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contents

COVER PICTURE: These Prize-Winning Stud Herefords Paraded Among Garden Beds on the Lawn at "Woodlands," Greenmount, to be Viewed by Members of the R.N.A.-Shell 1960 Journalists' Tour. Leading them are (left to right): Misses Kay Freshney and Georgina Bassingthwaighte and Mr. G. W. N. Bassingthwaighte.

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Beat Mat Grass With Pasture Renovation

Compiled from a report by N. E. GOODCHILD, Senior Adviser in Agriculture.

Carpet or mat grass (*Axonopus affinis*) is fast becoming a major enemy of the rich dairy pastures on scrub lands along the Queensland coast. An Agriculture Department study on methods of controlling this pest is giving an encouraging verdict.

The mat grass problem is growing, and each year more farmers are faced with the need to attack it.

Silently creeping into old-established paspalum and kikuyu pastures, carpet grass soon takes over and dominates the sward. Its spread is helped by the fact that it is unpalatable. Stock seek out the sweeter grasses and over-graze them, leaving the carpet grass to spread unchecked.

The nutritional value of carpet grass is low and its invasion of dairy pastures is always followed by a drop in milk yields.

Its appearance in a sward is generally a sign of deteriorating pastures, and overstocking could be a contributing factor. It appears that after grazing has continued for about 30 years, carpet grass will invade and suppress paspalum and kikuyu pastures on coastal scrub soils.

As time goes on, land use in Queensland will become more intensive, and the pastures, of course, will grow older. It is, therefore, increasingly necessary to maintain their vitality.

Ripping and Fertilizing

All the evidence so far points to ripping and fertilizing as the best practical means of restoring a cover of good quality pasture to the land. In trials, this two-stage method has given encouraging control of carpet grass.

Early in 1958, trials aimed at controlling carpet grass were commenced. Four acres infested with carpet grass were selected on a farm at Dalrymple Heights in the Mackay district. This land was deep red scrub soil originally carrying satin ash or Eungella gum. It had been under a paspalum and kikuyu pasture for about 30 years, but, at the time of the trial, was heavily over-run with carpet grass.

Early in January 1958, the plot was grazed heavily and then ripped to a depth of 4 in. The renovation was carried out with Ferguson tillers. Late in the same month the trial area, divided into four one-acre plots, was given the following fertilizer treatment: Plot 1 was left unfertilized as a comparison. Plot 2 was fertilized with a nitrogen-rich fertilizer (10 : 10 : 0) at 1 bag to the acre. Plots 3 and 4 were given 2 and 4 bags respectively of the same mixture. The whole area was then over-sown with 2 lb. of white clover and 2 lb. of red clover to the acre. Three inches of rain fell soon after sowing.

The response was rapid and vigorous. By May, within four months of treatment, the paspalum and kikuyu were growing vigorously in all the plots. Height and density of the sward reflected the amount of fertilizer applied: in the plots given the heaviest fertilizing the grass was highest and the sward thickest.

In all plots the stand of carpet grass was greatly reduced.

Plate 1

Renovated and Fertilized Pasture Shows this Response.

But clover growth was poor and restricted, due to the heavy smothering by the dense cover of paspalum and kikuyu. The clover failed to recover from this bad start.

Follow-up Fertilizer

The year following treatment was unusually wet—the rainfall for 1958 was 150 in. Observations made in February, 1959, indicated that the nitrates were depleted, probably leached out during the heavy and prolonged wet season. This suggests that follow-up fertilizer treatments would be required for permanent control of carpet grass.

Encouraged by the initial success, the treatments were repeated in February, 1960. Observations in the first two years of the trial suggested that further ripping and fertilizing would give greater control over the carpet grass.

The value of this trial is not restricted to the Mackay district. The carpet grass problem is growing in most coastal districts where improved pastures have been down for about 30 years. The method used at Mackay could have a definite place in carpet grass control on the Atherton Tableland and in coastal districts of southern Queensland.

As another attack on the carpet grass problem, a new trial is to be laid down on the same property later this year. In this an attempt will be made to use molasses grass to smother the carpet grass.

Maize Trials At Kairi

By J. van der LIST, Experimentalist.

Recent trials showed little difference between the yielding ability of Durum and Atherton Dent strains of maize on the Atherton Tableland.

Due to increased plantings of pasture and peanuts in recent years, the acreage of maize on the Atherton Tableland has declined somewhat from the estimated 24,000 acres that were planted annually to this crop.

Experiments have been carried out over the last seven years at the Kairi Regional Experiment Station to evaluate the relative merits of the two main types of maize planted on the tableland. These types are known locally as Atherton Dent and Durum.

Atherton Dent is an open-pollinated yellow dent maize, which originated from crossings made in the early days between the maize strains that best suited the soil and climate of the area.

The characteristics of this type are maintained by end of each season selection of seed for the next planting. It follows, therefore, that Atherton Dent is really a collective name for a number of strains, selected and maintained by individual farmers.

The Durum type originated by crossing hard flint maize with yellow dent. This strain shows only a slight crease in the otherwise rounded and smooth top of the grain.

Hybrid maize has been used commercially on a small scale in recent years. This hybrid maize was developed in the South but tested under local conditions.

In the experiment at the Station, three Atherton Dent strains and three Durum strains were tested each year in a 6 x 4 randomized block experiment. Unfortunately, only four strains were available for use over the whole period of 7 years. The other two had to be replaced by other strains of the same type of maize, and for this reason these figures have been omitted from the yields shown in Table 1.

The experiment was carried out on scrub soil, that is, soil derived from basaltic parent material under tropical rain forest conditions, which is similar to many areas cropped to maize in this district.

It must be stated here, however, that the experiment was located on soil that has been less eroded than the average district farm. It was located on the same site during the years 1953-54-55 but was shifted to a neighbouring paddock for the remainder of the period.

In the following table the average yield figures are tabulated for each of the four strains grown throughout, figures being presented as bushels per acre:—

TABLE 1

Strain of Maize	Year					
	1954	1955	1956	1957	1958	1959
Durum—						
Kairi R. E. S. ..	57·6	48·7	..	67·6	31·5	56·1
Kattenberg V. ..	63·5	58·9	..	82·3	33·9	56·7
Atherton Dent—						
McGeehan-Pensini	52·6	52·1	..	84·2	32·7	54·7
Brown	51·8	54·2	..	75·8	31·9	49·6
	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.
Average plant spacing	0 22	0 16	..	0 13	0 15	0 13
Row spacing ..	3 8	3 8	..	3 8	3 8	3 8

The trials were initiated in 1953, but crops failed that year following an outbreak of a severe virus disease.

During 1956, the crop lodged on account of cyclonic winds to such an extent that no reliable figures could be obtained.

Statistical analysis of the results revealed that differences due to season were highly significant and it was shown that the 1958 results were significantly lower than those obtained in other years.

A relatively late planting (23-12-58), coupled with a dry spell at tasselling, and poor filling out of the grain, were the causes of diminished yields in this season.

For the last three years, statistical analysis of the yearly results has also been carried out. Significant differences have shown up between strains, but have not been consistent over the years.

Allowing for the two strains that were changed during the period, it was found that the average yield of Durum during the period 1954-59 was 55·2 bus. per acre, whereas the average yield of Dent during the same period was 53·7 bus. per acre.

Average yield figures indicate the Kattenberg V. Durum and McGeehan-Pensini Dent were the better strains in their respective groups.

