Economic production is only possible from the well-grown, well-fed and well-bred birds; consequently, it is essential to give the layer of the future a good start in life. When it is considered that growing chickens, during the first six or eight weeks, do not consume very large quantities of food, the saving that may be made by the cheapening of the ration does not reduce the first costs to any material extent.

The following table indicate the reasonable weekly food consumption for chickens of two of the most popular breeds, and the average weight that chickens might be expected to be at these periods:—

Table Showing Weekly Food Consumption and Weight of Chickens.

Week.	Leghorns.		Australorps.	
	Food Consumed, in oz.	Weight of Chick.	Food Consumed, in oz.	Weight of Chick.
First	1·64	1·97	1·53	2·14
Second	3·36	3·31	3·32	3·61
Third	4·80	5.31	5·05	5·84
Fourth	6·46	7·61	7·20	8·68
Fifth	7·58	9·94	6·89	12·08
Sixth	8·96	12·92	10·62	15·86
Seventh	8·65	16·65	13·95	20·17
Eighth	13·29	20·41	15·05	25·31
Total	54·74	..	63·61	..

Pounds food consumed per 100 chicks in eight weeks—Leghorns, 342; Australorps, 398.

The above table indicates that it takes about 350 lb. of food per 100 to rear White Leghorn chicks to the age of eight weeks and approximately 400 lb. of food to rear Australorps to the same age. The saving of 2s. or 3s. per 100 lb. consequently makes very little difference to the cost, but it may materially and adversely affect the growth that is desired. In nutritional experiments that have been conducted at the Animal Health Station, the following rations have given most satisfactory results:—

Ration.	1-8 Weeks.	8 Weeks to Maturity.
	lb.	lb.
Maize Meal	40	60
Bran	20	13½
Pollard	20	13½
Meat and Bone Meal	7½	5
Dried Buttermilk	10½	3½
Salt	1	1
Cod Liver Oil	1	1
Lucerne Meal	..	2½
Crude Protein Content	17·15%	14·40%

To those who mix their own rations, a mash containing the abovementioned ingredients is recommended. Those who prefer to buy a prepared mash should purchase none but mashes which have been made expressly for the purpose of feeding chickens and growing stock.

—*P. Rumball.*

THE TROPICAL FOWL MITE.

Most poultry farmers are familiar with red mite. Not many, however, are aware that there are two kinds of red mite, namely, the tropical fowl mite and the true red mite.

The tropical fowl mite is the more common of the two species. It usually lives and breeds upon the birds, though when very numerous the nest boxes and perches may also harbour them. The species is most frequent below the vent, on the tail, and sometimes on the neck. The female mite lays its eggs among the feathers. Here the young mites hatch, and may grow to maturity without leaving the bird.

The true red mite is slightly larger than the tropical fowl mite. Like the poultry tick, it is usually found on the birds only at night, hiding in the cracks and crevices in the perches, among litter, and in other sheltered places by day. In those places the female mite lays its eggs, the young mites visiting the birds only in order to feed.

Both the tropical fowl mite and the true red mite are blood suckers. When numerous they cause distinct injury, especially to young birds. Sitting hens may be so irritated as to leave the nest. In birds which are subjected to continuous attack, the feathers become dirty and bedraggled, and the skin takes on a scabby appearance. The true red mite is also a vector or carrier of the organism of fowl tick fever, a serious and frequently fatal disease.

These mites may be controlled easily if the following recommendations are carried out:—

(1) Remove and burn all litter, nesting straw, and similar material. See that the fowl-house is thoroughly clean.

(2) Spray the whole premises with crude oil or kerosene, forcing the spray well into all cracks and crevices.

(3) Paint the perches with nicotine sulphate half an hour before the birds go to roost. Repeat for two or three nights. This treatment is excellent, also, against lice.

(4) Watch carefully for any mites which have survived, and, if necessary, repeat the spraying with crude oil or kerosene and the painting of the perches with nicotine sulphate.

—Dr. F. H. S. Roberts.

FEEDING OF GROWING CHICKENS.

After chickens are eight weeks old, it is still possible to use the all-mash system, but the crude protein content should be reduced to approximately 15 per cent. The easiest way to do this is by lowering the quantity of protein meal and dried buttermilk. From that stage onwards, some more fibrous material may be included in the ration with advantage and possibly lucerne meal would be the most convenient and desirable form for this to take.

A ration which has been found satisfactory in the all-mash method of feeding growing stock consists of 60 per cent. of maize meal, 13½ per cent. each of bran and pollard, 5 per cent. of meat meal, 3½ per cent. of buttermilk powder, 1 per cent. of salt, and 1 per cent. of cod liver oil, and 2½ per cent. of lucerne meal. The approximate protein content of that ration is 15 per cent.

If it were desired to feed grain in conjunction with that mash on the basis of two-thirds mash and one-third grain, and maize was available for the purpose, it would have to be remembered that maize had a protein content of roughly 10 per cent., and that the ration therefore would contain less than the 15 per cent. of protein required. It, therefore, would be necessary to increase the protein-rich foods by adding either meat and bone meal, or dried buttermilk, and to reduce the maize meal used in the mash. If, on the other hand, there was plenty of skim milk available, the chickens could be given that to drink, and they would obtain from it sufficient protein for their requirements under those conditions. While it is possible for a fairly definite rule to be laid down as to the protein requirements of the chickens, some latitude in respect of the kinds of food used is allowable. Full information on this important subject is obtainable from the Department of Agriculture and Stock, Brisbane.

The Papaw.

H. BARNES, Director of Fruit Culture.

PART I.

THE native home of the papaw is recorded as being tropical America, although the actual part to which it is indigenous is not known definitely. The plant is easily propagated from seed, and this fact has aided its rapid dissemination throughout the tropical and, to some extent, subtropical, countries of the world. There appears to be no record of how and when it was introduced into Queensland, but it is now grown in all our coastal districts in frost-free situations. It probably is one of the most susceptible of tropical plants to frost injury, and should be planted always above this level.

THE PLANT, ITS HABIT, AND ITS FRUIT.

The papaw is a giant herbaceous plant rather than a tree, attaining a height of 12 to 20 feet. According to its natural habit it develops only one stem, with no lateral branches, and surmounted by a tuft of large palmate leaves borne on the end of long petioles. Its likeness to the palm has been remarked upon frequently. The height of the fruit from the ground, after the plant has made about three years' growth, results often in the fruit being bruised and damaged when it is being picked. This difficulty can be overcome largely by pinching out the terminal growth of the young plant when it is 2 to 3 feet high. This will cause the single stem to divide into several secondary stems, all of which will bear fruit, and which naturally will not grow to such a height as it would if the plant were allowed to grow with a single stem.

Normally, the plant is of dioecious habit with staminate and pistillate (male and female) flowers produced on different plants. The flowers are produced in the uppermost axils of the leaves, and in the case of the male tree the flowers are white and are borne on the end of long pendant

racemes 2 to 3 feet in length (Plate 205). These flowers sometimes are of a hermaphrodite nature, and it is on this account that they are followed at times by small elongated fruit of no value. The flowers of the female tree are more yellow in colour, are larger, of a bell shape, and are subsessile (Plates 206 and 207).

As a general rule the first crop is borne twelve to eighteen months from planting, depending largely upon the time of planting and weather conditions (Plate 208).

Plate 204.

A papaw plantation at Sunnybank, near Brisbane (the property of Mr. W. Parker).

The fruit of the papaw varies in shape according to the variety from spherical to cylindrical, and when mature is of a bright yellow colour. The flavour varies somewhat in different varieties, and is influenced also by the conditions under which it is produced. Generally, however, it may be described as sweet, though at times insipid, and to some demands an acquired taste. Often it can be made more palatable by the addition of sugar, lemon, or orange juice, or wine. The fruit makes a splendid ingredient in the preparation of fruit salads, and is made also into excellent sauces, jams, chutneys, &c., whilst when green, after being allowed to soak to remove the milky juice and then boiled, it is quite equal to vegetable marrow. Many claims are made for the wonderful medicinal qualities of the papaw. It is credited with possessing remarkable digestion promoting properties, as also are the seeds, which resemble watercress in flavour. An active principle known as Papain, which greatly resembles Pepsin in its digestive action, and is sometimes used as a substitute for the latter, is present in the milky sap of the fruit and in all parts of the plant.

VARIETIES.

In recent years much attention has been directed to the evolution of perfect bisexual or hermaphrodite types in an endeavour to dispense with the necessity for male trees in an orchard for the purposes of cross

pollination. The late Director of Fruit Culture (Mr. G. Williams) stated in an article in the "Queensland Agricultural Journal" for December, 1931, that two bisexual varieties, the New Guinea or "Long Tom" and the Cowleyii or "New Era" introduced into the North some years ago were worthy of mention, but that the typical features by cross-fertilization had been almost eliminated. The truth that is contained in this statement is evident from a study of the fruit arriving at the markets from different districts. Modifications of these two original varieties are the most largely grown in Queensland at the present time, though the Cowleyii probably takes preference over the New Guinea type. A roundish fruit rather than a long cylindrical type is preferable for the fresh fruit market.

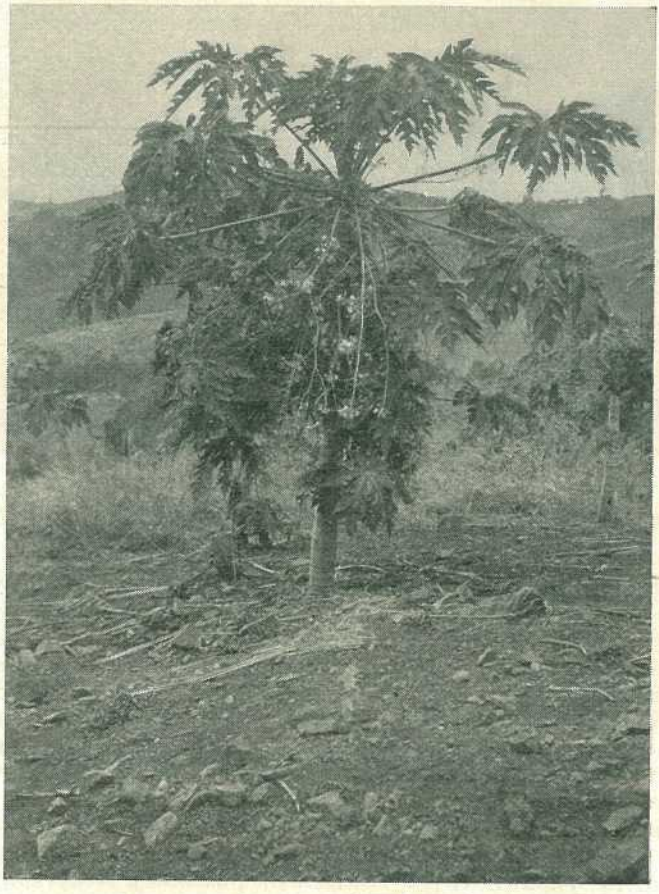


Plate 205.
Male papaw plant in flower at Brookfield, near Brisbane.

PLANTING.

It is wise for intending planters to select their own seed from large, well-formed fruit which have been allowed thoroughly to mature on the tree. The seed should be well washed in fresh water and then dried in the shade. Early spring is a good time for sowing the seed, though some growers sow early in the new year with very good results. The use

of specially prepared seed-beds subjected to partial shade is the recommended practice. If the beds are kept well watered the young plants will appear in a short time, and when about 8 to 12 inches high may be transplanted to their permanent positions. When planting out, the foliage, except the young undeveloped crowns, should be removed to reduce evaporation from the plants. Here a note of caution may be sounded. If at any time during the life of the papaw plant it is necessary to remove foliage, only the leaf blade should be cut away, allowing

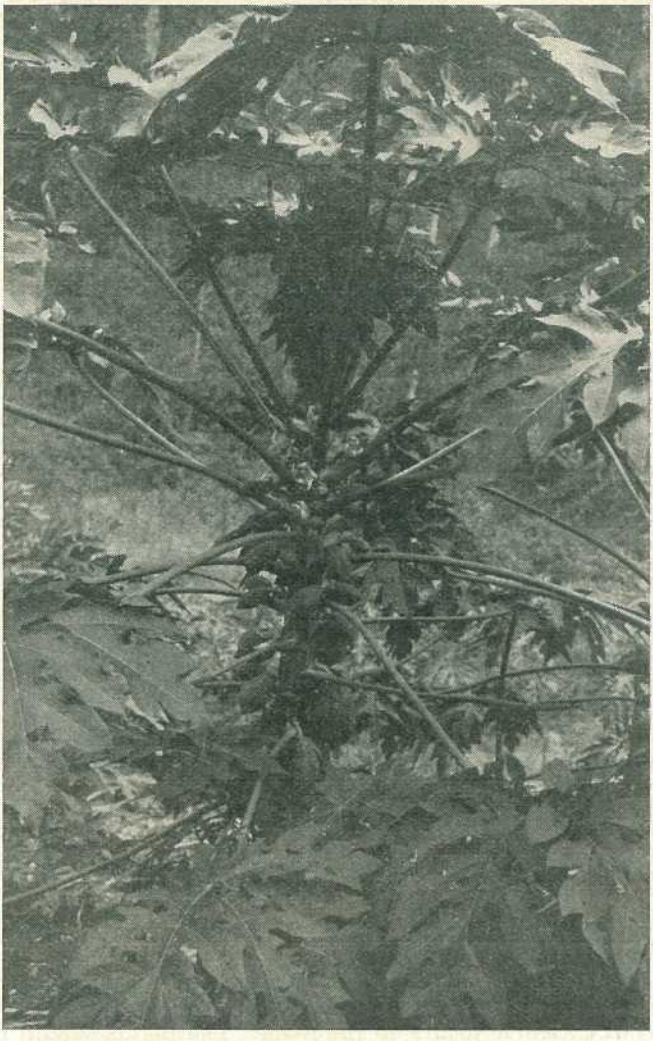


Plate 206.

Female papaw in flower and fruit (note flowers above the young fruit) in a plantation at Brookfield.

the petiole or leaf stalk to remain on the stem. If the petiole is removed whilst green an entrance to the stem of the plant is allowed for various rot-producing fungi, whereas if it is left on the plant the latter has a

chance to protect itself by the deposition of a layer of corky bark at the junction of the petiole and stem, and no open wound is left through which disease can gain an entrance.

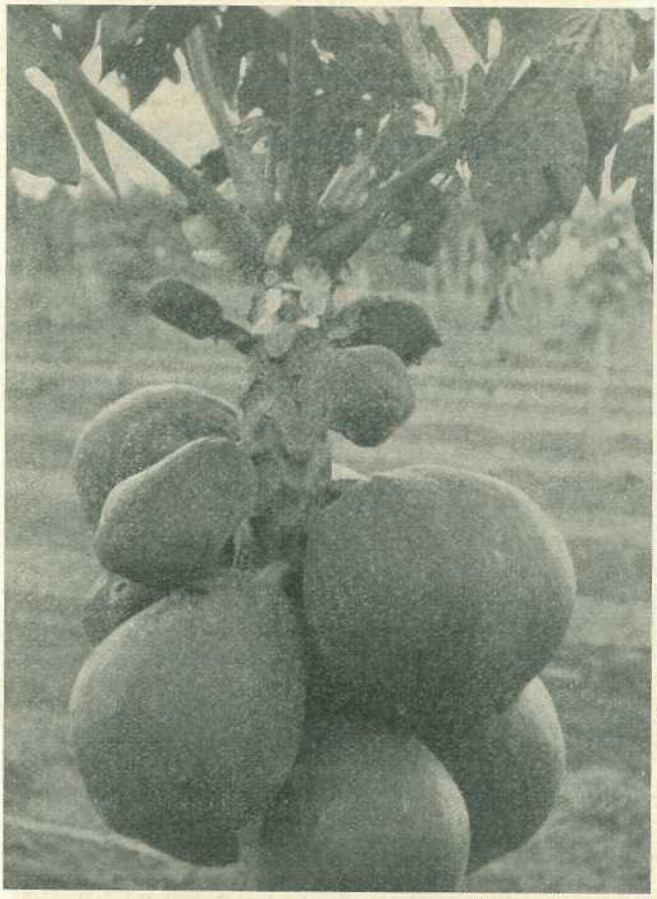


Plate 207.
Female Flowers and Fruit of Papaw.