However, there are other factors which favour the Durum strains, and this tendency has been apparent during each season. The figures in Table 2 indicate the average of the two strains in each group over the 1954-59 period.

TABLE 2

Strain	Barren Plants	Nubbins	Lodging	Partly Diseased Cobs	Totally Diseased Cobs
	%	%	%	%	%
Durum group	6·4	7·5	8·8	9	3
Dent group ..	7·6	8·0	10·6	12	4

While these factors all favour the Durum strains, they are offset by the fact that the Dent group produced more grain per grain-bearing plant—·368 lb. against ·341 lb. Dent grain, moreover, is more easily attacked by weevils than the harder Durum grain. This is important when harvesting delays occur.

Plate 1

Crop of Atherton Dent Maize Grown on the Atherton Tableland.

In practice, it is easier to obtain an even stand with dent grain on account of the larger seed size. Experiments have shown that even stands are required for high yields and well graded maize of even size is better to handle through the conventional planter.

Hybrids. Trials have been carried out during the last three years with promising hybrids of the dent type. Some of these have outyielded the local open pollinated strains by more than 15 per cent. However, all these hybrids were susceptible to ear rots.

These experiments have shown that there is no significant difference in the yielding ability of Durum and Atherton Dent strains. It is likely, however, that, in the future, hybrid maize will replace the local open pollinated strains to a greater extent.

Register Of Merit For Dairy Cows

By E. B. RICE, Director of Dairying.

The requirements for the entry of cows into the Register of Merit for dairy cows have been altered to bring them into line with Queensland environmental conditions. The amended rules, which have been agreed upon by the Dairy Cattle Breed Societies in Queensland, became effective on July 1, 1960.

The object of the Register of Merit for dairy cows is to provide a permanent record of high-producing strains of dairy cattle. The Register will be open to any qualified cow which has been recorded under the Pure Bred Dairy Cattle Production Recording Scheme, or the Herd Production Improvement Scheme.

All qualifying records made under the Pure Bred Dairy Cattle Production Recording Scheme will be automatically accepted. For records made under the Herd Production Improvement Scheme it will be necessary for the owner to apply for acceptance, which will be given only if the cow is identifiable to the satisfaction of the Director of Dairying, and has been sired by a registered pure bred bull or a bull eligible for registration.

Sections of Register

The Register will be divided into three sections:

Intermediate section
Lifetime section
Elite section.

Intermediate Section. A cow shall qualify for registration in the intermediate section if, in three successive lactations with not more than 15 months between consecutive calving dates, she produces at least—

(*a*) 950 lb. butterfat if her first qualifying lactation is commenced before she is 2 years and 183 days old;

(*b*) 1,000 lb. butterfat if her first qualifying lactation is commenced between 2 years 182 days and 3 years and 183 days old;

(*c*) 1,050 lb. butterfat if her first qualifying lactation is commenced after she is 3 years 182 days old.

The production of each lactation shall be based on the first 270 days from the commencement of recording.

Lifetime Section. A cow which has produced a minimum of 2,240 lb. of butterfat in not more than eight lactations shall qualify for registration in the lifetime section.

Elite Section. A cow which has produced a minimum of 3,600 lb. of butterfat in not more than 10 lactation periods shall qualify for registration in the elite section.

Details Recorded

The Register shall contain the following information:—

(*a*) The name of the owner;

(*b*) The name and herd book number of the cow;

(*c*) The name and herd book number of the sire;

(*d*) The date of calving prior to the commencement of each qualifying lactation in the case of the intermediate section;

(*e*) The pounds of milk, butterfat percentage and pounds of butterfat for each lactation in the case of the Intermediate section;

(*f*) In the case of the Lifetime and Elite Sections, the date of commencement of the first and last lactations, the total yield of milk and butterfat, the average butterfat test of the milk, and the number of lactations.

A certificate giving these particulars will be issued to the owner of the cow.

Records produced after the issue of a certificate shall be added on application to the Director of Dairying, Department of Agriculture and Stock, Brisbane.

Merit Stud Register for Dairy Herds

A Merit Stud Register has been inaugurated in order to indicate to dairy farmers the stud dairy herds in which a high percentage of the cows is entered in the Register of Merit for Dairy Cows.

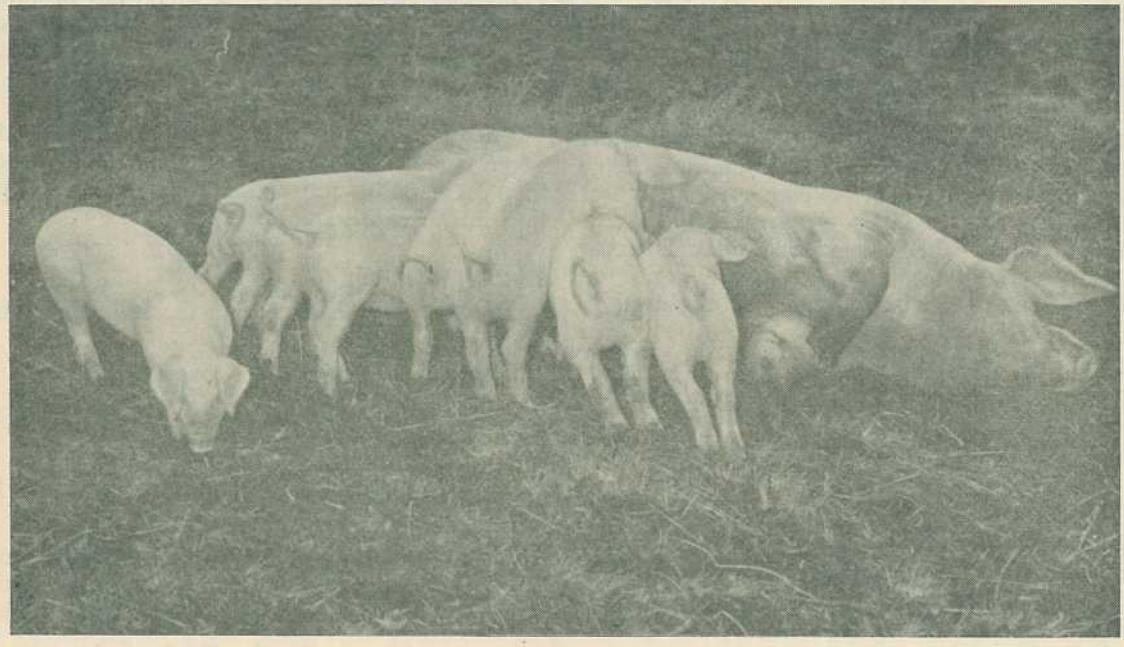
The following conditions apply:

(1) Any owner of a herd which is recorded under the Pure Bred Dairy Cattle Production Recording Scheme may apply for registration of his herd in the Merit Stud Register.

(2) In the year for which application is made for registration in the Stud Merit Register at least 40 per cent. of the cows not less than four years old in a herd (with a minimum of six cows) shall be entered in the Register of Merit for Dairy cows.

(3) A herd shall be registered in the Stud Merit Register for one year only. Fresh application must be made yearly for renewal of registration. For the purpose of the scheme the year shall be from July 1 to June 30.