Where young plants are grown under shade, this should be removed several days prior to transplanting, and watering should be discontinued to allow the plants to harden off, so that they will be able to get a better start when planted out. A few hours prior to digging up the plants the bed should be given a good soaking, so that the plants may be lifted easily without excessive injury to the roots. The plants should be taken up with a ball of earth adhering to the roots and planted in their permanent positions at about the same depth as that in which they were growing in the seed-beds. The soil should be well-firmed about them and watered thoroughly.

In any lot of seedling plants there is always the possibility of numerous male plants being found and these, of course, are unproductive. Though many methods have been advanced from time to time as

guides to enable male plants to be distinguished from female plants in the seed-bed, there are none unfortunately which can be recommended as infalliable. It, however, invariably happens that in the seed-bed a wide variation of vigour in individuals is noticeable. In practice it has been found that the stronger plants almost invariably are males; so that by weeding out these plants and leaving only the weaker specimens there

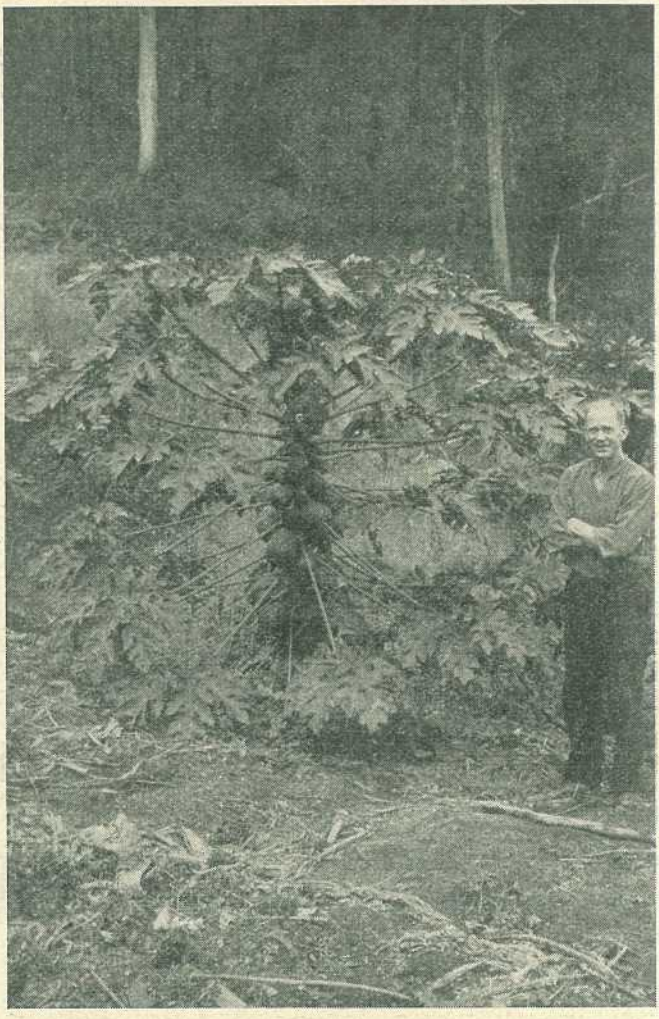


Plate 208.

Eighteen-months old papaw plant on Major Savage's plantation at Brookfield.

is a reasonable chance of obtaining a big percentage of females. It is not suggested that by following this practice 100 per cent. of females will be secured, and as a further precaution it is recommended that in planting out, two or three plants be planted 2 or 3 inches apart in the one hole and allowed to grow (Plate 209). When the flowers appear the males and unnecessary females can be removed and one female plant

Plate 209.
Young papaw plantation, Sunnybank, showing method of setting three plants in one hole.

left in each hole. About 8 feet by 8 feet permits of 680 plants being planted per acre and is regarded as a reasonable distance apart for planting, as this enables horse cultivation to be carried on between the rows (Plate 210). After planting, however, it is important that cultivation be confined solely to the shallow breaking up of the surface soil.

SOILS AND FERTILIZING.

Whilst the papaw is not essentially a deep-rooted plant, and, provided drainage is good, will grow well on soils which are comparatively not of great depth, it is a heavy feeder, and is therefore partial to a fertile soil. If the soil is not over well supplied with plant foods, the deficiency may be made up by the addition of stable manure where available and the application of artificial manures. The Agricultural Chemist recommends the following fertilizers per acre:—1 cwt. nitrate of soda; 2 cwt. bonedust or Nauru phosphate; 1 cwt. superphosphate; 1 cwt. sulphate of potash—or 1 to 2 lb. of this mixture per tree (Plates 210 and 211).

Part II.

HARVESTING, PACKING, AND MARKETING.

JAS. H. GREGORY, Instructor in Fruit Packing.

GENERAL HARVESTING CONDITIONS.

Climate and temperature, when harvesting is in progress, are big factors in the successful carriage of papaws and other tropical fruits to local and distant markets. Every care must be taken to eliminate carelessness and the rough handling of such delicate fruit. Where possible, when removing fruit from the tree, it should be cut, not pulled. It is essential that fruit after being harvested should be allowed to cool before being packed. This is all the more important if the fruit is to be carried over long distances.

Fruit packed while in a heated condition holds the heat for a long period during transit, thus causing premature ripening or sweating, with the certainty of the consignment opening up in an over-ripe or wet and musty state, which is just the condition favourable to the development of moulds and transit rots. Fruit in this condition has to be sacrificed by the agent to distributing retailers for rapid disposal. Such sales often have a detrimental effect on the price and upon the demand for sound consignments.

By considering the time of the day and picking the fruit while its condition is unheated, precooling is made much easier. If necessary, after picking, the fruit should be spread out in a cool place to reduce its temperature before packing. A flat-topped table with the surface covered with bags or other soft material is just the thing required for cooling, and also will make a good sizing and packing bench.

Care in the selection of the type and condition of fruit for carrying long distances is necessary. Tropical fruits do not ripen satisfactorily under the usual Southern climatic conditions, which lack the warmth and humidity of the Queensland climate. This makes it necessary to allow papaws for those markets to mature on the tree as much as possible before harvesting. During the winter months fruit can be allowed to colour more than in summer without affecting its carrying quality. It is necessary to allow the fruit to hang for the extra period if it is to be supplied to the Southern consumers in the best possible condition.

Plate 210.
Young hillside plantation on Major Savage's property at Brookfield. Note that plants are also set out in groups of three.

Plate 211.
Papaws Growing in a Chinaman's Garden at Redlynch, North Queensland.

Plate 212.
A Hillside Plantation, Brookfield.

Summer conditions require more care, the fruit not being allowed to advance in colour to the same extent. There appear to be two types of papaws, the one soft-fleshed when ripe, the other firm-fleshed. For average types of soft coloured varieties, the fruit in summer should show one-quarter colour, and in winter one-half. The firmer-fleshed type of papaw can be allowed to colour to an even greater extent before harvesting. Preference should be given to this type of fruit when sending it to distant markets. At the same time, care should be taken not to send the "soapy" type of fruit which never ripens satisfactorily. Removing

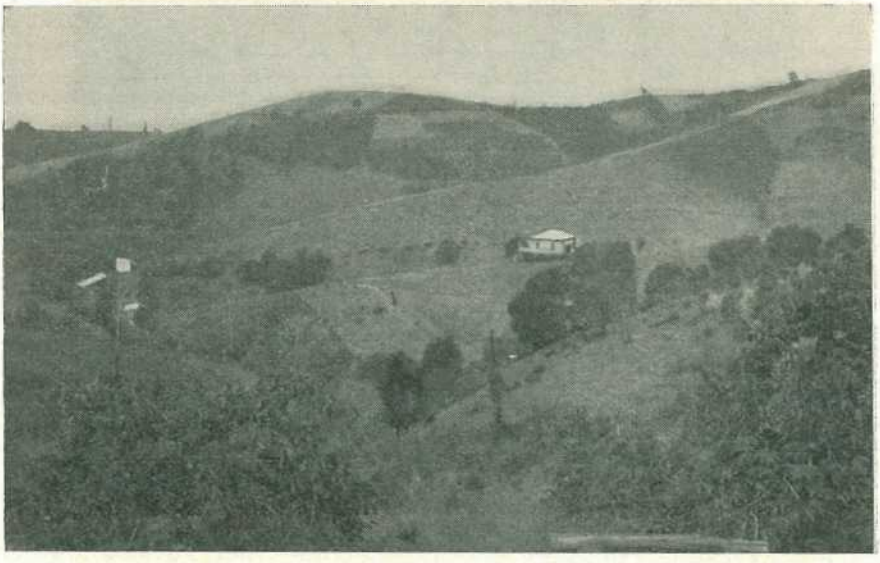


Plate 213.
Another Brookfield view of hilly country and planted slopes.

trees which give unsuitable fruit from the plantation is well worth while. Only observation on the part of the grower can determine the actual method to use for his own particular product. No positive method of procedure can be given to growers in this respect, only a general guide, but this, plus the use of common sense, should enable a good product to be placed on the market. Brisbane, Sydney, and Melbourne markets each need slightly different treatment on the lines suggested. The need for placing a first-grade article on the market cannot be stressed too greatly. Queensland growers have the market for tropical fruits completely to themselves, there being no competition from the other States. The importance of these markets therefore can be readily seen. The demand for our tropical fruits is as yet only in its infancy. It should be remembered that the Melbourne and Sydney markets do not want green papaws. Green papaws are unsaleable at any time and usually finish up by being damaged by fungus before they ripen to an extent that renders them only fit for the rubbish tip.

TROPICAL FRUIT CASE.

The best container for the long-distance carriage of papaws is the tropical fruit case, 24¾ inches long by 12 inches wide by 12 inches deep (Plate 214). Woodwool is the most satisfactory packing. The box is prepared by placing a layer of woodwool on the bottom of the case and around the ends and the sides. Each papaw then is wrapped in soft paper or cellophane and placed in a single layer in the prepared box, using small pads of woodwool to separate and make the individual fruit firm and snug. A thin layer of woodwool then is placed over the top of the layer of fruit, and the process is repeated until the case is full, finishing off with a layer of woodwool packing on the top. It is unwise to have the fruit projecting too far above the top of the box, but the lid of the case should press just firmly enough to keep the fruit snug and firm. Packers should avoid placing too much padding in the case; care in matching the various-shaped fruit will greatly assist in this. By using a coloured wrapper in conjunction with the woodwool a very attractive package can be placed on the market. Care in eliminating all green, over-ripe, or diseased fruit when packing is absolutely necessary to ensure safe transit and satisfaction to buyers. Cases when packed should not contain any fruit that will shake about whilst travelling.

PACKING FOR DISTANT MARKETS.

In packing papaws the aim should be to give the maximum protection to the fruit in transit, and to pack the fruit in such a way that it will display to the best advantage when opened and exposed for sale. Before being packed the fruit should be cooled and sized. To assist in making the operation of packing easier, an effort should be made to match the various-shaped papaws whilst sizing them into heaps. Four sizes should be sufficient to cover the packing of papaws for export. As with custard apples, sizing is done easily on a flat-topped table covered with soft bags or other suitable material. Many growers do not think it necessary to go to this trouble, failing to appreciate that the skin of the papaw is exceptionally tender, and that the slightest scratch will cause the fruit to bleed, thus damaging its appearance.

When being sent to Southern markets extremely large sizes of fruit should not be packed, as they are not favoured by buyers. When large fruit is packed and one or two specimens in the cases arrive in faulty condition, it creates a heavy loss such as is not likely to be incurred if only the medium and smaller sizes are used.

When packing papaws for distant markets the maximum protection is given to the fruit by placing the hardest part of the fruit, so far as is possible, to the sides of the case. An examination of a ripe papaw will disclose that the softest part of the fruit is at the opposite end to the stalk. When packing, the soft pointed end of the fruit is protected by placing to the centre of the box, with the stalk end to the outside of the box, where the ill effects of handling are most likely to be felt. With extra large fruit this cannot always be done. Plate No. 214 shows a method that is of assistance in good carriage. Careful attention to these details assists greatly in reducing damage during handling.

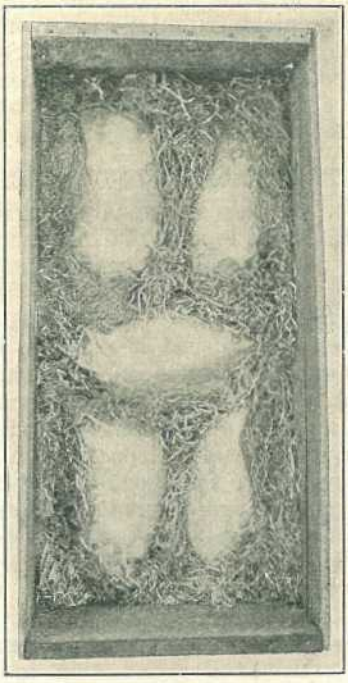


Plate 214.

Large Papaws Packed for Export.—The fruit is wrapped in soft tissue paper and nested in woodwool. The case used is the tropical fruit case, 24¾ in. by 12 in. by 12 in.

Papaws should never be pressed on their sides by thumbs or fingers to ascertain whether they are ripe. A gentle pressure of the hand at the stalk end will reveal the state of ripeness to the experienced packer without damage to the fruit.

PACKING FOR LOCAL MARKETS.

Growers who are near enough to their markets to be able to use motor transport have a decided advantage over those who have to send fruit over long distances. In the former case, the fruit can be left on the tree to become almost fully ripe before being sent to market, and it is not necessary to pack in the same manner as when sending further afield. Close attention should be paid to the elimination of all disease-infected or marked fruit, and sizing also should be rigidly adhered to. The Australian dump case, made in the form of a tray, 18 inches long by 14¼ inches wide by 8⅔ inches deep, is a good container for the local

market (Plate 215). The fruit is packed on end in a single layer resting on a layer of woodwool or similar packing. As a protection against rubbing the bottom end of each fruit, it should be wrapped for about two-thirds of the way in clean, plain white or coloured paper, while each fruit is made snug and tight by pushing pads of woodwool in between the fruit. Papaws packed in this way have a very attractive display value, and sell much more readily than those carelessly placed in cases without packing, the buyer being able to appreciate the quantity and quality at a glance.

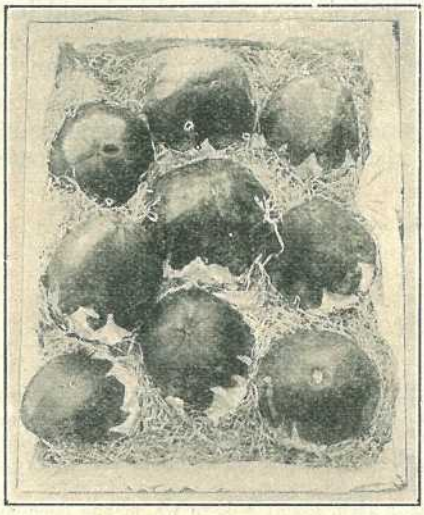


Plate 215.

Papaws Packed for Local Market.—Packed in the Dump Case used as a tray by removing the side; 18 in. long x 14¼ in. wide x 8⅜ in. deep. Note the wood-wool padding between the fruit.

CARE IN MAKING CASES.

Growers, after taking every care in handling their fruit while harvesting and packing, often, through carelessness in making and nailing down cases, offset an advantage already gained by careful handling. Careless nail-driving, causing nails to protrude inside the box from the timber of the case, often results in damaged fruit, with consequent waste. Nail-marked fruit decays, breaks down, and affects adversely the sound fruit in the box. Nails protruding through the outside of a case are a danger to all handling it in transit, often causing bad cuts or loss of temper, and rough handling in consequence. Extra care in such matters is well worth while, and saves trouble.

THE "GET-UP" OF THE PACKAGE.

Attractiveness is the main feature to be studied, as anything added or done to make the produce worth more to the buyer is a big factor in obtaining quick sales and higher prices. The following points are well worthy of consideration:—

Use only clean, well-made cases. Second-hand cases often carry insects and fungus diseases.

Plain white or coloured paper is much more attractive and cleaner than newsprint, while the extra cost is only a fraction of a penny per case.

Where it is necessary to use packing, clean woodwool is preferable to most types of grass and other packing.