Landrace Family at "Glenroy"



A Landrace Sow With Her Litter at "Glenroy" Stud Piggery, on the Darling Downs. The property, owned by Mr. W. F. Kajewski and Son, consists of 500 acres, of which 250 acres are under cultivation and 50 acres under improved pastures of lucerne, clover and grasses. The pigs, in addition to being grass fed, are given a mixture of grain, wheatmeal and minerals. The property also runs 100 pure bred A.I.S. cattle.

Tomato Diseases

And How To Control Them

By J. C. JOHNSON and J. E. C. ABERDEEN. *

The tomato plant is subject to attack by a large number of diseases, many of which may cause substantial losses to growers if adequate precautions are not taken to deal with them. Preventive measures should be adopted as far as possible, because they are generally cheaper and more satisfactory than control measures applied to crops which are already infected. The programme of disease prevention and control should be planned well in advance of the planting of the crop, since it involves consideration of the following matters:

(1) The purchase of disease-free seed.

(2) The planting of only those varieties which possess some degree of resistance to Fusarium wilt.

(3) The careful establishment of the seedbed.

(4) The choice of the position of the field planting, only after consideration of a suitable rotation.

(5) Ensuring that adequate supplies of fungicides and insecticides are ready for immediate application.

(6) Ensuring that the spray apparatus is working efficiently.

KEY TO IDENTIFICATION

The following key should help in the identification of the major tomato diseases, apart from nutritional disorders. Any determination of a disease made by using this key, however, must be checked by referring to the detailed descriptions of the symptoms given later under the heading of that disease. If the disease does not appear to correspond with any of those described, further advice should be obtained from the Department of Agriculture and Stock.

In the Seedbed:

1. Seedling stem shrivels at ground level, and falls to the ground ..... **Damping-off.**
2. Stem shows a dark-brown to black spot near soil level; growing tip often purplish in colour ..... **Target Spot.**
3. Leaves show small, dark spots..... **Target Spot, Bacterial Spot,** or **Septoria Leaf Spot.**
4. Leaves and stem show relatively large dark, rotted areas..... **Irish Blight.**
5. Entire seedling stunted and purplish; no disease apparent on leaves, stem, or roots ..... **Faulty Nutrition** or **Virus Disease.**
6. Seedling stunted; growing tip producing thickened distorted leaves; stem shows a characteristic bronze-green colour and reduced number of hairs **Tomato Mite.**

In the Field:

1. Entire plant wilted—
   (a) Wilting very rapid—sometimes in a few hours —suggesting plant severed from root system; no yellow leaves. Stem at soil level may or may not show a light-brown discolouration of woody tissues ..... **Bacterial Wilt.**
   (b) Wilting very slow—sometimes takes weeks; older leaves show distinct yellow colour; affected leaves break off easily from stem. Stem and leafstalks show light-brown to dark-brown streaks under bark in hard, woody tissue **Fusarium Wilt** (in summer), or **Verticillium Wilt** (in winter).
   (c) Some stems show splitting and rotting of internal tissue with mealy appearance; affected leaves do not break away from stem readily; leaflets on one side of leaf usually affected first (see also fruit symptoms)..... **Bacterial Canker** or **Pith Rot.**

* Mr. Johnson is a Plant Pathologist with the Department of Agriculture and Stock, and Dr. Aberdeen, formerly Plant Pathologist with the Department, is now Senior Lecturer in Botany at the University of Queensland.

2. Entire plant stunted—

(a) New growth slow, spindly, leaves crinkled and pale green, poor fruit set ..... **Leaf Shrivel.**

(b) Bronze markings on young leaves; these curved downwards more than normally ..... **Spotted** or **Bronze Wilt.**

(c) Young leaves show light and green markings and tendency to crinkle ..... **Mosaic.**

(d) Young shoots swollen and distorted, with last-formed flower buds standing erect; purplish colouration throughout tips ..... **Big Bud.**

(e) Young leaves malformed, with leaflets very spindly and fernlike ..... **Fern Leaf.**

(f) Young shoots show intense purplish colouration **Faulty Nutrition, Excessively Cold Temperature, Virus Disease, Irish Blight,** or **Target Spot** (attacking stem).

3. Leaves and stems—

(a) Small spots about $\frac{1}{8}$ in. in diameter, with grey centres and small black pin-point dots. Leaves at base usually affected first ..... **Septoria Leaf Spot.**

(b) Dark-brown spots, up to $\frac{1}{2}$ in. in diameter—sometimes larger on stem—with sharp margins and often with concentric ringed appearance. Basal leaves usually affected first. By far the commonest leaf spot ..... **Target Spot.**

(c) Large, dark-brown lesions often involving entire leaflet. These have the appearance of a wet rot in humid weather but are papery if atmosphere is dry. May show first on any part of plant **Irish Blight.**

(d) Lesions uniformly small, rarely greater than $\frac{1}{8}$ in. in diameter, dark-brown in colour ..... **Bacterial Canker** or **Bacterial Spot.**

(e) One leaf, or part thereof, shows decided wilt (see also fruit symtoms) ..... **Bacterial Canker.**

(f) Older leaves yellow without any obvious spotting; with or without wilting of tips ..... **Fusarium Wilt.**

(g) Large yellow indefinite lesions on upper surface of leaf, accompanied by a characteristic velvety dark layer of fungus under leaf. Only severe in wet northern regions of Queensland ..... **Leaf Mould.**

4. Fruit—

(a) Dark, sunken spot present on flower end of fruit ..... **Blossom-end Rot.**

(b) Mottled, brown markings covering large proportion of fruit surface; spread very rapidly (see also leaf and stem symptoms) ..... **Irish Blight.**

(c) Very dark spots, sunken and velvety, commonly up to $\frac{3}{4}$ in. in diameter, usually originating from stalk attachment, growth-cracks or other injury **Target Spot** and other **Alternaria Rots.**

(d) As for (c) but not dark or velvety, surface of spots pimply ..... **Phoma Rot.**

(e) Small spots 1/16 to $\frac{1}{8}$ in. in diameter, usually with light halo around margin ..... **Bacterial Canker.**

(f) Small spots 1/16 to $\frac{1}{8}$ in. in diameter, often raised and scab-like; no halo ..... **Bacterial Spot.**

(g) Large tough white spot on side facing sun ..... **Sunburn.**

(h) Blotchy ripening ..... **Mosaic,** or other **Virus Disease, Shade Spot,** or other **Physiological Disorder.**

(i) Fruits generally dwarfed, mis-shapen and hard **Virus.**

(j) Fruit completely broken down by watery rot **Bacterial** or **Fungous Rot** following insect or other injury.

(k) Blossom end of fruit mis-shapen ..... **Catface.**

TARGET SPOT

Target spot is very common both in the seed-beds and on the plants in the field. The seedlings do not always show obvious symptoms, as they may be attacked only on the stem at ground level and exhibit merely a hard, stunted appearance. A period of warm, moist weather following infection may soon cause the death of such infected plants. If the infection is unnoticed and the seedlings are planted out into the field, the stem lesion usually develops to a dry shrunken area, which may cause retardation of the growth of the transplants and result in a girdling of the stem leading to death of the affected plants, or leave the plants so weakened that they readily snap in the wind. This symptom is usually known as "collar rot". A plant may recover, if it has been transplanted sufficiently deeply, by developing new roots above the target spot lesion.

Leaves, stems, and friut may be affected on plants in the field, but the older leaves usually show the symptoms first. Dark-brown spots, commonly $\frac{1}{8}$ to $\frac{1}{4}$ in. in diameter but up to $\frac{1}{2}$ in. under favourable conditions and with definite margins, are produced on leaves and stems. These spots may be marked by the concentric rings (Plate 1) from which the common name of the disease is derived. They may also have a yellow margin.