Fancy labels are an improvement, but if stencils or rubber-stamps are used care should be taken to apply them neatly and so avoid smudging and spoiling the appearance of the finished package. The packer's full name and address, with the variety and contents of the case, as required by the Fruit and Vegetable Acts, should be embodied in labels or stencils. Cases should always be stencilled or labelled clearly with the name "Papaws." Labels suitably printed can be obtained.

When sending long distances wiring the cases is an improvement, and is an economy and insurance against rough handling. Wiring also is an attraction to the buyer who desires to despatch fruit to distant places.

THE CHOKO.

The choko is a popular vegetable, grown largely in Queensland for both market and home use. It has the advantage that, once planted, it comes into bearing each year from the original root. The plant will die down only during the coldest months, and in the spring will shoot again from the tuber which is formed under the ground.

The choko requires a rich, loamy soil to which has been added a heavy dressing of well-rotted stable manure. Additions of dried blood and bone dust, or of manure during growth, are of great benefit, as, being a perennial and a heavy feeder, the choko's food requirements are considerable.

The method of planting the choko differs a great deal from that used for other varieties of the same family. Whole choko fruits are used as planting material, the growth coming from a shoot from the kernel in the fruit. The fruit should be planted on the side with the broad end sloping downwards and the stem end slightly exposed.

A trellis is essential to satisfactory growth, though, if planted near a fence or old stump, the plants will spread over it very quickly. When chokos are grown commercially it pays to erect a suitable trellis. This may be done with good logs or rough timber. Sometimes an ordinary "T" trellis is used, over which strong fencing wire is stretched.

A good permanent trellis may be constructed as follows:—Two rows of strong posts are set firmly in the ground with a height of about 6 feet 6 inches above the surface, the rows being about 9 feet apart and the posts about 8 feet apart in the rows. The tops of the posts support cross timbers on which strong fencing wire is stretched with about 18 inches between the wires to carry the vines. Stays support the outside posts, and wires for trellising also should be stretched upon these.

The choko takes some months to come into full bearing, but will commence to bear fruit generally some four to five months after planting. The plants appear to improve with age when properly cultivated and manured.

There are two varieties, the green and the cream. The cream-coloured variety is the more popular.

Chokos should be picked fresh and, after having been peeled, should be cut into suitable portions and boiled or baked.

—*C. N. Morgan.*

Tomatoes in the Central District.

W. J. S. SLOAN, B.Sc.Agr., and W. J. ROSS.

WITH the higher level of prices which usually operates from September to December, the tomato crop assumes greater importance to the farmers in the tomato-growing areas of the Central district. This period coincides with an increased incidence of pest and disease troubles. Particular attention, therefore, should be paid to the cultural requirements of the plants and to pest and disease control in order to prolong the bearing period.

Normally with tomato patches on scrub burns, weeds do not trouble the young crop unduly; but it is advisable to check the weed growth which sometimes becomes serious at picking time. The soil around the base of the plants should be kept loose, at the same time, with the hoe. In cultivated areas, the land should be kept well stirred and free of weeds, which both rob the soil of valuable moisture and encourage the breeding of pests such as the corn-ear worm and the tomato mite.

Old plants may be cut back profitably if the root systems are reasonably sound and a bunch of fresh growth is shooting from the main stem. If excessive, this flush of new shoots may be thinned lightly. Severe thinning is undesirable, as it is necessary to retain sufficient foliage to keep a reasonable balance between the root system and the parts of the plant above the surface.

A handful of a 4:11:10 chemical fertilizer, containing sulphate of ammonia, superphosphate, and sulphate of potash, should be applied to old plants and backward young plants, in order to stimulate new growth and blossoming. When the first fruit has set, a dressing of 50-60 lb. of sulphate of ammonia per acre will help to keep the plants moving.

Tomato mites spread rapidly as the warm weather approaches, and quickly cause a dying-back of the foliage from the centre of the plant. Loss of foliage exposes the stems and the fruit to the hot sun with harmful results. For the control of the mite the plants may be sprayed with lime sulphur at a strength of one in eighty. Alternatively, a dust composed of flowers of sulphur and a good quality hydrated lime in the proportion of 1:1 can be used. If mites already are numerous on the plants, spraying is preferable to the dusting. However, if the plants are treated with a sulphur-lime dust from the seed-bed onwards, a satisfactory control of the mites will be obtained.

Damage by the corn-ear worm also increases rapidly in the spring, and may be the cause of heavy losses of fruit if not checked at an early stage. Lead arsenate is the most reliable insecticide for this pest, and may be used as a spray or dust. A suitable spray can be prepared by adding 3 lb. of lead arsenate to 100 gallons of water and including a spreading agent. If mites are troublesome at the same time, colloidal sulphur may be included with the lead arsenate. As a dust, the lead arsenate is used diluted 1:1 with either a good quality hydrated lime or sulphur, the latter diluent having the additional advantage of controlling the mite.

Lead arsenate leaves an objectionable spray residue, and should not be used after the plants have commenced to fruit. Constant attention to the control of the corn-ear worm up to this stage, however, gives an excellent chance of a reasonable crop.

Leaf diseases and black spot on the fruit frequently appear as the plants age and lose their vitality. Correct manuring, cultivation and pest control all help considerably to prolong the life of the plant.

When a fungicide is necessary, either a Bordeaux spray or a copper dust may be used to hold the diseases in check. To control pests and diseases with a combination spray, lead arsenate and a colloidal sulphur preparation may be added to the Bordeaux. Lime sulphur cannot be included in sprays containing either lead arsenate or Bordeaux, as such mixtures are liable to injure the plants.

Various proprietary dust mixtures containing lead arsenate, sulphur and a copper compound are marketed for the purpose of controlling pests and diseases in one operation.

THE EGG PLANT.

The egg plant is easily grown and produces an excellent culinary vegetable. It is grown similarly to the tomato, and like that plant is very sensitive to cold. It requires a light, rich, loamy, well-drained soil, and poorer ground may be improved by the addition of a 1-4-1 mixture of sulphate of ammonia, superphosphate, and sulphate of potash at the rate of about 5 cwt. to the acre, or by heavy dressings of well-rotted stable manure to which a small quantity of superphosphate has been added.

For an early crop the seed may be sown under cover during July and August; and, when all danger of frost is over, the plants should be set out about 2 feet apart in rows 3 feet apart. Difficulty may be experienced with transplanting, and, it is sometimes desirable to sow the seed in the permanent positions for the plants after all danger of cold weather has passed.

Cultivation and plenty of water are necessary for the plants, as they do not recover readily after a check in growth. Staking in a similar manner to tomatoes may be practised, while, as soon as the fruits are formed, they should be thinned out to leave only eight or ten to each plant. The fruits are harvested when from 4 to 6 inches in diameter. The time from seed planting to transplanting is approximately two months, and from seed planting to mature fruit five months. The best variety is the New York Purple Spineless.

For cooking the fruit should be cut into slices and fried in batter, the slices having been covered first with salt. If being boiled or baked, the fruit should be seasoned with butter, pepper, and salt.

—*C. N. Morgan.*

PRUNING GRAPE VINES TO AVOID INJURY BY SPRING FROSTS.

Spring frosts occasionally cause considerable damage to vineyards, especially in the inland areas of high altitude. Vines which are the first to come into leaf naturally suffer most, as the dormant vines are injured only in exceptionally extreme cold. Many cases have been brought under notice where the entire crop of a vineyard has been ruined overnight by one late frost, while an adjoining area, in which the vines had not commenced to sprout, has been quite unharmed.

Vines that have been pruned in the late autumn and early winter are the first to come into leaf, and naturally are more susceptible to injury by frost than those pruned in the late winter or early spring.

Many vignerons practise early pruning, the desire being, no doubt, to have the job finished and so leave themselves free for other work. It is true that late pruning comes often at an inopportune time, conflicting with other spring work on the farm; but where a grower is considering his income he must, if at all possible, arrange pruning operations to minimise frost injury to his vines.

The work can be simplified to a great extent by a modification of the usual practice by which the pruning is carried through in one operation. Instead of completing the pruning by mid-August, which, for instance, would be a wise procedure in the Stanthorpe district, a preliminary pruning could be made in June, which would consist of shortening the canes back roughly to, say, nine eyes above the main arm or spur, and removing the prunings from the land. Then, just before the buds commence to swell in the spring, the rods that have been left on the vines can be shortened back to the required length.

Young vines that have been budded in the previous summer should never be pruned early, for, being close to the ground, the young growth is much more susceptible to injury than that of more mature vines higher up on the trellis wires.

—*F. L. Jardine.*

Cucumber-growing.

C. N. MORGAN, Fruit Branch.

THE warmth of the climate makes this crop a very suitable one for Queensland. In the coastal and northern districts several crops can be grown during the season.

Planting is carried out usually in the southern coastal districts from September to January, and on the tablelands from October to January; in the northern districts, on the coastal areas from July to January, and on the tableland and inland areas from August to January.

The Agricultural Chemist, in his pamphlet on "Complete Fertilizers," states: Cucumbers may be grown on almost any soil so long as it is fairly light and loamy and plenty of manure is added. The pits or hills should be prepared by mixing a large amount of well-rotted stable manure, sheep or fowl dung, ashes, and bonedust with the soil. Apply in addition the following artificial fertilizer:—

1½ cwt. sulphate of ammonia or nitrate of soda;

3 to 4 cwt. Nauru phosphate—superphosphate mixture;

1 to 1½ cwt. sulphate of potash;

or 6 to 8 cwt. of a 5-12-5 mixed fertilizer per acre, or 2 to 3 oz. of the same mixture per square yard.

The terms "pits" or "hills" are used to represent groups of four or five plants. At one time the seed was sown always on hills raised above the ground level, but unless the ground is badly drained this practice need not be followed.

Four or five plants are sufficient to a "hill," and the seeds should be placed 3 or 4 inches apart and about 1 inch below the surface. The "hills" should be about 4 feet apart each way, and the whole surface left loosely cultivated.

Should the plants send out their runners to a distance of 2 or 3 feet without setting cucumbers, fruiting may often be induced by pinching out the tips of the runners.

Cucumbers should be harvested when nearly full grown, before the seeds harden and the skin begins to turn yellow.

The time from planting to harvesting is usually about three months, and 1 lb. of seed set out as directed will plant an acre.

The varieties recommended are: For market purposes, Imperial White Spine; for pickling, Early Green Cluster.

THE FARM ORCHARD.

Where there are young children in a family particularly a good supply of fresh fruit and vegetables is a necessity, if there health is to be maintained. Even if some expense is involved in making a farm orchard garden, it is well worth the cost. A well-kept garden, and a home surrounded by trees is a decided asset to any farm, and undoubtedly enhances its value.

The Fruit Market.

JAS. H. GREGORY, Instructor in Fruit Packing.

CONTINUOUS dry weather is still causing complications in the marketing of fruit. High prices have been maintained for many fruits, but a drop will soon ensue if growers do not cease sending small poor-quality fruit.

The price for bananas has reached the highest level for many seasons, but growers may expect a sharp decline in the near future if the practice of marketing immature fruit is allowed to continue. Thin, angled fruit is never in demand and slows up sales, causing an accumulation of stocks with a consequent price easement for all lines.

Growers are reminded, too, that cutting fruit too soon has the effect of greatly reducing the ultimate output of the plantation. Certainly at this period of the year most plantations will have a proportion of bunches that have fallen out or have had to be harvested from dead stools, but at the same time this does not give the right for a consignment to be composed completely of immature, angled fruit. In the last few weeks many consignments have been condemned for this fault.

Many reports of the incidence of "squirter" have been received. Squirter and black-end can be practically eliminated by the adoption of cluster packing. It is well to remember that it is the grower who pays for all faults noticeable on the market, not the agent.

Pineapple quality has improved, less green fruit being noticed, and values have remained steady but at lower levels than a few weeks ago. Growers are advised to cut all fruit for distant markets.

With the approach of the warmer weather consignments of papaws will have to be watched more closely, and care in the selection of firm, coloured fruit will need to be exercised. Summer consignments should not show more than about one-third colour for most types. Unfortunately, no fixed rule can be given, since papaws vary in type—some being highly coloured and some green when ripe. There also are apparently both hard and soft types. Consignors to Southern markets are urged to study their plantations and select the trees which produce the best types of fruit for distant carriage. Remember that the taste for tropical fruits has still to be developed in the Southern States. As Queensland has the means for unlimited production of these fruits with no competition to meet, it is all in our interests to foster this trade.

Southern apples are giving trouble on the Brisbane market. Southern shippers should realise that the weather in Queensland is now becoming warmer, and that apples sent from cold stores in the cooler Southern climates do not hold long in good condition in Queensland at this time of the year Only varieties such as Yates and Tasma should now be sent. Jonathans and Sturmers of any size will inevitably cause trouble and loss.

Market prices for the month:—

TROPICAL FRUITS.

Bananas.

Brisbane.—Eights and nines, 17s. to 21s. per case. Sevens, 11s. to 19s. 6d. per case. Sixes, 12s. 9d. to 17s. 6d. per case. Smalls, 9s. to 15s. 6d. per case.

Sydney.—Eights and nines, 22s. to 24s. per case. Sevens, 19s. to 22s per case. Sixes, 15s. to 19s. per case. Thin fruit hard to move.

Melbourne.—Eights and nines, 23s. to 24s. per case. Sevens, 21s. to 22s. per case. Sixes, 19s. to 20s. per case. Thin fruit slow of sale.

Pineapples.

Brisbane.—Smooths, 5s. to 8s. per case; loose, 1s. 6d. to 7s. per dozen. Ripleys, 8s. to 11s. per case; loose, 2s. to 7s. per dozen.

Sydney.—Smooths, 8s. to 11s. per tropical case.

Melbourne.—Smooths, 8s. to 10s. per tropical case; a few special lines higher.

Papaws.

Brisbane.—Yarwun, 7s. to 11s. per tropical case; locals, 2s. 6d. to 6s. per bushel case; Gunalda, 5s. to 6s. per bushel case.

Sydney.—10s. to 13s. per tropical case.

Melbourne.—10s. to 14s. per tropical case.

Mangoes.

Mangoes have made their appearance on the market. Many consignments give the appearance of having been harvested with a stick, shillings a case being lost in the price.

Brisbane.—7s. to 8s. per case; inferior, bruised, and soft fruit lower.

Passion Fruit.

Brisbane.—6s. to 12s. per half-bushel; specials, to 14s.

Sydney.—6s. to 9s. per case; inferior fruit hard of sale.

Melbourne.—4s. to 12s.; specials higher.

Strawberries.

Brisbane.—4s. to 6s. per dozen boxes; specials, to 9s.

Sydney.—Trays, 3s. to 5s. each; boxes, 9s. to 12s. per dozen.

CITRUS FRUITS.

Oranges.

Brisbane.—Valencias, 5s. to 8s. 6d. per bushel; second crop, 4s. to 5s. per bushel; Gayndah district, 9s. to 10s. per bushel.

Sydney.—Valencias, 4s. to 7s. per bushel.

Melbourne.—Navels, 6s. to 8s. per bushel; commons, to 10s. for specials.

Lemons.

Brisbane.—Locals, 4s. to 8s. per case; Gayndah, 8s. to 13s. per case.

Sydney.—Locals, 3s. to 6s. per case.

Melbourne.—4s. to 7s. per case.

Grape Fruit.

Brisbane.—4s. to 9s. a bushel.

Sydney.—4s. to 10s. a bushel.

Melbourne.—6s. to 12s.; specials higher.

Mandarins.

Brisbane.—King of Siam, 5s. to 8s.; Waratah, 5s. to 12s. Other varieties and small fruit hard to sell.

Apples.

Brisbane.—Jonathan, 6s. to 9s.; Granny Smith, 5s. to 9s.; Sturmer, 4s. to 7s.; French Crab, 5s. to 7s.; Crofton, 7s. to 10s.; Yates, 5s. to 9s. Many lines are not holding well, particularly the softer varieties.

Pears.

Brisbane.—Coles, 9s. to 15s. per bushel; Nelis, 7s. to 12s. per bushel; Josephine, 9s. to 13s. per bushel.

All pears should be wrapped and handled as little as possible when packing, as at present a strong tendency to go specky is noticeable.

Custard apples and avacadoes are now off the market.

OTHER FRUITS.

Cape Gooseberries.

5d. to 7d. per lb.

Tomatoes.

Brisbane.—Good, ripe 7s. to 9s. per half-bushel; inferior, down to 4s. per half-bushel; green matured, 4s. to 10s. per half-bushel; coloured, to 12s. per half-bushel.

Sydney.—Yarwun, to 10s. per half-bushel; Bowen, 6s. to 10s. per half-bushel; Southern Queensland, 12s. to 13s. per half-bushel.

Bowen growers would do better if packing in the dump half-bushel case were adopted.

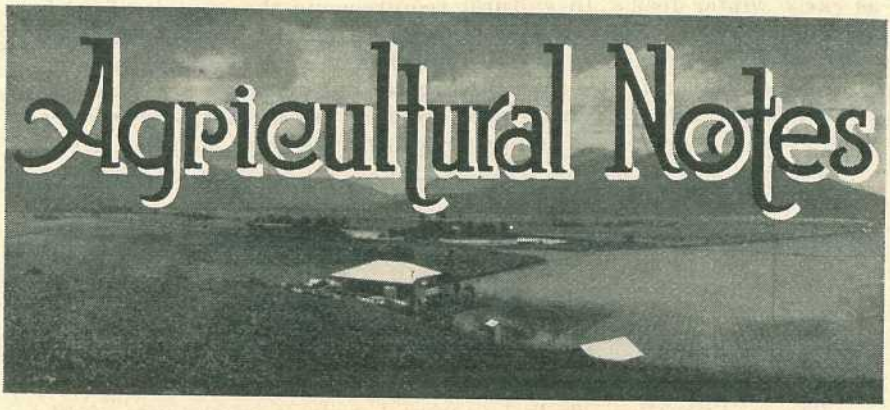
Melbourne.—Adelaide Hothouse, 18s. to 22s. per half-bushel; West Australian, 12s. to 18s. per half-bushel.

Vegetables.

Brisbane.—Beans: 4s. to 6s. a sugar bag. Peas: 4s to 6s a sugar bag Lettuce: 6d. to 1s. 3d. dozen. Cucumbers: Bowen, 5s. to 7s. per bushel; locals, 4s. to 11s. per bushel.

Publication.

"Strawberry Packing" is now available for distribution.



Seasonal Sowings.

C. J. McKEON, Director of Agriculture.

LAND prepared for summer-growing crops can be sown now with a variety of fodder, hay, and grain crops—such as maize, sorghum, millet, Sudan grass, and cowpeas. The majority of farmers recognise fully the necessity for making provision for recurring dry spells, and also for the winter months, when the growth of natural pastures is retarded considerably. In favourable seasons good results can be obtained by the cultivation of winter cereals and legumes; but it is to the more vigorous growing summer crops that stockowners must look for the provision of their chief requirements in hay, fodder, and silage.

MAIZE.

Maize can be grown successfully on a great variety of soils within the 30-inch rainfall region, deep alluvial soils being particularly suitable for its full development. Land ploughed deeply during the winter should be in good condition just now as a result of cross ploughing and harrowing; and it is well to remember that no amount of inter-row cultivation will undo the effects of sowing on hastily prepared land.

Maize crops usually are termed early or late, but as sowings may take place from August to late December, no definite sowing period can be recommended, weather conditions being the governing factor.

For grain purposes, the chief essential is to assure adequate moisture during the tasselling stage. Nine to 10 lb. of sound seed to the acre will be found sufficient, sowing in rows 3 feet 6 inches to 4 feet apart; but for fodder or silage purposes double this quantity may be used, choosing a leafy variety such as Reid's Yellow Dent.

SORGHUMS.

The sweet or saccharine sorghums also are widely grown throughout the dairying districts, as they provide a large bulk of nutritious and palatable fodder.

Although slightly less nitritious than maize, the sorghums will withstand dry conditions much better, while they also retain their

succulence for a period after maturity, making them specially valuable as early winter feed. In cultural requirements the crop is somewhat akin to maize, sowing being done in rows 3 feet to 3 feet 6 inches apart, which will be found to utilise approximately 5 lb. seed per acre. Sorghums frequently are sown broadcast; but although a finer stalk is produced, the total yield is reduced often by this method, besides which, weed growth is apt to be troublesome during the early stages of growth.

For silage purposes sorghum should be cut when the grain is well formed yet still in the soft dough stage. Saccaline, Imphee and White African are popular varieties.

MILLETS.

Where a quick-growing summer grazing or hay crop is desired, the millets can be recommended confidently, as they will produce fair crops even on the poorer soils.

The seed usually is drilled or sown broadcast, at the rate of 12 to 15 lb. per acre, and under favourable conditions the resulting crop will provide good grazing within five or six weeks. However, it is preferable to exclude stock until the plants are 8 inches to 9 inches high, when the roots will have a sufficiently strong hold to withstand grazing.

For hay purposes millets should be cut when the grain is in the soft, doughy stage; and, if a binder is used, small sheaves should be made and stooked in windrows. The varieties known as Japanese millet and white panicum have given the best results.

SUDAN GRASS.

Sudan grass also is excellent for grazing or silage purposes, and is considered to be the best possible summer crop for the drier farming areas, such as the Western Downs and Maranoa.

It is better to drill in the seed, using approximately 8 lb. per acre; but for broadcasting double the quantity will be required. The risk incurred in allowing stock access to Sudan grass prior to the flowering stage has been stressed often; however, the risk is taken by many experienced stockowners who have fed the crop during all stages of growth without ill-effects. Sudan grass and other members of the sorghum family cross fertilize readily, and the resultant hybrids are likely to cause poisoning; consequently, care should be taken to obtain pure seed from a reliable source.

COWPEA.

The cowpea now is widely recognised as a valuable green manure crop, resulting in the development of a good trade in locally-grown seed. Its profitable utilisation as a fodder crop is also receiving attention by progressive dairymen, as it is highly nutritious, provides a good bulk of fodder, and is valuable as a rotation crop. Stock can be readily accustomed to green cowpea by sowing in conjunction with maize, either in the maize drills or in alternate rows. The seed varies greatly in size according to variety; so that, when sown in drills 3 feet apart, from 5 to 15 lb. seed per acre will be necessary. Poona, groit, black, and brabham are popular varieties.

With all spring-sown crops much better results are obtained when inter-row cultivation is carried out thoroughly, although, as previously pointed out, the initial preparation of the land, involving winter fallow, is of primary importance.

Cutworms in Seedling Cotton.

W. J. S. SLOAN, B.Sc.Agr., Assistant Research Officer.

DURING the spring and early summer months one of the most serious pests of seedling cotton with which the farmer has to contend is the common cutworm.

In years of cutworm outbreaks the loss of stand may necessitate replanting. Replanting is successful only when the soil contains adequate soil moisture, and some time may elapse between a cutworm outbreak and the resowing. Late replant crops are rarely so successful as those sown early, and for that reason precautions should be taken against cutworms to ensure a commercial stand of cotton with the first seeding.

The winter of 1937 has been more or less favourable for the insect, and it is possible that good spring rains will be followed by a widespread emergence of moths. Farmers therefore should be familiar with the habits of the pest and the methods used for its control.

The cutworm—the larva of a dark-brown moth—is a stout, soft-bodied greyish-brown to greyish-green caterpillar growing up to 1½ inches in length, which feeds principally on low-growing weeds. When these food supplies are disturbed in any way, the caterpillars may migrate to nearby cotton fields or, if already in the paddock, may damage the germinated cotton. The pest feeds at night and normally attacks the stem just above the ground level.

Cutworm losses in cotton may be considerably reduced by a good cultural system. Thorough ploughing, in which weeds are destroyed completely, is necessary. Patches of weeds missed during ploughing frequently are the centre from which extensive cutworm damage may radiate. Ploughed land should be kept free of weeds for at least a month before the planting, which, if the rains are suitable, will be carried out between mid-September and mid-October. Early ploughing is therefore required. After planting, weeds should be kept in check.

If weeds are ploughed under immediately prior to planting, the risk of cutworm injury is increased greatly, for many of the eggs and larvæ on the weeds will survive and attack the cotton seedlings.

Virgin land, or Rhodes grass paddocks which are being prepared for cotton, usually contain little weed growth, and this, to a great extent, minimises the risk of cutworm injury. Under these conditions, a later planting may be made without incurring severe seedling losses. Even in these cases, however, early ploughing is preferable, in order to ensure the preparation of a good seed-bed, and to allow adequate time for the organic matter to break down.

Where direct control of the cutworms is required, insecticides must be used. The poisoned bran bait method has been tested thoroughly, and is recommended as a reliable control measure.

To prevent the entry of invading swarms, the use of one or more baited furrows is necessary. When the pest is within the field, the bait may be broadcast or applied in lines along the rows of cotton seedlings. If broadcast, about 50 lb. dry weight of bran will be required per acre; if distributed along the rows, 25-30 lb. dry weight of bran per acre should be sufficient for baiting purposes. The formula of the poison

bran bait is as follows:—25 lb. bran, 1 lb. Paris green, 2 quarts of molasses, and enough water (2-2½ gallons) to make a friable, crumbly mash which can be broadcast without difficulty. The bran and Paris green are first mixed dry; the molasses is dissolved in the water, and after being mixed the whole is well stirred up to make the mash as required. As the cutworms are night feeders, the bait should be applied in the late afternoon and evening. The use of insecticides for cutworms is a remedial measure only, and is not necessary, normally, if efficient cultural practices are applied on the farm.

THE CULTIVATION OF GRAIN SORGHUMS.

During the past two years climatic conditions prevailing in Southern Queensland have not favoured maize production, particularly on the Darling Downs and on farm lands west of the Main Range. The production of grain sorghum as an alternative to maize in the drier farming areas, therefore, is well worth consideration when planning cropping programmes. There is no doubt that suitable varieties of grain sorghums will yield profitably under seasonal conditions which are usually unsuitable for maize grain production.

Friable medium to heavy loams will produce the heaviest yields, but satisfactory crops can be grown on average wheat lands throughout the Darling Downs, Maranoa, and the agricultural districts of Central Queensland. The best results are obtained from thoroughly cultivated winter fallowed land.

Grain sorghums may be sown through standard grain drills, either in rows 3 feet to 4 feet apart, permitting of inter-row cultivation, or through every grain run or every second grain run of wheat drills. When sown in the wide spaced rows, 4 to 5 lb. of seed per acre are usually necessary, although satisfactory stands have been obtained with a seeding rate as low as 3 lb. per acre.

Of the tall-growing varieties Feterita and Standard Milo have given the best results, Blackhull, Kafir, and White Milo also being satisfactory types.

For large-scale production of such varieties it is necessary as a rule to harvest with a maize binder prior to curing, carting, and threshing.

Small areas can be headed with a cane knife and carted direct to the barn, subsequently passing the heads through a thresher or corn sheller suitably adjusted for the purpose.

The dwarf-growing varieties, however, offer the greatest opportunity for economical production within the wheat areas, as harvesting can be undertaken successfully with header-harvesters, reaper-threshers or auto-headers.

During the 1936-37 season, when maize crops on the Downs failed generally, small areas of Wheatland, Milo, Brown Yolo, Kalo, Day Milo, and Dwarf Pink produced marketable grain, the yields varying from approximately 6 to 50 bushels per acre, according to seasonal conditions in the district concerned, three growers harvesting with standard grain harvesting machinery. As grain sorghums can be relied on to produce heavier yields than maize during any season, the fact that machine harvesting is now possible should greatly enhance their popularity.

In some districts bird pests are very troublesome; but with increased areas these probably would prove less serious.

Regarding food value, the grain sorghums are little inferior to maize. Feeding tests carried out in the United States of America have indicated that grain sorghums had approximately 90 to 95 per cent. of the feeding value of maize for fattening cattle, pigs, and lambs. The protein content of grain sorghums is higher generally than that of maize.

Seed supplies of the dwarf-growing varieties are very limited, the stocks previously held by the Department of Agriculture now being exhausted.

However, it may still be possible to secure seed from growers on the Darling Downs and in the Rockhampton district. Inquiries should therefore be directed to the offices of the Department of Agriculture and Stock at either Toowoomba or Rockhampton.

The Sweet Potato.

N. E. GOODCHILD, Senior Instructor in Agriculture.

THE sweet potato is not cultivated in Queensland to-day to the extent that its usefulness warrants. At one time it was used largely on the householder's table, but now it is a rarity.

When questioned about the shortage of sweet potatoes for table use, the farmer usually replies, "There is no demand for them." This is true only in part, as there is still a demand for the right varieties. A dry floury, or a moderately moist, potato will suit the consumer best. No doubt, some of the good varieties in use in the past are not now available, because of droughts and irregular planting, but many are still grown in certain localities. If the planting is confined to varieties which have proved popular with the consumer, and which could be sold on name, the demand for them should be continuous. Under present conditions a householder may buy sweet potatoes which are unpalatable. If, however, consumers realised that there were different types and varieties of sweet potatoes, they would learn to purchase only those varieties suitable for culinary purposes.

Market gardeners should, therefore, cultivate varieties for which they could readily find buyers, as some are already doing with good results. Very watery or stringy varieties are both undesirable. It is a mistake for a grower to allow a portion of his crop to stand over after maturing, as the tubers then begin to deteriorate in quality.

The sweet potato is a hardy, vigorous grower, but prefers deep sandy loam soils, as the texture of the soil affects the form, size, and smoothness of the potato. The period of planting is dependent very largely on the locality; in most parts along the coast it may extend from October until the end of February, the tubers being ready to lift within three to four months after planting. The crop must mature before the frost commences. It does not require a heavy rainfall—in fact, excessive moisture is detrimental, in that it increases the growth of vines, and lessens the development of tubers.

The most satisfactory method is to plant a few medium-sized tubers in a nursery-bed of good friable soil, which is mulched in order to retain moisture and promote rapid growth, and to pick slips or cuttings as growth progresses. A bed of fifty selected tubers planted in this way will provide many thousands of cuttings. The alternative, and less satisfactory, method of obtaining planting material is to procure cuttings from an old plot, which is usually neglected. The terminal cutting from the vine is generally regarded as giving the best results. The land is set up in ridges 3 feet apart. The cuttings should be 12 to 15 inches in length, and planted on the ridge to a depth of approximately 6 inches, cuttings to be set from 20 to 24 inches apart. On well-prepared soil weeds should not be troublesome, shallow cultivation being sufficient until the runners commence to cover the ground.

A classification of all varieties grown in Australia was carried out in recent years by an officer of the Department of Agriculture and Stock, and cuttings of a known type, together with a number of new seedling varieties, were distributed in different agricultural districts

of the State. Some recommended varieties for planting for table use are Gold Coin, Seedling No. 3, Brook's Gem, and Snow Queen—which are obtainable in the Rockhampton district—and Porto Rica, Market, Red, Director, and Farmers' Special, which are obtainable more readily in the southern districts.

It is advantageous to the grower to market the tubers in a clean and attractive condition.

GRADING OF ONIONS.

Onion harvesting generally will commence in October. Flavour, size, firmness of texture, and capacity to carry well without serious bruising or other damage all influence their market value.

Buyers, however, sometimes complain of onions being marketed without due regard to their classification in accordance with the size of the bulbs. It is the custom of some growers to include large and small sized onions in the same bag. This practice is against the interests of the farmer, contrary to the wishes of the selling agents, and results in comparatively lower realisations on the market.

Onions should be classified according to their size. The small sized onions, say, below 2 inches in diameter, should represent one "size" grade. Onions ranging from 2 inches to less than 3 inches in diameter should comprise another grade, and onions from 3 inches to 4 inches in diameter should form a further grade.

Some growers prefer to classify the onions in grades in accordance with each ½-inch increase in diameter. This practice results in the onions in each grade being very even and uniform in appearance.

The number of grade classifications should be determined by the variation that occurs in the size of the individual bulbs comprising the crop. In ordinary circumstances, the classification of the bulbs into three or four grades will suffice. It is important, however, that the onions should be graded as evenly as practicable. All "outsized" bulbs, especially the onions that are coarse, and are customarily referred to as "bull-necks," should be rejected.

WHAT IS SUCCESS IN FARMING?

The successful farmer is often spoken of, and so the question arises naturally: What is success in farming? Most people without practical experience will say that is very easy to answer. From experience it is known that the longer the calling of farming and stockbreeding is practised the more it is realised that success in agriculture and other land industries is not so simple as it looks.