The fruit lesions are in the form of black to dark-brown oval to round spots, which usually occur immediately on the edge of the stem scar

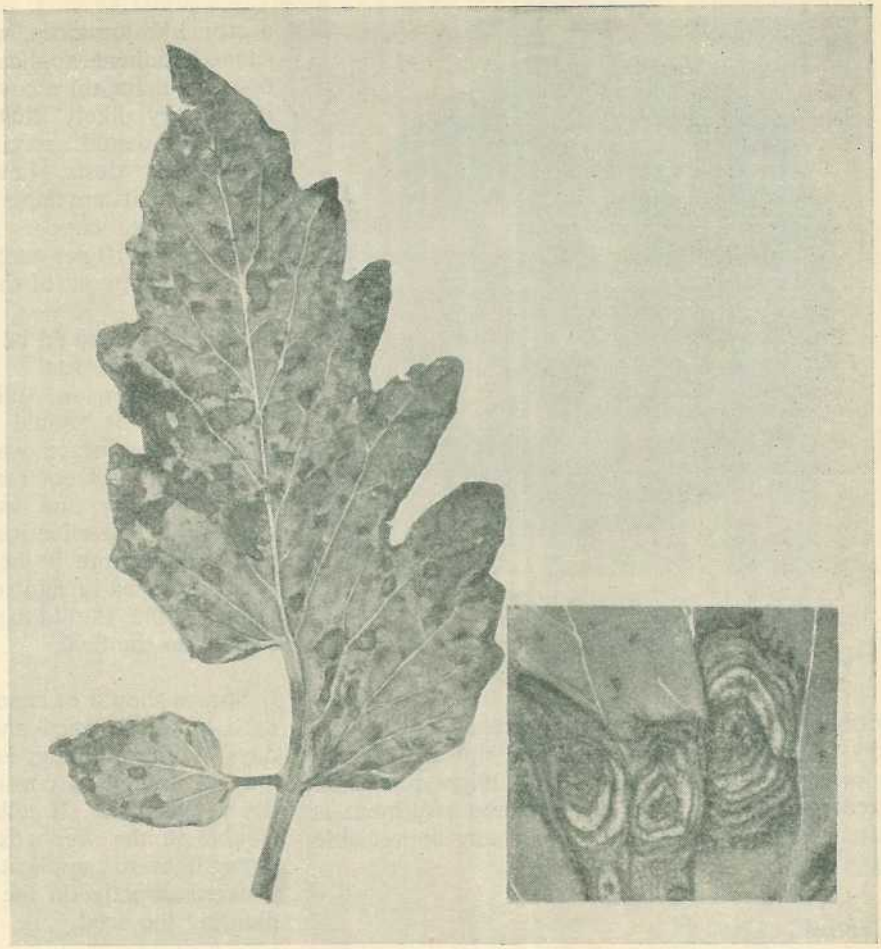


Plate 1

Target Spot on Foliage. Inset shows concentric rings more highly magnified.

(Plate 2) but may be also scattered about the fruit. In the former case, they may often be associated with a growth-crack, but at other times the disease appears to have attacked the fruit stalk first and subsequently entered the fruit. The fungus does not grow readily in green fruit, so that a mature green fruit which is infected, although not showing any spots when forwarded to the market, may develop the disease as it commences to colour.

This disease is caused by one particular fungus (*Alternaria solani*), but when causing fruit rots it may have associated with it several closely-related fungi which help to extend the damage. All of these fungi are far more resistant to dry weather conditions than is the fungus causing Irish blight, and they appear to require very little moisture and wind movement for their development and spread. Also, the target spot fungus prefers warm temperatures, so that in south-eastern Queensland the autumn and spring are the seasons most likely to provide conditions favourable to epidemics, though the disease may be present to some extent throughout the year.

Observations indicate that the disease advances more rapidly when the plant is carrying its maximum load of fruit, and that if plants are backward in any way they are more readily attacked.

The available evidence suggests that the target spot fungus is readily carried over in the soil from season to season.

Target spot is present throughout all the tomato-growing areas of Queensland, and

Plate 2

Target Spot on Fruit.

probably causes a greater aggregate loss than any other tomato disease. The slower and less spectacular spread than in Irish blight results in greater neglect by the growers and treatment is often commenced too late to do any appreciable good.

Control

Zineb is the most efficient fungicide available for the control of this disease. Both spray and dust preparations are available. Zineb has largely replaced copper preparations because of its greater effectiveness and lower toxicity to the plants. It is however less persistent than copper preparations and should be applied more regularly, that is, at 7 to 10 day intervals.

Copper preparations have the advantage that they give more lasting protection, and that they are more effective against diseases other than target spot which are likely to be present also. The choice of which type of fungicide should be used therefore rests with the grower.

The usual copper spray strength for field use is that given by 4-2-40 Bordeaux mixture; commercial copper compounds should be used at the strength recommended on the label. With a crop like tomatoes, where rapid growth necessitates frequent applications of the fungicide in order to maintain a covering on the growing tips, it is very likely that a weaker strength of Bordeaux would exercise economic control. In considering dusts, however, it is not recommended that anything less than a strength of 7 per cent. copper should be used, to be increased to 10 per cent. if conditions are favourable to the spread of the disease.

Great care should be exercised in the selection of the seedbed site. It should be in an open sunny position in soil not recently used for tomatoes. It should also be high enough to ensure that surface water from nearby sources of infection will not reach it. Plants should be raised in rows and well spaced to permit air circulation and effective spray application. The plants should not be held in the bed longer than necessary if early signs of the disease are present. Less trouble should be experienced with direct seeding in the field.

Sprays should be reduced to half strength when used in the seedbed and not applied within two days of transplanting, as the loss in transplanting may be increased considerably if conditions are dry at the time. If collar rot is regularly causing trouble in the seedbeds, a solution at the same strength as for application to the plant may be watered directly on the surface of the soil after planting the seed.

(See section at end on a combined spray for tomatoes.)

IRISH BLIGHT

The first evidence of the presence of Irish blight is usually in the form of extensive dark-brown to black lesions on the stems and leaves (Plate 3). In moist weather the leaf lesions have the appearance of a wet rot and may even show a white downy growth on the lower surfaces of the leaves, but when dry conditions prevail the lesions are dry and papery. The fruit is readily attacked in all stages of development, a large mottled-brown lesion with indefinite margins usually covering at least one-fourth of the fruit surface being produced (Plate 4). A minor symptom of Irish blight is an intense purple dis-

coloration of an individual stem, apparently due to interference with the food supply to that stem caused by girdling.

Irish blight is caused by a fungus (*Phytophthora infestans*) which grows very readily in cool, moist weather. The disease appears only in the cooler months, during which time it may become epidemic only when favoured by continued showery conditions and overcast skies. Heavy dews also favour its spread. Extremely rapid development of the disease is brought about by a succession of sharp, cold snaps, as the causal fungus, under these conditions, can reproduce itself even more rapidly than when the weather is uniformly cool and moist. If the temperature rises appreciably, or dry weather appears, the spread of the disease ceases immediately. Because Queensland winters are normally dry, epidemics of Irish blight are not common in this State.

It is also likely that most present-day varieties possess some resistance to this disease. This would in part contribute to the fact that few serious outbreaks have occurred over the past 10 years.