To one man, success will mean the winning of a prize at the Brisbane or district show; to another it means having the best kept farm for miles around; to yet another success will be assured when the mortgage is lifted. Many may dream of the day when they can lie in bed with tea and toast in hand listening to the cows being yarded; or spread out in a squatter's chair on the veranda watching ripe apples falling into the basket.

However, when the business of farming is looked at in its true perspective it becomes plain that some men on the land have no definite aim. Farming is such a long-term job that, to get any real measure of satisfaction it is necessary—and would pay handsomely—to decide on a general policy and stick to it.

Difficultles are often due to lack of a definite policy—planning of the work and working to the plan—and the great attraction in agriculture is that it gives so much room for initiative and success. If initiative is lost much of the joy will soon go out of work on the land.

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, and the Friesian Cattle Society, production charts for which were compiled during the month of August, 1937 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORN.				
MATURE COW, (STANDARD 350 LB.).				
Model 3rd of Alfa Vale (365 days)	W. H. Thompson, Nanango	18,733·9	835·071	Reward of Fairfield
SENIOR, 2 YEARS, (STANDARD 250 LB.).				
Sunnyview Gaiety	J. Phillips, Sunnyview, Wondai	13,938·6	454·262	Burradale Byron
JUNIOR, 2 YEARS, (STANDARD 230 LB.).				
Rosenthal Roseleaf 17th (246 days)	M. C. and A. M. Sullivan, Pittsworth	6,502·52	268·048	Rosenthal Carbine
Sunnyview Princess 3rd	Burnett Brothers, Brookfield	7,283·2	267·64	Burradale Byron
College Molly 5th	Queensland Agricultural High School and College, Gatton	6,143·76	231·237	College Butterman
JERSEY.				
JUNIOR, 2 YEARS, (STANDARD 230 LB.).				
Bluebell of Peeramon	O. H. O. Koppen, Peeramon	4,924·6	293·3	Trinity Sagunda's Prince
Bellgarth Birthday III.	D. R. Hutton, Cunningham	5,339·97	277·413	Airlie Thorn
Limelight of Peeramon	O. H. O. Koppen, Peeramon	4,742·85	231·644	Trinity Sagunda's Prince
FRIESIAN.				
JUNIOR, 2 YEARS, (STANDARD 230 LB.).				
Arcadia's Queen Zara	F. C. Noller, Kumbia	6,375·7	252·739	Ryfield Sultan 2nd.

The Tropics and Man

Effects on the Nervous System.

DOUGLAS H. K. LEE, M.Sc., M.B., B.S., D.T.M., Professor of Physiology, University of Queensland.

Second Series: No. 3.

IN the last two articles the words "nervous system" have cropped up several times. By devious channels this section of the body's machinery seems to come in for special attack by the various factors of tropical climate. So true is this, and so important the results, that it seems advisable to consider it a little more fully here.

Development of the Brain.

The lowest animals have no nervous system. The different parts are so close together and the animal's structure is so simple that a nervous system is of no more use to it than telephones would be in a small store. Animals slightly higher in complexity have a nerve net, just as an office may have a simple telephone system without a switchboard. In a large factory, such a simple net would be cumbersome and inefficient, so a central switchboard is installed. Just so do the next higher animals develop the most forward part of their nervous system as a brain. This brain becomes more and more highly developed as the animal's complexity increases until the incredibly complicated nervous system of man is obtained to the despair alike of the medical student and the sufferer from neurasthenia.

The nervous system is at once the most delicate, the most complex, and the most essential system that man possesses. For these reasons it bears the brunt of every-day stresses, and if disturbed, involves the body in the most important consequences (e.g. a motor car smash after three whiskies). Scientists investigating the electrical changes in nerve cells had to invent apparatus so delicate that it was disturbed by the compression of the air in the room when a gust of wind blew against the wall of the closed building. That may give you some idea of the incredibly delicate nature of the nerve cell. Yet the smallest variation in these processes means a huge alteration in the efficiency of the nerve cell. If we once realise that, the wonder is, not that our surroundings affect the nervous functions, but that we can live at all. The most delicate instrument made is the crudest toy as compared to the nerve cell.

Control of Body Temperature.

We saw in an earlier article that the main purpose of the body's behaviour when placed in hot surroundings is to keep the body's temperature constant, or at least within a certain harmless range. This may at times be possible without interfering unduly with body function; at others, some sacrifices may have to be made; at others, it may be quite impossible, no matter what sacrifices are made by the different systems. In all these adjustments, the nervous sytem, as befits its nature, has many duties to perform. Through its activities the sweat glands are called into action, the skin blood vessels dilated, extra fluid

thrown into the circulation, and muscular relaxation increased—all measures designed to increase loss of heat from the body or diminish its production within the body. The decreased desire for physical work is also protective, and, in a way, a function of the nervous tissue. Certain of the ductless glands, particularly the suprarenal medulla, are under nervous control and have to be regulated to the same general ends—maintenance of a constant body temperature.

Thus the nervous system is not merely a passive victim of hot surroundings, but is actively engaged in combatting their effects. Upon its efforts depends, to a large extent, not only the fate of other bodily tissues, but also its own.

Can Stand Honest Work.

The nervous system has a great deal of work to do in combating heat, but this alone would not worry it unduly. After all, work is its job, and it is built to stand up to a good deal of work. Like the modern motor car, it can stand a lot of honest work; it is abuse which wears it out. Abuse of the nervous system occurs very easily in hot climates. Such abuse may be internal and natural or external and unnatural.

Internal or natural abuse of the nervous system arises largely from circulatory failure as I have mentioned before. Because of the dilation of the skin blood vessels, reduction of muscle tone, and loss of water, the available blood has difficulty in filling the vessels completely. Even a small reduction in the amount of blood available to the brain may have profound effects, so incredibly delicate is its mechanism. Insufficient oxygen may be supplied or insufficient wastes removed.

Even if there is a sufficient volume of blood, it may easily be too concentrated, or have a wrong balance between its acid and alkaline components, or have too little salt, or be at too high a temperature. Any one of these things may throw the working of the nervous system quite out of gear. Mild disturbances might result in tiredness or apathy, moderate upsets in irritability, sleeplessness or neurasthenia, severe disturbances in a complete failure of adjustment to heat with fainting, rapid rise of temperature or death. Milder symptoms are the most common, but by no means negligible. They undoubtedly turn a good many worthy people away from the tropics and furnish a serious and continual drain upon the efficiency of hosts of others, particularly in the field of mental endeavour.

External or unnatural abuses arise from our own ignorance or folly. Unwise eating, both in quantity and quality, neglect of common-sense precautions amounting sometimes to gross carelessness, abuse of alcohol and other stimulants, and failure to face up to facts are appallingly prevalent. I have at times been guilty of most of these, without being in any way conspicuous in my behaviour.

Forewarned is Forearmed.

Internal abuses can be minimised by methods I have already suggested—taking plenty of fluids, eating a balanced diet, adding sufficient salt to the food, keeping a proper balance between rest and exercise, taking all the usual measures to keep physically fit.

External abuses have such obvious remedies that they are very commonly forgotten. It is a true case of familiarity breeding contempt.

Over-eating is general, and eating too much of one type of food at the expense of others is very prevalent. The diet should be as varied as possible, even at the one meal. It is well to choose as much as you can from the "foundation foods"—milk, meat, cheese, eggs, fruit and vegetables, and use other foods only to fill in the gap. In many country places the gaps are as yet many, although improvement is on the way. Much more use can be made of shade in our country towns, and kitchens can be made much less like a vision of the under-world. Larger kitchens placed on the shady side of the house, with insulated or even electric stoves, and adequate coolers, ice chests, or refrigerators are essentials to home-building. Free ventilation in humid climates, thick insulated walls and closed rooms during the heat of the day in dry climates are essential. Air-conditioning is still a dream, but must soon become reality in tropical housing. Something might be done in the matter of adjusting working hours to tropical conditions. As an alternative to the siesta-arrangement, there is the practice adopted widely in Malaya of commencing work about six in the morning and finishing about four in the afternoon, which leaves a considerable and attractive part of the day for social and sporting activities. Alcohol in reason at the end of the day's work is a matter for individual judgment; alcohol during the day in all but the most moderate and dilute form (or in excess at any time) can be nothing but detrimental.

Mental activity requires as much drill as physical. The mental sluggishness characteristic of hot weather is remedied by acclimatization and this in turn is aided by physical fitness. The lapse into mental sloth is insidious but real, unless active steps are taken to forestall it. If efficiency is to be maintained, this must be done. Mental inactivity as much as over-worry is to be avoided.

SHEEP LAND FOR GRAZING SELECTION.

BARCALDINE AND HOME CREEK RESUMPTIONS.

Portions 7 and 9, parish of Home Creek, comprising part of Barcaldine and Home Creek resumptions, will be open for Grazing Homestead Selection at the Land Office, Barcaldine, on Thursday, 11th November, 1937, at 11 a.m.

The portions are situated about 24 and 28 miles south of Barcaldine.

The areas of the portions are 26,615 acres and 20,930 acres.

The term of each selection will be twenty-eight years, and the annual rental for the first seven years is 4½d. and 4d. per acre, respectively.

Each selection must be stocked to its reasonable carrying capacity with the applicant's own sheep within a period of three years.

Both portions are artificially watered, but more water will be required on portion 9. They comprise downs country and are first-class sheep areas, suitable for fattening, woolgrowing, and breeding.

Free lithographs and full particulars may be obtained from the Lands Department, Brisbane, the Land Agent at Barcaldine, and the Queensland Government Tourist Bureaux at Sydney and Melbourne.

Answers to Correspondents

BOTANY.

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

Kangaroo Apple.

K.J.D. (Fernvale)—

The specimen forward with your letter represents the kangaroo apple, *Solanum aviculare*, a native plant that frequently comes up very abundantly following a scrub burn. The plant is not known to possess any medicinal value. The late Dr. T. L. Bancroft found it to contain an alkaloid similar to nicotine. The berries have been sent to us on one or two occasions as a reputed poison to pigs; on another occasion we received specimens of the young growth said to have been responsible for the deaths of a number of sheep in the Tara district. Pulling up by the roots is the only method of eradication. It would probably succumb readily to a weak arsenical spray, but there is always the possibility of stock becoming poisoned by eating the sprayed foliage. We think it likely that after a time the plant will choke itself out. It seems to be essentially a weed of freshly cleared country.

Kangaroo Grass.

B.S. (Bunya, via Aspley)—

The botanical name for kangaroo grass is *Themeda australis*. The heaviest seed crop is borne in the months of February and March, but it varies somewhat with the seasons. Buffalo grass is *Stenotephrum secundatum*. This grass flowers at different times of the year, mostly in the late summer months. It does not produce fertile seeds, at least not under Queensland conditions, and propagation is always by division.

Berries and Burrs.

A.H. (Laidley)—

1. *Melia dubia*, white cedar. The berries of white cedar are poisonous to stock, particularly pigs.
2. *Acanthospernum hispidum*, star burr. A very bad weed in parts of Queensland, particularly in the North. It is not known to be poisonous or harmful.
3. *Cassia Sophera*, sometimes known as arsenic bush or yellow pea. If eaten in any quantity by stock, it probably would cause severe purging, as it belongs to the genus which produces the senna leaves of commerce.
5. *Malvastrum spicatum*. A very common weed of the Mallow family, often called *sida retusa*, but the true *sida retusa* is a different plant. It is not known to possess any poisonous or harmful properties.
6. *Alstonia constricta*, native cinchona or quinine bark. Feeding tests in New South Wales show this plant to produce nervous symptoms somewhat similar to those of strychnine poisoning. It is not likely, however, that an odd mouthful taken by dairy stock or travelling cattle would cause serious trouble.

The rumen contents were examined, but contained only grass and two or three odd leaves of eucalypts, probably picked up in the grass at the time of feeding. No leaves, berries, or seeds of any of the above six plants were found in the rumen contents.

An Edible Berry.

M.H. (Charvel, Theodore)—

The specimen is *Myoporum debile*, a creeping plant producing an edible berry. It is fairly widely distributed in the State, but we have not heard a common name given to it. The generic name, *Myoporum debi'e*, is quite short enough for general usage. Most of the species of *Myoporum* are shrubs or trees, and the present plant is an exception to the rule, hence the specific name "debile," meaning "weak" or "lowly."

Native Bryony.

S.D. (Coomera)—

Your specimen represents the Native Bryony, *Bryonia laciniosa*, a fairly common vine in parts of Queensland, particularly among the secondary growth in freshly cleared scrub country. It is poisonous, but so far as we have observed, is rarely touched by stock.

Wild Onion.

M.H. (Tannymorel, via Warwick)—

The plant sent is a wild onion or onion weed, *Asphodelus fistulosus*. It is a native of the Mediterranean region. It has appeared in some places on the Darling Downs. In some parts of New South Wales it tends to take possession of the land wherever it gains root. It is not eaten very readily by stock, but if cows happen to eat it an offensive smell is given to the milk.

If you have only a few plants on your property, it would be advisable to eradicate them.

Balloon Cotton.

H.C. (Milmerran)—

The specimen sent is the Cape Cotton or Balloon Cotton, *gymphocarpus fruticosus*, a native of South Africa, now a widespread weed in Queensland. It is usually left untouched by stock, but if eaten in any quantity, is poisonous. The silky cotton surrounding the seeds has no commercial value.

Cudweeds, Turnip Weed, Fish Weed, and Nettles.

G.H. (Booinbah)—

1. This specimen bore neither flower nor seed, but looks like *Gnaphalium* sp., a cudweed. The cudweeds are very common plants, both as weeds of cultivation and of the pastures of Queensland. They are eaten sometimes by stock, but their wiry hairs are said to cause impaction.

2. *Sisymbrium orientale*, tumbling mustard. This and several other plants of the family *Cruciferæ* are known frequently as turnip weeds or mustard weeds. They all give a strong flavour to milk or cream.

3. Specimen too young to determine.

4. *Lamium amplexicaule*, henbit or dead nettle. This is a very common weed during the winter and spring months in many parts of Queensland. It is allied very closely to the stagger weed or wild mint, and, like it, causes shivers or staggers in working horses and travelling stock. Ordinary paddock resting stock, however, eat the plant with impunity. In fact, most dairymen look on it as quite a good fodder.

5. *Rhagodia hastata*. The name fishweed is given to these plants on account of the peculiar flavour they give to milk and cream.

"Mexican Clover"—A Serious Pest.

A.D.C. (Glasshouse Mountains)—

The specimen is *Richardsonia braziliensis*, sometimes called Mexican clover, although this name is rather misleading, as the plant does not belong to the clover family.

It was boomed some years ago as a fodder, but our experience has been, on the whole, that stock do not eat it readily. If you have only a small patch, we would advise you to get rid of it, because once it sets seeds it is a very serious pest, particularly in pineapple plantations.

Purgative Properties.

D.E.E. ("Croxdale," Charleville)—

The specimen is the Bean Bush or *cassia pleurocarpa*. This plant, which is widely spread in Australia, has been very much on the increase in the Charleville district of recent years. It has not been proved definitely poisonous. On the whole, the species of *cassia* contain purgative properties, the senna leaves of commerce being the product of several species.

Mist Weed.

A.H.S. (Yeerongpilly)—

The specimens have been identified as mist weed, *Eupatorium riparium*. This plant has a fairly strong hold in South Coast districts, especially along creeks. In some localities it is thought to be poisonous to stock, but, so far, there is no definite evidence of a poisonous character.

Castor Oil Plant.

A.S. (Roma)—

The specimen you send is the common castor oil plant. The seeds of this plant contain the commonly known castor oil. As the fruit contains a poisonous substance, it should be treated as poisonous. It is presumed generally by botanists that the plant was a native of Africa, but it now is cultivated in many tropical and sub-tropical countries. Its botanical name is *ricinus communis*, and it belongs to the euphorbian family.

Cassia Lignum-Vitae.

C.H. Malmoe Siding, Mundubbera line)—

1. *Cassia eremophila*—the shrub with yellow flowers. Plants of the Cassia genus are mostly regarded as possessing purgative properties. As a rule, stock do not eat them readily.
2. *Vitex Lignum-vitae*, native lignum-vitae. This is not known to be poisonous. It is mostly avoided by stock.

Native Elderberry.

R.C. (Brisbane)—

The specimen forwarded with your letter is the native elderberry, *Sambucus gaudichaudii*, a shrubby plant very common in parts of the Lockyer Valley. We have not heard, however, of its being a bad pest to cultivation. The best means of poisoning it would be to cut it somewhere about ground level and to pour arsenic into the freshly-cut surface as soon as possible. This should run down to the lower parts of the roots and eventually kill them out. So far as we know it is not a pest in any other part of the State.

Spear and Wire Grasses.

M.T.R. (Wallace, via Burketown)—

1. *Heteropogon contartus*, bunch spear grass. The name bunch spear grass refers to the habit of the long awns or spears to become entangled among themselves in bunches. This grass is quite palatable in the young stage. As a matter of fact, we have known it used as a chaff or chop-chop for horses in a drought period even when fairly old. In this state, however, its nutritive value is very low. It is one of the commonest grasses in the coastal and near-coastal belt of much of North Queensland.

2. *Aristida* sp., a wire grass or three-pronged spear grass. The wire grasses, of which there are a number, are very closely allied species. Some are not regarded as having very much value as fodder. The grass you describe as kerosene grass is evidently a species of *spinifex* or *triodis*, of which we have several in North Queensland and the Northern Territory. So far, we have not succeeded in finding a grass that can grow in competition with it and smother it out.

Burr Trefoil.

W.B. (Rocky Creek, Yarraman)—

The specimen is *Medicago denticulata*, the burr trefoil. This plant is very common during the winter and spring months in Queensland, particularly following winter or spring rains. It is quite a good fodder, but, in its green state, is apt to bloat stock if they feed heavily on it. When it dies down it presents a mass of burr-like pods. These are eaten readily by stock, particularly sheep. The plant is particularly common in some of the Downs country, and causes a good deal of trouble in belly-wool. The seed is stocked by most reputable seedsmen, and should be sown preferably in the autumn months.

General Notes

Staff Changes and Appointments.

Mr. H. G. Knust, Instructor in Cane Culture, Innisfail, and Mr. S. A. Clayton, Inspector of Dairies, Caboolture, have been appointed also Inspectors under the Diseases in Plants Acts.

Constable J. H. Lewis, Emerald, has been appointed also an Inspector under the Brands Acts.

Messrs. A. R. Brooks and E. A. Harden, of Zillmere Road, Zillmere, have been appointed Honorary Rangers under the Animals and Birds Acts.

Messrs. M. Buchanan (Gympie) and E. N. Greaves (Coolangatta) have been appointed Growers' Representatives on the Banana Industry Protection Board until 30th September, 1938.

Messrs. D. F. Vaughan (District Scout Commissioner, Rockhampton), L. V. Masters (Organising Commissioner, Boy Scouts' Association, Brisbane), W. R. Thomson (Scoutmaster, Rockhampton), S. W. Holmes (Cubmaster, Taringa), and A. J. O'Farrell (Scoutmaster, Koumala) have been appointed honorary rangers under the Animals and Birds Acts.

Mr. C. J. McKeon, Director of Tropical Agriculture, has been appointed Director of Agriculture, Department of Agriculture and Stock.

Mr. W. Leslie, Assistant Instructor in Fruit Culture, has been transferred from Toowoomba to Bowen.

The resignation of Mr. B. Courtice, Bundaberg, as a representative of sugar-cane growers on the Sugar Experiment Stations Advisory Board, has been accepted.

The following have been appointed honorary rangers under "*The Animals and Birds Acts*, 1921 *to* 1924":—

Messrs. S. W. Gibson, H. V. Hanson, W. F. Klaka, J. Roberts, G. Mann, E. W. Ford, F. Ferguson, E. G. Fowler, J. Harris, A. P. Couper, T. R. Lucas, H. J. M. Ransden, D. Watt, senr., H. Watson, and C. J. Mann, of the Inkerman Mill Suppliers' Committee, Home Hill; and

Messrs. W. M. E. P. Prufert and T. Knopke (Summerhill), S. W. Hutchens, junr. (Crediton, Dalrymple Heights), J. V. Sullivan (Dalrymple Heights), and R. J. C. Wood (Eungella, Dalrymple Heights).

Cotton Board.

An Order in Council has been issued under the Primary Producers' Organisation and Marketing Acts providing that the growers' representatives on the Cotton Board shall be elected triennially instead of biennially as at present. The members of the board shall hold office for a period of three years, and this provision shall apply to the 1937 election of members, as well as to all future elections.

Grade Standards for Cavendish Bananas.

Schedule 6 of the Fruit and Vegetable Grading and Packing Regulations has been rescinded and a new schedule, embodying grade standards for Cavendish bananas, issued in lieu. The amended grades provide for cased bananas packed in both clusters and singly. Cased bananas packed in clusters shall be divided into three grades—"Small," "Standard," and "Large"—and at least 90 per cent. of the bananas in any case so packed shall consist of clusters of not less than three bananas each. Cased bananas packed in singles shall be divided into five grades—"Small," "Sixes," "Sevens," "Eights," and "Nines."

Broom Millet Board.

Orders in Council have been issued under the Primary Producers' Organisation and Marketing Acts providing that elections of growers' representatives on the Broom Millet Board shall be held triennially and that members elected shall hold office for three years; further, giving notice of intention to extend the operations of the Board for the period from 1st November, 1937, to 31st October, 1943. Growers of broom millet who have supplied their product to the Board may forward a petition for a poll on the question of whether or not the Board shall be extended as above.

"Pig Breeders' Annual"—World Pig Progress.

Published by the National Pig Breeders' Association of Great Britain as one of a series, the 1937-38 edition of the "Pig Breeders' Annual" just to hand from London is a worthy successor to a long line of useful, informative publications, which have gained for the "Annual" a world-wide circulation, and this latest edition has been the means of distributing an immense amount of helpful information to pig raisers in all parts of the world.

The "Pig Breeders' Annual" is the only publication of its kind in the world. Its contributors are men well and favourably known in the sphere in which they work, and as units in a world-wide organisation; and its appeal is one that should find for it a place in the library of every pig producer whose heart is in his business.

Among the many very informative contributions to the book is that which deals with the world's pig progress, a survey of production in all the principal pig-raising countries, with informative statistics, and a general review of the lines along which different peoples work in this particular industry.

The Australian contributors include Mr. E. J. Shelton, H.D.A., Senior Instructor in Pig Raising in the Queensland Department of Agriculture and Stock, who deals in an interesting way with the influence of N.P.B.A. breeds on Australia's pig-breeding industry, and Mr. Richard G. Watson, of Brisbane, who gives his "Impressions of European Pig Production," gathered during a recent visit to Great Britain and Denmark.

Mr. Watson, in addition to being a successful commercial and stud pig farmer, is also vice-president of the Queensland branch of the Australian Stud Pig Breeders' Society and chairman of the Australian Pig Industry Council, as well as being the pig producers' representative for Australia on the Australian Meat Board.

In addition to many other helpful contributions, the outcome of experiments, research, and surveys, the "Annual" carries a large number of useful tables, statistical data, clear sharp illustrations, and many very fine advertisements.

The fact that 500 copies of this publication already find a place in the homes of Australian pig producers should be a guarantee of good faith and an assurance that at 3s. 6d. post free it represents excellent value. Copies may be obtained direct on receipt of remittance addressed to Mr. E. J. Shelton, Department of Agriculture and Stock, Brisbane, Queensland.

Control of Plague Grasshoppers.

A Proclamation and Regulation have been issued under the Diseases in Plants Acts declaring that the area comprising the pastoral districts of Moreton and Darling Downs shall be a quarantine area in respect of the plague grasshopper, and prescribing the nature of the quarantine to be imposed.

Provision is made for the laying of baits prepared from arsenic pentoxide, molasses, water, and bran on roads, stock routes, and reserves where the grasshoppers are prevalent. Property owners and local authorities shall lay such baits on their holdings and all areas under their supervision.

The following officers of the Department of Agriculture and Stock have been invested with the powers of Inspectors under the Diseases in Plants Acts, and will be available to render any assistance in connection with the control of the pest:—

Messrs. P. Round (Pittsworth), R. E. Watson (Oakey), E. T. Lewin (Dalby), D. Culhane (Toogoolawah), and A. Hossack (Laidley).

Queensland Cane Growers' Council.

The result of the voting in connection with the levy of ½d. per ton of sugar-cane harvested during the present season—to be utilised by the Queensland Cane Growers' Council by expending the same on matters of an economic, legal, or compensatory nature where such matters are of vital importance to the sugar industry—was:—

For the levy	.. ..	911 votes.
Against the levy	.. ..	2079 „

Fruit Fly in the Stanthorpe-Warwick-Killarney District.

A Proclamation and Regulation have been issued under the Diseases in Plants Acts declaring the Stanthorpe, Warwick, and Killarney districts to be a quarantine area in respect of fruit fly, and prescribing the nature of the quarantine to be imposed in such area. Orchardists shall control fruit fly by placing, at certain specified periods, traps charged with fruit fly lure approved by an inspector at the rate of ten per acre amongst all trees in their orchards.

Rural Topics

Lamb-marking.

The term "lamb-marking" covers the castration and tailing of the male lambs, tailing the ewe lambs, and the snipping of the registered ear mark. The best age at which to mark is from a fortnight to one month old.

The operation should be performed under the most hygienic conditions possible. The use of old yards should be avoided so as to minimise the risk of tetanus and septicæmia. All instruments should be absolutely clean at the commencement of operations and must be dipped into a disinfectant frequently during the progress of the work.

There are two methods of castration, namely, tipping and slitting. The latter practice has the advantage of giving a wether a better cod when fat.

Tipping, however, is advocated, for the wounds heal more quickly in lambs treated in this way. Where the flock is small, farmers are advised to hurdle off a temporary yard in the corner of a paddock. The lambs, when marked, should be dropped on to clean pasture land. A non-arsenical dressing, which is both curative and blowfly repellant, should be applied to all wounds with a clean swab or brush, and a careful watch kept over all treated lambs. Should the flies be bad fresh treatment may be necessary.

—*J. L. Hodge.*

Milk from Newly-calved Cows.

With the approach of spring, dairy farmers should be careful regarding their increased milk supplies, especially colostrum milk. The milk of the newly-calved cow is abnormal, and is called colostrum or beastings. It is yellow in colour, has a rather strong pungent taste, an unpleasant odour, a sickly albuminous flavour, a high specific gravity, a high total of solids, high albumen, and low figures for fat and sugar. The fat of colostrum has different properties from that of normal milk, and the sugar is largely glucose and not lactose—it also shows a larger proportion of phosphate.

Such milk serves as food for the new-born calf, and increases the resistance of the calf to disease during the first few days of its existence. It is not to be used as a means for increasing the supply to the factory. The milk becomes more normal day by day until, in seven days after calving, it is practically normal, although it may take up to a fortnight to attain perfectly normal composition.

It is advisable to isolate the newly-calved cows, and for the first seven days at least this colostrum milk should not be mixed with normal milk, either for butter or cheese making. Cream from such milk blended with good cream results in the whole delivery being graded down either to second grade, or in being completely rejected. For that reason this milk should not be separated on any account. Colostrum milk is quite unfit for cheese-making, since it is easily coagulated by heat, curdles very slowly with acids and rennet, and results in very poor quality cheese.

It should be remembered, therefore, that:—(1) Colostrum milk is food for young calves only; (2) it should on no account be sent to cheese factories or, as cream, to butter factories.

—*O. St. J. Kent.*

Tar Branding of Sheep.

Wool from sheep which have been tar-branded is sold often at a lower price than wool branded with one of the several branding fluids on the market. These branding fluids are very satisfactory, being harmless and having no ill-effects on the wool, while at the same time they are readily emulsifiable.

It is difficult to remove tar from the wool during the process of manufacture. Tar-stained wool, therefore, may bring a lower price than clean wool free from tar.

The grazier obviously in his own interests should discontinue the practice of tar-branding.

Jack Howe, Shearer—The Man and His Records.

Jack Howe, in his own day and in his own sphere, was just as well known as any champion cricketer or boxer, and, as is the case with all champions, there was no lack of rivals eager to displace him from his position of pre-eminence. Shearers would make big journeys to try their skill against him, but nearly all of such contests enhanced rather than diminished Howe's reputation.

On one occasion Howe was shearing at Evora Station. Amongst the other men was a very fast shearer, Harlin by name, who came from New Zealand. Harlin had hopes of "ringing" the shed in spite of Howe, and there was keen interest amongst the rest of the men to see how the two champions would fare. Shearing started on a Monday. On that day the Queenslander shore 111 sheep and the New Zealander 92—not high tallies for first-class shearers, but the sheep carried a great deal of sand in their fleeces. On the Tuesday Howe's tally was the same, with Harlin's a little closer to it; it was successively closer still on Wednesday, Thursday, and Friday, and it appeared that Howe at last was to meet his match. There was a belief held by some of the men that the champion was apt to "go to pieces" when pressed, and, acting on this belief, Harlin's backers urged their man to make a special effort on the Saturday, when only a half-day would be worked. The New Zealander responded to their urging with a very good tally of 84 for the half-day. But, to the surprise of everyone and to the discomfiture of Harlin, Howe's tally still remained at 111. The victory was such a decisive one that it ended any hopes of Harlin "ringing" the shed.

Howe established his famous record when shearing at Alice Downs in 1892. Between the starting and "knock-off" bells on October 10 of that year he shore no less than 321 sheep, and in so doing established a shearing record which has never been bettered. Keeping in mind that the shearing sheds of that period worked longer hours than they do to-day, Howe averaged more than a sheep every two minutes throughout the whole day. Even this fact, remarkable as it is, does not show what Howe was capable of when really extended, for, as a final spurt, during the last five minutes of his record-making day he shore five sheep, and had the sixth on the board as the bell rang, which, in accordance with shearing shed practice, was included in the day's tally.

Few records of any sort are established under anything but favourable circumstances, and Howe's feat was no exception to this rule. The sheep that were hurried up the race and bustled into the pens of Alice Downs shed on that memorable day were practically free of wrinkles, and carried open fleeces of a little less than the full 12 months' growth. Nevertheless, in every way it was a genuine record, and Howe received no assistance from anyone to which he was not fairly entitled, although it is safe to assume that his pen mate handled any rough sheep that were sent in to their catching pen. Favourable as the circumstances were to speedy shearing, the next fastest man on the board—a New South Wales champion —could not get to within a hundred of Howe's tally, so that his superiority was definitely emphasised in more ways than one. In this machine age, it is of interest to note that the record was made with blades.

Howe was not only a fast shearer—he was a good one as well. His work was marked by that effortless ease which is the mark of the master, and neither the man that owned the sheep, nor the boy that picked up the fleeces, nor the shed hands that rolled them, ever had reason to complain of his work. He died a few years ago in the centre of that district where he had created so many records, and his end was in keeping with a man who had always been a good sportsman and a true friend. He is one of the select few whose name is perpetuated by an article of clothing, for even to-day in the shearing sheds of Queensland the men speak of a sleeveless shirt as a "Jacky Howe"—the older ones with a reminiscent gleam occasionally lighting their eyes as the name recalls to their mind the big shearer who had set such a rattling pace forty years before.—B.W.P. in the "Sydney Morning Herald."

A Show Impression.

One of the advantages of owning livestock is the thrill to be got out of a good stock show. Shows are an excellent training ground for young farmers of ambition and arouses in them a sense of responsibility, and, above all, they learn how to take defeats as well as successes. Everyone likes the man who when he misses the blue ribbon says that his exhibit was beaten by a better beast. Behind every exhibit at the show there is keenness, intelligence of a high order, considerable capital, and a real love of the land and its industries.

New Legislation for Poultry Industry.

To give further protection to poultry farmers, amending legislation has been passed by the State Parliament. A method of determining the sex of "day-old" chickens—a method that requires the highest proficiency—is a recent discovery. The object of the new legislation is to make sure that only properly-qualified and expert persons may be licensed for the work of sex determination in chickens. When chickens are classified as cockerels it is usual for poultry farmers to sell them for rearing as table birds. The new measure will prevent unscrupulous dealers from selling the male chickens as a mixed flock or—as has happened—as pullets. Persons licensed to sex "day-old" chickens will be required to mark with a stain all chickens that they decide are males.