Control

Irish blight can be controlled by the use of copper sprays or dusts. If there is any likelihood that the disease will develop, or, as the first symptoms are detected, a copper spray schedule should be adopted, and continued for as long as climatic conditions favourable to the spread of the disease persist. Normally, the interval between applications is 7 to 10 days. This period may need to be shortened if climatic conditions are unusually favourable to the development of Irish blight, whereas during prolonged dry spells it may be increased. As for target spot, it is not advisable to reduce the strength of a dust below 7 per cent. copper. Sprays weaker than the standard 4-2-40 Bordeaux mixture could possibly be used, but thoroughness of application must never be neglected.

It must be noted that tomatoes may be packed in apparently good condition and develop the symptoms of Irish blight while in transit to, or on, the market. Hence, if the grower has Irish blight in his crop it is advisable for him to hold the fruit for three or four days before packing.

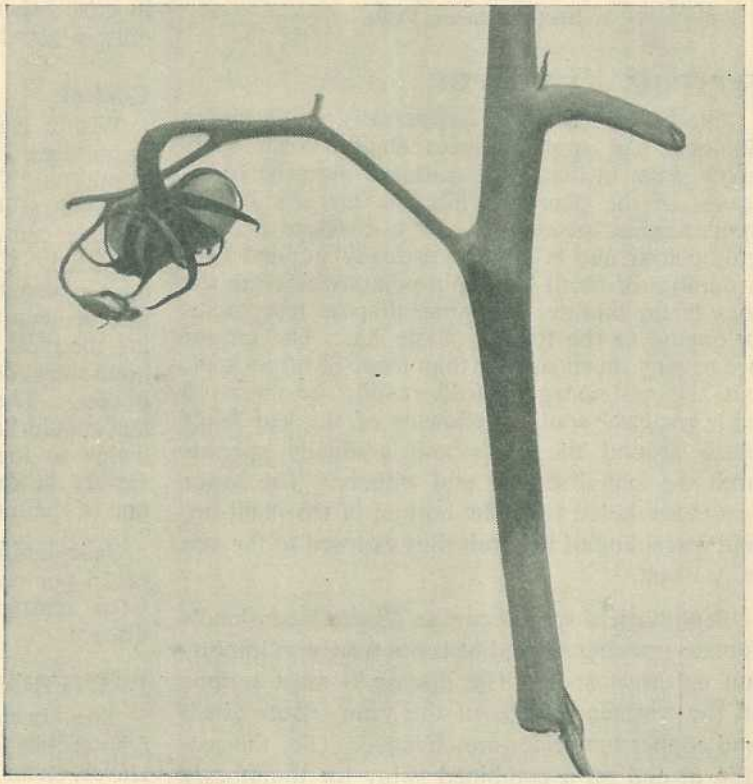


Plate 3

Irish Blight on Stem.

Plate 4

Irish Blight on Fruit.

SEPTORIA LEAF SPOT

The fungus (*Septoria lycopersici*) which causes Septoria leaf spot produces small brown spots about ⅛ in. in diameter, scattered over the lower leaves of the plant. While the margins of the spots remain brown, the centre develops a light-grey colour and is characteristically studded with a number of small black pin-points which are the tops of the minute, flask-shaped spore receptacles belonging to the fungus (Plate 5). The lesions are usually much smaller than those of target spot, but the early stages could readily be confused with bacterial spot. Yellowing of the leaf takes place around the spots and gradually spreads until the leaf dries out and withers. The lower leaves are killed from the bottom of the plant up, and a scalding of the fruit thus exposed to the sun may result.

Septoria leaf spot occurs in all of Queensland's tomato-growing areas, but is not nearly so important as target spot. The disease is most serious in the warmer months of the year. Both zineb and copper fungicides are effective. (See the section at end on a combined spray for tomatoes.)

Treatments should be applied as a protective measure. Little benefit will be obtained by spraying after the plants are well infected with the disease.

LEAF MOULD

Leaf mould is likely to occur seriously only in the very high rainfall districts of Queensland. A chacteristic symptom is the premature death of the older leaves, leaving the plant with a ragged appearance somewhat similar to the result of defoliation by target spot. Another characteristic is the appearance on the lower surface of the leaf of a velvety dark growth, which is the causal fungus. In the earlier stages of the attack the leaves show indefinite yellow lesions on the top surface. Infection of the fruit is unusual, but the blossoms may be attacked and destroyed.

The disease is caused by a fungus (*Cladosporium fulvum*) and the essential factor for its spread is a very high humidity. While the disease has been recorded as far south as Brisbane, it is of regular occurrence only in northern parts of the State. Here leaf mould often surpasses target spot in importance. While the disease is present in most other countries, it is usually troublesome only in glasshouses.

Control

Within glasshouses great stress is laid on the importance of controlling temperature and humidity. That is to say, temperature should be kept below 70 deg. F. and relative humidity below 70 per cent., and ample ventilation should be provided. Control of these conditions in a field crop is usually out of the question. However, it will be seen that areas well protected from winds are the most likely to be affected, as high relative humidities develop more readily in still atmospheres. The breeding of tomatoes resistant to leaf mould has been successful in some areas, but owing to the different strains of fungus no one variety is successful everywhere. Manalucie is one of the most useful yet released in Queensland.

Salicylanilide sprays at a strength of 1½ pints of 25 per cent. solution in 40 gal. of water have been reasonably successful in controlling this disease.

BACTERIAL SPOT

The bacterium (*Xanthomonas vesicatoria*) responsible for bacterial spot disease attacks the leaves, stems and fruits. On the leaves (Plate 6)

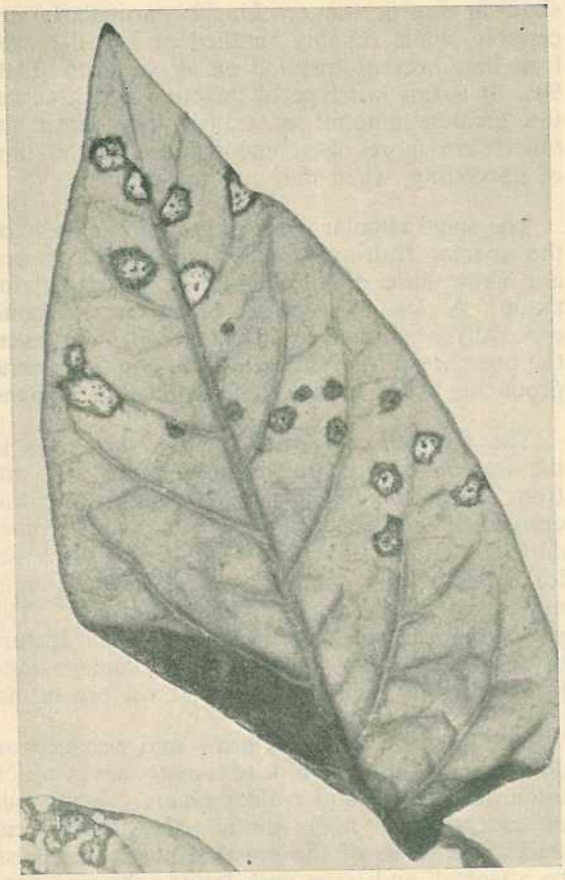


Plate 5

Septoria Leaf Spot on Leaf.

and stems (Plate 7) the disease appears as small dark spots similar to the early stages of Septoria leaf spot and target spot. They are differentiated from Septoria leaf spot in that they do not develop the grey centres and pin-point fruiting bodies, and from target spot in that they remain comparatively small and do not develop concentric rings. Also, if the bacterial spots are examined from the lower surface of the leaf, it will be found that many of them have a greasy appearance. In addition to attacking leaves and stems, the disease forms small dark greasy spots on the flower hands which cause a considerable loss due to flower drop.