The Act provides also for the voluntary registration of hatcheries, with the object of raising standards in the chicken-dealing business.

Under the original legislation all poultry diseases had to be notified, but the amending measure makes it no longer necessary, except in cases of highly contagious diseases.

The selling of or attempting to sell diseased poultry for table use—poultry unfit for human consumption—is an offence, and inspectors will have much wider powers of condemnation.

The amending legislation will be welcomed by poultry farmers as a measure designed to further protect their interests, when either buying or selling.

Dehorning Calves.

Every dairy farmer knows the advantages of dehorning his poddies. There are sound reasons for dehorning cattle while they are still young. The operation is less painful than it is with grown cattle. It is cheap, quick, simple, and effective if reasonable care is taken. A herd of dehorned cows are quieter to handle and more content when yarded. They are not so liable to injury. They will give better and more consistent production.

Until the calf is about a week old the horn buttons are either not attached or loosely so, to the bones of the skull. It goes without saying that it is in this period that dehorning with caustic potash will give 99 per cent. results.

The best way to do it is to tether the calf short, but with rope enough to allow it to pull back. It can be straddled easily then. With sharp scissors clip the hair from each horn button. Roll a stick of caustic potash in a piece of paper, with one end protruding. In this way it may be handled without injury to the fingers. Dip the end of the caustic in water, and shake off surplus water, for if it drips the water may run into the eyes of the calf and blind it.

Each horn button should then be rubbed thoroughly with the point of the caustic until the skin is well broken. In a few hours the caustic will have done the job quite well.

No further treatment is required, but the calf should be kept covered for twenty-four hours. Bull calves usually require more treatment than heifers.

Caustic potash will last for years in an air-tight tin or jar, but—*and this is important*—do not keep it where children can get it.

Trucking Fat Lambs.

Complaints of the bruising of lambs consigned to market are not uncommon, but to a great extent the remedy lies in the hands of growers.

The tenderness of sucker lambs is often not appreciated sufficiently, and in many cases they are handled like fat sheep. Sheep, too, may be bruised by bad handling, though not so badly as sucker lambs. It should be remembered that true sucker lambs have never been off the mothers. It is advised, therefore, that if a road journey has to be undertaken some of the ewes should accompany the lambs to the trucking yards. A lamb should never be lifted by the skin. Prodding sticks should never be used. Over-crowding in the trucks should be avoided entirely. In all cases, every endeavour should be made to deliver the lambs at the market with the bloom on them. A certain loss in weight and appearance is unavoidable on a long journey, but if the foregoing rules were observed strictly, complaints of bruising would be rare.

Orchard Notes

NOVEMBER.

THE COASTAL DISTRICTS.

Citrus Fruits.

In the citrus orchard the increase in temperature and the possibility of a dry period call for the utmost attention to soil conditions, particularly aeration and moisture conservation. At the slightest sign of distress, owing to lack of moisture, trees should be irrigated thoroughly whenever water is available for this purpose.

At the same time care and attention should be given to cultivation, particularly on hillside orchards, and in the coastal districts the possibility of the approach of storms will prompt growers to consider the completing of each cultivation by forming shallow drains to care for excess water and prevent soil losses.

Attention must be given to the incidence of mites, which are the direct cause of the darkening of the skin of the fruit known as "Maori." Usually the first indication of the trouble is when, with the sun shining on it, the fruit has the appearance of being covered with a grey dust. If examined with a good lens, the skin will be seen to be covered with numerous yellow slug-like insects which are living on the skin.

Under certain weather conditions scale movement may be expected.

Detailed information regarding insect control may be obtained from Department publications on the subject.

Pineapples.

Continue planting pineapples as discussed in these notes last month, always remembering that the modern practice is smaller areas, close planting with more pineapples per acre, quicker, better and more healthy growth, and finally better fruit by liberal fertilising through the leaf bases with 10-6-10. Taken all together, these recommendations tend towards the elimination of wilt.

Bananas.

New Plantings.—November and December are very suitable planting months in most districts. Just as modern methods have effected great improvements in pineapple culture, so they might be applied in principle to banana growing. Smaller areas and large production per acre should cut overhead costs and lighten labour, lengthen the profitable life of the plantation, and reduce the time of waiting for the crop. To this end select planting material with care, plant in large holes, and break up the ground as soon as possible after planting. To prevent the loss of top soil by erosion and to provide the bananas with a cooler and moister environment, plant a cover crop as soon as weather permits, and initial weed growth has been suppressed. This will hold the loose surface soil during the summer rains.

Young Plantations.—The correct follower or followers for each plant should be selected, if not already done, and all additional suckers suppressed. Cultivate to conserve moisture and mulch with a cover crop. A complete fertilizer will improve the coming crop.

Old Plantations.—De-sucker to one follower to each plant. Apply a complete fertilizer, if not already done, and cultivate to conserve moisture.

General.—Bait for borers; be prepared for grasshopper and caterpiller plagues; watch for bunchy top.

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 not 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. A sharp lookout must be kept for brown rot in fruit, 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 sprayed frequently with Bordeaux or Burgundy mixture, the former for black spot and downy mildew, and the latter for early and late (Irish) blight.

TOURIST TRAVEL.

Vivid impressions regarding the possibilities of tourist travel in Queensland are gained during visits to different parts of the State. The tourist industry, as it may be termed, has become, like talking pictures, a world-wide industry and is being highly organised and widely advertised by the countries which have attractions to offer. Competition is very keen. Tourists might be divided broadly into three groups—intrastate, interstate, and overseas; each group has its special desires and idiosyncrasies, and thus the calls upon a tourist agency are many and varied. If the attractions are not made sufficiently enticing the tourists, particularly those belonging to the interstate and overseas groups, will go elsewhere. The Railways Department has done very good work in extending the activities of the Queensland Tourist Bureau, but progress seems to have reached a stage at which the Department needs the co-operation of outside bodies. Besides the actual attractions, there are such factors as access roads (in addition to main roads) and general approaches, modern hotel or other accommodation, water supply, lighting, and sanitation—which have a marked influence on tourists. But these things are controlled by a variety of authorities; these authorities might embrace—Main Roads Commission, Forestry Department, Licensing Commission, Local Authorities, Electric Light Authorities. Even the advertising and displaying to better advantage for tourist purposes of many of the unique attractions may fall to non-governmental authorities, and some of these bodies may not be able to take appropriate or adequate action through lack of ways and means. It was therefore suggested to the Premier (as President of the Bureau of Industry) that the Bureau, whose function it is to do work of the kind, should be deputed, in co-operation with the Railways Department, to inquire into the aspects outlined and to furnish a composite scheme for the further and wider orderly development of tourist travel in Queensland: the scope of the inquiry to include the exploration of all relevant possibilities; the making of contact with individuals, groups, and organisations interested in the subject; the devising of ways for the securing of co-ordination amongst authorities which control utilities essential to a successful scheme of tourist travel; and, generally, to formulate an attractive and progressive programme which may be put into operation, piece by piece, as opportunity offers. The suggestion found favour, and the Bureau and the Commissioner for Railways have the matter in hand.

—From the Annual Report of Mr. J. D. Story, I.S.O., Public Service Commissioner.

Farm Notes

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 impressed too strongly 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 on obtaining a good surface mulch. Failure to follow up the subsequent sowings by harrowing prior to the appearance of the young plant conduces to weed growth and very often entails 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 Kafir, and the various Milos are examples, should occupy a more prominent position for purposes of horse and pig feeding, and are suited particularly 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.

COOLING OF CREAM.

If properly used under conditions of scrupulous cleanliness, a cream cooler will give excellent results. Besides lowering the temperature of the cream and thus checking bacterial development, a cooler ærates the cream, releases gases and food flavours, and improves its consistency. Freshly separated cream, after it has been cooled sufficiently, should be mixed with the cream already held in the dairy. Fresh and over-ripe cream should not be mixed, as is often done when lots are held in separate vessels until delivery day. Cream should be stirred frequently while it is held on the farm. Proper stirring controls the ripening.

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 planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable deaths.

CHILD WELFARE.

MOST important are the early beginnings of all things. Especially is this true of health. On the health of the mother depends the health of the infant; on the health of the infant depends the health of the child; on the health of the child depends the health of the adult; on the health of the adult depends the health of the State; and these must not be left to chance.

Largely they have been left to chance. Of recent years something has been done to promote health, something apart from the attempt to cure disease by hospitals and other means. Let us clearly understand that disease is nothing in itself, but only the absence of health, and that it is by the cultivation of health that we can best diminish disease. If our people are to be healthy they must learn to think in terms of health, and not in terms of disease. They must pursue the living fact, and not waste their energies in struggling with shadows.

There are three things that are now of the greatest importance. Firstly, the care of the expectant mother. This care is the responsibility of her medical adviser. The Lady Bowen Hospital has an ante-natal clinic; so have other maternity hospitals; and there are ante-natal clinics in the Valley and Woolloongabba. We must so educate our mothers that the excellent work done by all these shall be multiplied tenfold. For want of knowledge mothers and infants die or are crippled in health. Most pathetic is the loss of life and the survival of weaklings owing to the want of this care, which is freely offered to all mothers who will seek it.

Secondly, we want to reach, as far as possible, every mother and infant in the State. In the last fifteen years our infant mortality has fallen considerably, and we hope that it may fall still lower.

Thirdy, the health of the young child is now a pressing problem. Ill-health and deaths from infection are far too common. We must spread knowledge of the ways to prevent the spread of infection and to increase the resistance to infection by a sound diet rich in vitamines. Something has been done in this direction, but much more remains to be done. By special means we can give immunity to diphtheria and typhoid fever, and can surely eradicate hookworm; but against other infections very little has been done.

Let us do these things that we can, and presently we shall be able to do things that are now impossible.

IN THE FARM KITCHEN.

Inexpensive Meat Dishes.

To make cheap cuts very palatable, steep in seasoned oil and vinegar, allowing 2 tablespoonfuls olive oil to 3 tablespoonfuls of vinegar. Add to this 1 tablespoonful each of onion and chopped parsley, and pepper to taste. Soak meat for 1 hour, at least, turning in liquid occasionally.

Boiled Breast of Mutton.

Take 2 carrots, 2 small turnips, breast of mutton, boiling water, salt to taste.

Wipe the meat. Place in a saucepan. Cover with boiling water. Add salt to taste. Cover and boil fast for ten minutes, then simmer gently for one and a-half hours. Add sliced scraped carrots and peel turnips, cut into suitable pieces, cover, and simmer for half an hour.

Oxford Hot Pot.

Take 1lb scraps lamb or mutton, 2 sheep's kidneys, 1½ lb. small potatoes, 2 onions, 3 gills water, salt, and pepper to taste.

Place the meat, onions, and halved and scored kidneys in a casserole. Add water, potatoes, and salt and pepper to taste. Cover and cook in a slow oven till the potatoes are tender, but not broken. Remove the lid from the casserols for the last quarter of an hour to brown the hot-pot. Serve in the casserole.

Roast Breast of Mutton.

Take 3 lb. breast of mutton, 6 oz. breadcrumbs, 1 onion (minced), salt and pepper, ½ teaspoonful chopped thyme, 2 tablespoonfuls chopped parsley.

Remove the bones from the meat, also any brown skin on the outside. Stew the bones in one and a-half pints of water and use for gravy. Flatten the meat well with a rolling-pin. Scrape all trimmings of meat and fat from the bones and put through the mincer twice. Soak the breadcrumbs in water until soft. Squeeze till almost dry. Put bread, minced meat, parsley, thyme, onion, and seasoning into a basin, and mix well. Spread stuffing on to the boned meat on the side from which bones have been removed. Roll up loosely and tie. Roast in a quick oven, basting with the fat that drips from the joint. Do not add any dripping to the pan. Dish up the roast. Remove string. Pour off most of the dripping from the pan, leaving only about a tablespoonful. Add half an ounce of flour. Stir into the fat and fry slowly till brown. Add half a pint of stock from the bones. Boil for four or five minutes. Season to taste, and serve in a sauce-boat.

Scotch Meat Shape.

Take ¾ lb. minced meat, 2 oz. minced suet, 3 oz. breadcrumbs, ½ teaspoonful curry-powder, 1 beaten egg, pinch of herbs, stock, pinch of nutmeg, brown breadcrumbs to cover.

Mix all the dry ingredients together, and add the well-beaten egg and a little stock. Pour into a well-greased mould. Cover thickly with brown breadcrumbs. Cover with a buttered paper. Steam for one and a-half hours. Serve turned out with gravy or white sauce.

Stewed Lamb and Green Peas.

Take 1½ lb. middle neck of lamb, 1 onion, 1 oz. dripping, 1 oz. flour, 1 pint water or stock, 1 tin green peas, salt and pepper to taste.

Melt the fat in a saucepan. When smoking hot, add the peeled and chopped onion and fry till brown and crisp. Remove the onion. Add the meat divided into suitable pieces for serving. Brown on both sides. Remove to a dish and drain off any remaining fat in the pan. Mix the flour to a paste with a little of the water or stock. Turn into a saucepan. Stir in the remainder of the liquor. Keep stirring till boiling. Add the meat and onion and simmer gently for two and a-half hours. Add drained tinned peas and bring again to the boil. If you use fresh peas, add them about thirty minutes before the stew is ready.

Steak and Kidney Pie.

Take 1 lb. shoulder steak, 2 kidneys, ½ lb. flaky pastry, 1 tablespoonful flour, 1 minced onion, salt, pepper, 1 egg.

Cut the steak into very thin slices; split, skin, core, and slice the kidneys. Mix flour, onion, and seasonings. Dip the meat in flour. Pack loosely into a pie-dish a little above the level. Cover with pastry. Decorate edges with the back of the prongs of a fork. Cut a hole in the centre. Brush top with beaten egg.. Bake in a quick oven to start with to firm the pastry, then reduce the heat and finish cooking.

Stewed Shin of Beef

Take 2 lb. shin beef, 1 carrot, 1 clove, 1 bayleaf, 1 tablespoonful flour, ½ teaspoonful pepper, 1 medium onion, 1½ teaspoonfuls dripping, sprig parsley, 2 teaspoonfuls salt, 1 quart boiling water.

Have the bone cut into one or two pieces. Place the shin with the peeled, sliced onion, carrot, clove, bay-leaf, parsley, salt and pepper in a stewpan. Add water. Cover and bring to the boil. Simmer for four hours. Melt the dripping in a saucepan. Stir in the flour, then gradually stir in half a pint of the water in which the meat was boiled. Stir till boiling. Boil two minutes. Add meat and marrow from the bone. Serve with boiled or mashed potatoes. Use the remainder of the liquid as the basis of a vegetable broth.

Beef Olives.

Take 1 lb. stewing steak, 2 teaspoonfuls flour, 1 tablespoonful diced turnip, 1 tablespoonful diced carrot, salt, pepper, 1 tablespoonful dripping, 1½ oz. chopped ham, 1 heaped tablespoonful parsley, 5 heaped tablespoonfuls breadcrumbs, salt, pepper, herbs, stock.

Mix the crumbs with the chopped ham, parsley, salt, pepper, and herbs to taste. Add enough extra stock to moisten well. Divide the steak, cut into a thin slice, into four or five portions. Spread with the ham mixture. Roll up each portion and tie firmly with string. Dip in seasoned flour. Brown in smoking hot dripping in a frying pan. Place in a casserole. Brown the vegetables and add to the casserole with the stock. Cover and simmer for three and a-half hours. Serve with mashed potatoes.

Hamburg Rolls.

Take 3 cupfuls minced beef, 1 cupful rice, cabbage leaves, tomato sauce, salt, pepper.

Mix the meat with the rice, which has been boiled in plenty of salted water, till tender. Cook the cabbage leaves in boiling salted water for two minutes, then drain well. In the middle of each leaf put two tablespoonfuls of the mixture, seasoned to taste, and fold the leaf over. Place in a buttered fireproof dish. Cover with tomato sauce. Bake for one hour and serve.

Pot Roast of Beef with Cabbage.

Take 3 lb. brisket, 1 cabbage, 2 tablespoonfuls dripping, 1 small onion, 2 tablespoonfuls vinegar, 2 tablespoonfuls sugar, salt and pepper.

Melt the dripping in a saucepan. Shred the cabbage. Peel and mince the onion. Cook the vegetables in dripping until brown. Season to taste with salt and pepper. Place the meat in another saucepan. Cover with cold water. Cover and bring to the boil. Add cabbage and onion. Simmer till both are tender. Add vinegar and sugar, and, if not thick enough for your taste, thicken the gravy with a little cornflour dissolved in water. Bring to the boil and cook till smooth.

IN THE FARM GARDEN.

THE GARDEN COMPOST HEAP.

THE garden compost heap is a cheap means of converting garden and household vegetable refuse into valuable fertilizing material. Materials such as lawn clippings, spent crops free of disease, vegetable tops, &c., should all be used in this manner, but the coarse, woody stalks of strong-growing plants should not be used.

The production of artificial manure from garden waste, straw, &c., consists in the decomposition, by fungi and bacteria, of much of the plant material. The nitrogen in the process is converted from an inorganic to an organic form, and is present in increased amount in the material finally produced. The rapidity with which the process goes on is influenced by the type of material, its degree of maturity and chemical composition, and by the presence of nutrients such as lime, phosphate, nitrogen, and potash, for the organisms carrying on the decomposition are much akin to plants in their requirements.

Actual damage can be done to crops, other than some legumes, by the addition of uncomposted, poor-quality material to the soil. This damage is due largely to a lack of available nitrogen in the soil. Such poor-quality materials as bush scrapings, dry mature grass or straw, offer a good source of energy for the soil bacteria and fungi, which rapidly increase in numbers, and in so doing consume all the available nitrogen. This competition for soil nitrates results in the nitrogen starvation of crop plants.

The usual process of allowing plant refuse to decay without any chemical treatment results in a very acid product, providing no immediately available nitrogen. With nitrogen-poor plant residues it becomes necessary to add available nitrogen to the heap, as well as lime, which prevents the development of acidity, and phosphate, which is required in the nutrition of the organisms. With nitrogen and mineral-rich materials such as legumes (peas, beans, &c.), green vegetable tops, and other green succulent material, the use of lime alone should be sufficient to enable rapid decomposition.

With general refuse or poor-quality material, a heap can be made on a square base, and of such size that the final height is about 3 feet. Spread the chopped-up material in layers several inches deep, treating each layer in the following manner:—

Snow over with ground limestone (5 lb. per 100 lb. material), fork in loosely, give a sprinkling of superphosphate, and then add sulphate of ammonia at the rate of 1½ lb. per 100 lb. material. The material should be moistened before building up the layers, if not already moist. Ammonia may be given off slowly, so that it is necessary to keep building up and treating the successive layers quickly, so that it will not be lost. The final layer is not treated, and may be given a covering of an inch of soil. When next the heap is added to, the untreated layer can be moistened and treated.

When the heap is at the full height, after subsidence due to compaction and loss of material by bacterial action, the heap can ferment under the untreated capping, which can be used as a base for the next heap. The heap should be kept damp, but water should not be added in quantity sufficient to cause drainage from the heap.

In summer the material should be ready for use after two months, but in cold weather the process is much slower.

Artificial manure properly prepared is very similar in chemical composition to composted horse manure, and gives equally good results in promoting plant growth.

LIME FOR THE GARDEN.

Lime fulfils many functions which are essential to soil fertility. Its most useful action is in neutralising the acidity of strongly acid soils, for with the removal of acidity the other valuable effects of liming follow. Lime improves the physical condition of heavy acid soils, ensuring better drainage and aeration, and making cultivation easier. It is an essential plant nutrient, and when present in sufficient amount promotes many phases of bacterial activity, especially those ultimately bringing the reserves of nitrogenous material in the soil into the soluble forms of nitrogen so advantageous to plant life.

There is no foundation for the common statement that exposure of acid soil to sun and air "sweetens" or reduces its acidity. Acidity is developed through an insufficiency of lime in the original soil-forming material, or by the loss of lime,

through leaching, and absorption by plants. Acidity thus developed can only be counteracted in field or garden practice by the use of some form of lime, such as hydrated or slaked lime, and ground limestone or carbonate of lime.

Slaked lime is formed by the action of water on burnt or stone lime, and forms a very fine powder which can be spread efficiently. Ground limestone is a cheaper and more pleasant material to handle than slaked lime, and can be relied on nearly always to give as quick and good results as slaked lime, provided the material is sufficiently fine and well distributed, and that equivalent dressings are applied. In the last respect, 4 lb. of carbonate of lime are required to supply as much "effective" lime as 3 lb. of slaked lime contains.

The soil to be limed should be dug over and reduced to good tilth, the lime spread uniformly and then worked lightly into the top several inches of soil. The amount of lime to be used depends on the degree of acidity of the soil, its texture, organic content, and the type of plant to be grown. Unless all these features can be determined, suggestions on the amount of lime to be added to a soil can only be approximate.

On loams and heavier soils, dressings may range from 1 lb. of slaked lime, or 1½ lb. ground limestone, per square yard on loams, to double these quantities on clay loams and clays. Sandy loams or still more sandy soils can receive lighter dressings of approximately half the amount for loams. Lime is lost most rapidly from sandy soils, which are usually more acid than heavier soils under the same conditions. Under garden conditions, with frequent waterings, lime is continually being lost, especially from the sandier types of soil. After the initial liming, which may need to be heavy to counteract strong acidity, it is preferable to add light dressings each season, rather than occasional heavy dressings.

It is not necessary always to add sufficient lime to neutralise soil acidity completely, as most garden plants grow well on slightly acid soils. This slighty acid condition will only result in the majority of garden soils after liming. Only for those plants listed below as very sensitive to acidity is it advisable to neutralise acidity completely. Whilst many plants grow best on neutral soils or on slightly alkaline soils, a considerable number of plants will tolerate fairly acid soils. The latter are not affected adversely by being grown in limed soils, though many plants which require a good lime supply may fail on acid soils.

By careful planning of the garden cropping scheme, portion of the area may be set apart and only lightly limed, if at all, for certain plants (as indicated below), and the remainder limed for those crops with a higher lime requirement. Potatoes do best on slightly acid soils, and in gardens where dry conditions are not experienced the danger from scab diseases in slightly acid soils is small.

The following statement shows the relative sensitiveness of a number of garden and crop plants to acid soil conditions:—

Very tolerant.—Potato, radish, strawberry, sweet potato, rhubarb, watermelon, pineapple.

Tolerant.—Bean, carrot, cucumber, turnip, crimson clover, maize, oats, tomato, cowpea, cabbage.

Sensitive.—Cauliflower, rape, red clover, sweet clover, wheat, white clover, lettuce, onion.

Evidence is available to show that excess of lime under certain conditions may depress plant growth. Overliming may result when the calculated amount of lime is applied to the surface zones of soil, and not worked to the proper depth. Overliming injury is produced only on heavily-limed acid soils, and not on non-acid soils, or soils which have been limed previously. This injury is not permanent and usually is overcome by the time the first crop is removed. Lettuce and lucerne are crops which may suffer from bad lime distribution.

Large additions of organic matter such as compost, manure, &c., are very effective in reducing overliming injury, and this fact is of importance in indicating that a liberal addition of green or stable manure should be applied to the soil if immediate liming and seeding are necessary. Where very heavy dressings of lime are necessary, it may be advisable to apply lime in two successive seasonal applications. After the preliminary liming, the lime added in a well-made compost will go far to counteract natural losses of lime from the soil.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF AUGUST, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1937 AND 1936, FOR COMPARISON.

Divisions and stations.	Average Rainfall.		Total Rainfall		Divisions and stations.	Average Rainfall.		Total Rainfall.	
	Aug.	No. of years' records.	Aug., 1937.	Aug., 1936.		Aug.	No. of years' records.	Aug., 1937.	Aug., 1936.
North Coast.	In.		In.	In.	*Central Highlands.*	In.		In.	In.
Atherton	0·87	36	1·31	0·04	Clermont ..	0·68	66	0·05	0·04
Cairns	1·72	55	1·18	0·10	Gindie	0·63	38	0·22	0·06
Cardwell	1·27	65	0·26	0·73	Springsure ..	1·02	68	0·25	0·10
Cooktown ..	1·20	61	0·52	0·32					
Herberton ..	0·63	51	0·42	..					
Ingham	1·46	45	0·21	3·60					
Innisfail	4·90	56	5·26	0·07					
Mossman Mill ..	1·31	24	0·81	..	*Darling Downs.*				
Townsville ..	0·50	66	0·01	..					
					Dalby	1·18	67	1·51	0·40
Central Coast.					Emu Vale ..	1·05	41	2·49	0·39
					Hermitage ..	1·12	31	..	0·24
Ayr	0·55	50	..	..	Jimbour ..	1·13	49	1·20	0·22
Bowen	0·64	66	0·05	..	Miles	1·09	52	1·41	0·36
Charters Towers ..	0·52	55	0·01	..	Stanthorpe ..	1·75	64	3·43	0·67
Mackay	1·03	66	0·31	0·13	Toowoomba ..	1·61	65	2·27	0·06
Prosperine ..	1·32	34	2·68	0·35	Warwick ..	1·42	72	2·90	0·51
St. Lawrence ..	0·80	66	0·23	..					
South Coast.									
					Maranoa.				
Biggenden ..	1·07	38	1·11	..					
Bundaberg ..	1·26	54	1·45	0·58	Roma	0·90	63	0·41	0·48
Brisbane	1·96	85	1·40	0·10					
Caboolture ..	1·51	50	1·61	0·08					
Childers	1·20	42	0·80	0·13					
Crohamhurst ..	2·17	44	2·94	0·10					
Esk	1·44	50	1·09	0·16					
Gayndah	1·14	66	1·40	..					
Gympie	1·69	67	2·26	0·01	*State Farms, &c.*				
Kilkivan	1·40	58	1·07	..					
Maryborough ..	1·66	66	0·89	..	Bungeworgorai ..	0·74	22	..	0·40
Nambour	1·85	41	3·20	0·36	Gatton College ..	1·08	38	..	..
Nanango	1·31	55	1·41	0·08	Kairi	0·91	21	..	..
Rockhampton ..	0·81	66	0·29	0·03	Mackay Sugar Experiment Station	0·86	40	0·48	0·10
Woodford	1·65	50	1·42	..					

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—AUGUST, 1937.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Mean Atmospheric Pressure at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.				Total.	Wet Days.
		Max.	Min.	Max.	Date.	Min.	Date.		
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·98	77	67	82	31	59	28	52	4
Herberton	..	71	51	81	20	39	28	42	9
Rockhampton	30·13	75	54	84	20	43	23	29	4
Brisbane	30·17	70	52	78	19	44	5	140	11
Darling Downs.									
Dalby	30·18	69	44	81	20	31	6	151	7
Stanthorpe	..	61	38	73	31	22	5	343	14
Toowoomba	..	65	44	76	31	22	5	227	13
Mid-Interior.									
Georgetown	30·02	84	54	90	19, 20, 30	38	4	Nil	..
Longreach	30·10	78	49	93	31	36	3	22	2
Mitchell	30·16	71	40	89	31	29	6, 23	48	2
Western									
Burketown	30·02	83	58	90	26	49	4	Nil	..
Boulia	30·08	78	50	96	30, 31	40	3, 4, 6	31	2
Thargomindah	30·09	72	47	90	31	35	2	28	3

ASTRONOMICAL DATA FOR QUEENSLAND.

Times Computed by A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	October. 1937.		November. 1937.		Oct. 1937.	Nov. 1937.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					MOONRISE.	
					a.m.	a.m.
1	5·33	5·51	5·3	6·9	3·4	3·28
2	5·32	5·51	5·2	6·10	3·43	4·4
3	5·31	5·52	5·1	6·11	4·18	4·40
4	5·29	5·53	5·0	6·12	4·53	5·21
5	5·28	5·53	5·0	6·12	5·28	6·2
6	5·27	5·54	4·59	6·13	6·5	6·48
7	5·26	5·54	4·58	6·14	6·43	7·36
8	5·25	5·55	4·57	6·15	7·24	8·27
9	5·24	5·55	4·57	6·15	8·6	9·21
10	5·23	5·56	4·56	6·16	8·52	10·14
11	5·22	5·56	4·56	6·17	9·42	11·9
						p.m.
12	5·21	5·57	4·55	6·18	10·34	12·5
13	5·20	5·57	4·55	6·18	11·29	1·1
					p.m.	
14	5·19	5·58	4·54	6·19	12·25	1·58
15	5·18	5·58	4·54	6·20	1·20	2·58
16	5·17	5·59	4·53	6·21	2·17	4·2
17	5·16	6·59	4·53	6·22	3·17	5·10
18	5·15	6·0	4·52	6·23	4·18	6·21
19	5·14	6·1	4·52	6·23	5·21	7·29
20	5·12	6·1	4·52	6·24	6·29	8·33
21	5·11	6·2	4·51	6·25	7·37	9·28
22	5·10	6·3	4·51	6·26	8·33	10·20
23	5·9	6·3	4·51	6·27	9·46	11·4
24	5·8	6·4	4·50	6·28	10·46	11·44
25	5·8	6·5	4·50	6·28	11·37	..
						a.m.
26	5·7	6·5	4·50	6·29	a.m.	12·20
27	5·6	6·6	4·50	6·29	12·23	12·56
28	5·6	6·7	4·49	6·30	1·6	1·29
29	5·5	6·7	4·49	6·30	1·44	2·4
30	5·4	6·8	4·49	6·31	2·19	2·40
31	5·3	6·9			2·53	

Phases of the Moon, Occultations, &c.

4th Oct.	●	New Moon	9 58 p.m.
13th ,,	☽	First Quarter	1 47 a.m.
20th ,,	○	Full Moon	7 48 a.m.
26th ,,	☾	Last Quarter	11 26 a.m.

Apogee, 10th October, at 4 a.m.
Perigee, 22nd October, at 2 a.m.

Mercury, on the 29th, will be on the farthest side of its orbit, beyond the Sun from the Earth. Though it will be nearly 36 million miles from the Sun it will seem to be only about one degree from its disk, lost in its overpowering light.

Observers will have watched with interest the gradual approach towards each other of the two most brilliant objects in our evening sky, Mars and Jupiter. Since the middle of August, Mars has been travelling on its normal eastward course from the head of Scorpio into Sagittarius, while Jupiter has apparently moved westward, until on 15th September it resumed its direction eastward. By the end of October the little world, more nearly like our own, will be very near the giant sunlike planet. On the 30th, at 3 a.m., Mars will appear to be only 1½ degrees south of Jupiter.

Mercury rises at 4.35 a.m., 58 minutes before the Sun, and sets at 4.43 p.m., 1 hour 8 minutes before it; on the 15th, it rises at 4.56 a.m., 1 hour 22 minutes before the Sun, and sets at 5.12 p.m., 46 minutes before it.

Venus rises at 4.10 a.m., 1 hour 23 minutes before the Sun, and sets at 3.34 p.m., 2 hours 17 minutes before it; on the 15th, it rises at 4.7 a.m., 1 hour 11 minutes before the Sun, and sets at 3.55 p.m., 2 hours 3 minutes before it.

Mars rises at 10.16 a.m. on the 1st, and sets at 12.18 a.m. on the 2nd; on the 15th, it rises at 10.7 a.m., and sets at 12.1 a.m. on the 16th.

Jupiter rises at 11.40 a.m. on the 1st, and sets at 1.26 a.m. on the 2nd; on the 15th, it rises at 10.53 a.m., and sets at 12.33 a.m., on the 16th.

Saturn rises at 5.17 p.m. on the 1st, and sets at 5.31 a.m. on the 2nd; on the 15th, it rises at 4.18 p.m., and sets at 4.32 a.m.

The Southern Cross will be upright at midday on 1st October, and at its lowest position at midnight on or near the 150th meridian, and will therefore be lost to the evening sky; only the pointers are showing above the horizon.

While the fine constellation Scorpio will disappear in the west the most brilliant of all star groups, Orion, will arise in the east.

3rd Nov.	●	New Moon	2 16 p.m.
11th ,,	☽	First Quarter	7 33 p.m.
18th ,,	○	Full Moon	6 10 p.m.
25th ,,	☾	Last Quarter	10 4 a.m.

Apogee, 6th November, at 8·0 p.m.
Perigee, 19th November, at 11·0 a.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.