On the fruit, bacterial spot appears as a small black raised scab-like spot (Plate 8) which may increase in size to approximately $\frac{1}{8}$ in. in diameter. When approaching the maximum size, however, the centres become slightly sunken. If the spotting is severe a number of spots will sometimes coalesce, forming a more extensive area. The size of the individual spot depends on the amount of growth that the fruit makes after it is infected, and does not increase after the fruit has matured. The fruit cannot be infected after a certain stage of maturity has been reached, which appears to correspond with the disappearance of the hairs from the fruit.

The fruit spot does not penetrate past the tissue immediately under the skin and if extensive rotting occurs it is due to other organisms entering the bacterial spot injury. No new spots develop in storage or in transit.

The variety Grosse Lisse and the various selections from it exhibit a high resistance to the fruit spot phase of the disease. The leaves and stems, however, are often affected. Sioux, Red Cloud, Rouge de Marmande and Break-O-Day are highly susceptible to the fruit spot.

Late summer and autumn appear to be the most favourable periods for development of this disease, probably because rain is the main factor in its spread. Wind-blown rain followed by drizzly overcast weather creates ideal conditions but these periods are normally of brief duration.

The disease is widespread throughout the older tomato-growing areas.

Control

The main sources of infection with bacterial spot appear to be in the seed and in the soil. Seed contamination is usually confined to the outside of the seed, so routine treatment with corrosive sublimate or one of the mercurial seed dressings is recommended. The general precautions in selection and treatment of the seedbed, as discussed later, are also recommended.

There is evidence that the application of a copper spray checks bacterial spot. This idea is supported by the increased severity of the disease in some cases where copper has been replaced by zineb in the spray programme. If the disease is well established, it would be wise to grow only a Grosse Lisse type.

Plate 6
Bacterial Spot on Foliage.

PHOMA ROT

The disease Phoma rot was first recorded in Queensland in 1926, and though usually regarded as being of minor importance, it may become a serious problem to tomato growers during seasons of high rainfall. Under such conditions it may prove to be the most serious cause of fruit wastage, both in the field and during transit to the market. The causal agent is the fungus *Phoma destructive* Plowr., which is a wound parasite gaining entry through injuries present on the surface of the fruit.

On the fruit, infection occurs frequently at the stem end, where it causes sunken lesions not unlike those caused by target spot. In this case the fungus enters through the stem scar. Fruit showing ring or star cracking is particularly susceptible, while roughly handled or hail damaged fruit may become infected on all surfaces (Plate 9). It is this last type of infection which causes the greatest amount of transit loss, since the others are more often encountered at the time of harvesting, when they are rejected.

The small circular spots as they first appear on the ripening fruit are usually somewhat depressed and show little discolouration of the underlying tissue. A close examination of the larger lesions, especially when held towards the light, will reveal the presence of numerous minute erupting spore-producing bodies in the centre of the diseased area.

The pimpled appearance which this gives to the lesions is a distinguishing feature and one from which the older name of pimply rot was derived. The infected tissue usually later becomes dark and sunken, but this is not always the case, for under certain conditions large infected areas may occur and be neither sunken nor dark. The pimply appearance is, however, a constant feature of the disease. The invaded tissues remain quite firm unless invaded by other soft rot organisms.

The fungus is able to grow and produce an abundance of spores on dead tomato leaves which often accumulate under older plants. In periods of exceptionally high rainfall, the leaves, leaf stalks and stems of the growing plants may also be attacked, and large dark lesions showing concentric ring markings are produced. These symptoms are again very similar to those produced by target spot.

Control

The amount of fruit wastage in the crop depends largely upon what precautions are taken right through the growing period. Residues from previous crops should be destroyed by raking and burning, or by some other means. Seedbeds should not be located near packing sheds or where diseased and discarded fruit from previous crops have been allowed to accumulate. The regular application of a fungicide such as zineb or copper will also serve as a form of protection. Where dead leaves accumulate under the plants, the fungus is able to build up a reservoir of infection from which the spores are conveyed to the fruit, and these should therefore be removed where possible. This practice should not prove difficult in staked or trellised crops.

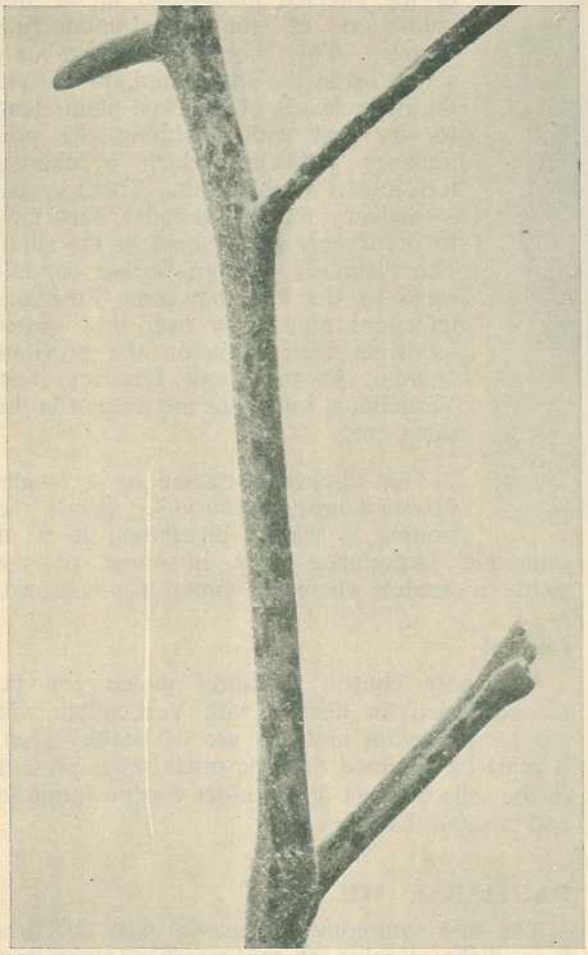


Plate 7
Bacterial Spot on Stem.

Since infection takes place through skin wounds on the fruit, care should be taken to ensure minimum injury during harvesting and packing operations. This should include careful inspection of picking tins, packing benches and graders for likely causes of fruit injury, and the use of protective felt or soft sacking surfaces wherever possible. After harvesting, fruit should be kept in a dry place until it can be marketed.

FUSARIUM WILT

The first indication that a plant is infected with Fusarium wilt is given by a cessation of growth. The next symptom is provided by the leaves, for those near the base of the plant commence to turn yellow and die. Then, a week to a month later, according to whether temperatures are high or moderate, the entire plant becomes wilted. Sometimes the infected plant does not die but remains in a stunted state for several months.

Leaves on a diseased plant readily break away from the stem, and, if the stem surface is scraped off the plant just above the ground level, brown streaks will be seen in the woody water-conducting tissue (Plate 10). In severe cases the dark streaks extend around the entire stem, so that if the stem is cut across with a sharp knife a dark ring shows up just inside the bark. A further characteristic feature is that often only one branch of the plant is infected. If this happens when the growing period is entering the cooler part of the year, the plants may produce a number of healthy branches and a payable crop still be harvested.

This disease is caused by a fungus (*Fusarium oxysporum* f. *lycopersici*) which penetrates the roots and grows up through the water-conducting vessels of the stems and leaf stalks. The fungus also occasionally grows from the stem into the developing fruit and infects the seed.

It is introduced to a farm with the seed or by means of wind blown spores and carries over from season to season in the soil. It may be spread by soil washing across lower slopes, by ploughs or other implements, or by moving the residue of an infected crop on to an uninfested area.

This disease requires warm temperatures (with an optimum of 80 to 90 deg. F.) for its development and consequently only affects plants growing during the spring and summer months. Light-textured soils tend to produce a greater incidence than heavy soils, and an acid soil also accentuates the trouble. Severe outbreaks often follow waterlogging of the soil.

Fusarium wilt is present in practically every warm-temperate, subtropical and tropical tomato-growing area in the world. In Queensland it is still a limiting factor for warm weather crops, and any soil which has grown tomatoes for a number of years may be assumed to be infected with the Fusarium wilt organism.

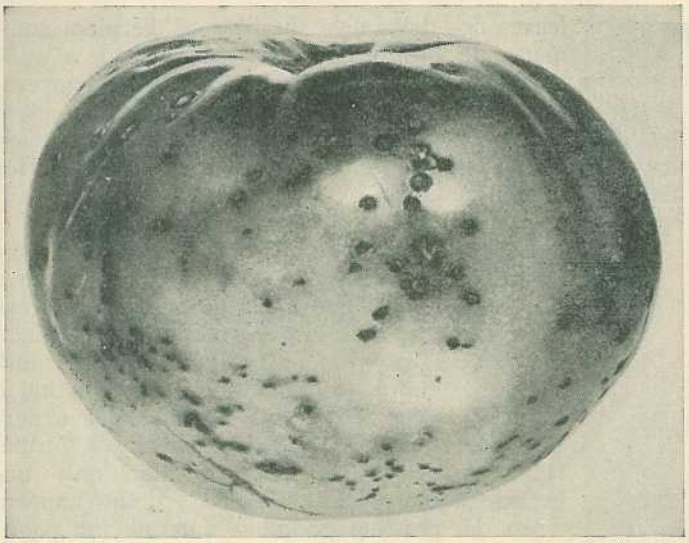


Plate 8
Bacterial Spot on Fruit.

Control

The main line of control for Fusarium wilt is to use resistant varieties. It should be understood, however, that the term "resistant" is really a relative one, and under conditions very favourable to wilt some of these varieties show a percentage of infection. Two outstanding varieties for resistance to this wilt are Manalucie and Kokomo. These two varieties have not been readily accepted by growers, however, probably because the fruit is smaller and less abundant than would be desirable. However, they are near-commercial types and can be recommended for trial in localities where wilt is generally severe.

Suitable so called "resistant" varieties are Grosse Lisse, Pearson, Red Cloud, Valiant and Rutgers. The number of varieties with high resistance should increase considerably in the near future, as much breeding work is being done on this problem. Amoung the definitely susceptible varieties are Burwood Prize, Chalk's Early Jewel, Bonny Best, Rouge de Marmande, Earliwinner and Earliana.

VERTICILLIUM WILT

The symptoms of Verticillium wilt are very similar to those already described as characteristic of Fusarium wilt, both in the manner of wilting of the affected plants and in the discoloration of the water-conducting vessels. This disease, however, only shows up in the winter and spring, and the older leaves of attacked plants tend to dry and wither without the preliminary yellowing which is characteristic of Fusarium wilt. There is also a tendency for the vascular darkening to occur only in the base of the stem. The diagnosis is often further complicated by the fact that some Fusarium infections may carry over into winter following their initiation the previous autumn, so that both Fusarium and Verticillium infections are present in the same crop.

This disease is caused by a fungus (*Verticillium albo-atrum*). While the trouble is widely distributed it is of economic importance only in some of the southern districts where the winter crop is grown.

Control

The only control measures which can be recommended for dealing with Verticillium wilt are crop rotation and the use of healthy seed. It must be assumed that the organism is present in the soils of most of the older tomato farms in and around Brisbane.

BACTERIAL WILT

The first symptom of bacterial wilt infection is a slight stunting of the attacked plant, but the symptom which is generally noticed is the spectacular collapse of what appears to be a vigorous, healthy plant (Plate 11). This collapse may be complete within 24 hours and may show no preliminary symptoms on the lower leaves. In this respect it differs from Fusarium wilt. The water-conducting vessels under the bark are often discoloured, as in the latter disease, but when the stem of a bacterial wilt infected plant is cut across just above soil level a slimy ooze is often, but not always, apparent. It is never present in Fusarium wilt.

Bacterial wilt occurs in most tomato-growing countries and has been recorded from the majority of the tomato-growing areas in Queensland. It is only of economic importance to the late summer crops of tomatoes. The disease may

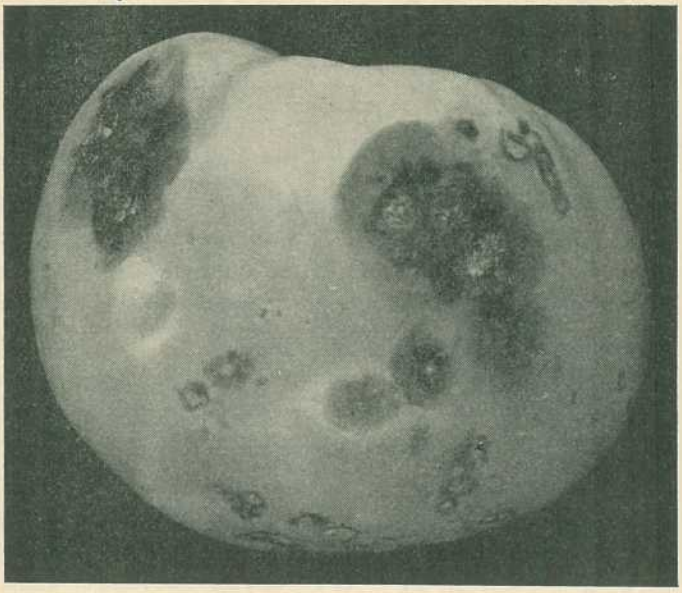


Plate 9

Phoma Rot. Transit rot produced by careless harvesting or packing. Note damaged skin of fruit.

also attack potatoes, eggplants, tobacco, dahlia, sunflower and zinnia, so the presence of these plants on a farm may favour its occurrence.

Bacterial wilt is caused by a bacterium (*Pseudomonas solanacearum*) and in this respect it differs from the two previously discussed wilts, both of which are the result of fungous infection. It appears, however, to be very localised in its occurrence; for example, in one large district only portions of individual farms are affected. The tendency is for the lower and moister portions of the properties to show the greatest incidence of the disease. The soil may receive its primary contamination from a crop of potatoes, or from seedlings of any of the susceptible plants brought in from infested soil, but it is possible that virgin soil may be infested. Like Fusarium wilt, this disease occurs mainly in warm weather, the most favourable soil temperature being approximately 75 deg. F. It is carried over from one season to another in the soil.

Control

It would appear that losses due to bacterial wilt will only be minimised by refraining from growing crops of tomatoes on infected soil during the warmer months of the year.

On a number of occasions it has been noted that a mulch of animal manure on the seedbed has been associated with heavy losses of transplants.

So far as resistant varieties are concerned, the only commercial variety that has shown any degree of resistance to bacterial wilt is Sioux. This variety has several disadvantages. It is susceptible to a disorder known as vascular browning, a darkening of the inner wall of the fruit, which at times causes heavy wastage, and the fruit has the reputation of not carrying well to the market.

BACTERIAL CANKER

As bacterial canker is very easily spread from plant to plant by handling, especially in pruning a trellised or staked crop, it is important to be able to recognize the early symptoms of the disease. In a young infected plant one leaf, or perhaps only the leaflets on one side of a leaf, droops and wilts, while the remainder of the plant looks quite normal and vigorous. Following this preliminary wilting, there appears a dieback of the growing tip (Plate 12) and this is accompanied by a splitting of the stem.

The wilting of the leaflets on one side of the leaf, mentioned for the young plant, is also characteristic of the disease in the older plant. If an affected leaf on such a plant is broken or cut off, a brown discoloration of the tissues can be observed on the exposed area of the stem. On peeling away the surface layer of the stem just over this discoloured portion, the tissues are seen to have a mealy appearance. This discoloration advances into the inner portion of the stems as the disease progresses. In the later stages of the disease the stems of an affected plant may split and produce the cankers from which its name is derived.

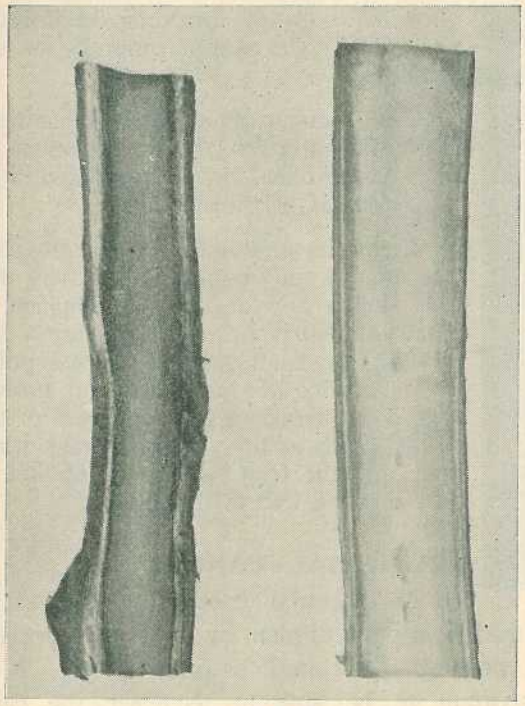


Plate 10

Fusarium Wilt. In the affected stem on the left the brown streaks in the woody water-conducting tissue are evident.

The leaf spots are usually round and very small, and not particularly characteristic, but the fruit spots generally have a white margin with a split in the centre and are therefore more characteristic and are suggestive of another name sometimes given to this trouble—bird's-eye spot (Plate 13). The spots are rarely over $\frac{1}{8}$ in. in diameter, and are not raised as is often the case with bacterial spot.

Several other tomato diseases display symptoms which are similar to those produced by bacterial canker; for example, one-sided wilt of the early stages of bacterial canker occurs at times in bacterial wilt and may also be caused by a stem-boring caterpillar. In addition to bacterial wilt, bacterial canker may be confused with Fusarium wilt. However, there is usually some distinguishing characteristic by which the diseases may be separated; for example, the golden yellow discoloration of Fusarium wilt is not found in bacterial canker, and the lower leaves do not break off so easily as is the case when Fusarium wilt is the cause of the trouble. Again, the mealy discoloration of the internal tissues of the stem which occurs in bacterial canker extends right into the pith, whereas in the case of Fusarium wilt and bacterial wilt the discoloration is confined to the water-conducting tissue, which presents a woody appearance.

Bacterial canker, as the name implies, is caused by a bacterium (*Corynebacterium michiganense*). The disease develops most rapidly in the early autumn and spring months, but crops affected in the early autumn will readily carry the disease into the winter. The rate at

Plate 11

Bacterial Wilt. The collapse of the plant is shown.

which bacterial canker may spread in an affected crop is accelerated by the onset of rain, but it is not so strikingly dependent on rain as is bacterial spot.

Although the disease originally enters the crop through the medium of infected seed, its subsequent spread takes place either by the handling of the plants in pruning or other operations or, after the stems crack, by the splashing of the plants with bacteria in raindrops. Bacteria are present in large numbers in the stem cracks, and, if splashed on to the leaves and fruit by rain, extensive spotting will develop.

The only important tomato-growing area in Queensland from which bacterial canker has not been recorded is the Bowen district. This does not mean that it is not present there, however, because it could remain undetected for a considerable time in crops growing unpruned on the ground. So long as care is exercised in seed selection and treatment, it is unlikely that canker will affect a whole district to the extent that Irish blight may in a season which is favourable to its development. However, it can be disastrous for the individual grower, especially if he is trellising or staking the crop and has made several prunings before discovering the presence of the disease.

Control

One of the most essential points in dealing with this disease is to obtain, if at all possible, seed

Plate 12

Bacterial Canker on Young Plant. Leaf on left shows wilting of leaflets on one side only.

from a disease-free source. A grower who saves his own seed should take special precautions against bacterial canker infection, one of the most important of which is to allow the seed and pulp to ferment for three to six days without adding any water. This process kills any bacterial organisms which may be present in the seed and in the pulp. However, as the type of fermentation may vary with different conditions, it is recommended that the seed be dried after cleaning and then treated in a corrosive sublimate solution according to the directions given later. Seed from an unknown source should also receive this treatment. Seed treatments with acetic acid and hot water may also be used. In spite of the seed treatments, however, the main emphasis must always be on disease-free seed.

Before the pruning of a tomato crop is commenced an experienced person should check through the crop and mark all plants suspected of being infected with bacterial canker. If more than 5 per cent. of the plants are so affected it is advisable to leave the crop unpruned on the ground, thus reducing handling to a minimum. The hands should be washed very thoroughly in soap and water after working with any diseased plants, and any material which will be used again next season (such as stakes) should be sprayed with 2 per cent. formalin and immediately covered with bags for several hours. None of the usual sprays exercises any appreciable degree of control of this disease.

In recent years when Grosse Lisse and its various selected types have been predominant in southern Queensland tomato-growing districts bacterial canker has been almost unknown. There is a strong possibility that this variety is somewhat resistant to the disease. The Daydream variety is known to be very susceptible.

SCLEROTINIA ROT

The fungus which causes *Sclerotinia rot* (*Sclerotinia sclerotiorum*) also causes a serious disease of beans, and to a lesser extent affects lettuce, cabbage, and celery. The most characteristic symptom is a light coloured rotting of the stem, which may be 1 ft. or more in length, usually causing the tops of the plant to wilt and die. Infection usually arises where a spent flower has lodged on the stem, or where the stem has been injured by rubbing against a stake or trellis wire. As the diseased tissue dries out, the black resting bodies (sclerotia) of the fungus begin to appear in number both on the inside and (though less often) on the outside surface. These bodies vary in size from $\frac{1}{8}$ to $\frac{1}{2}$ in. in length and are irregular in shape. They fall to the ground in due course and serve to carry the disease over to the next winter. When suitable winter weather reoccurs, the sclerotia give rise to small cream mushroom-like bodies on the soil surface, $\frac{1}{8}$ to $\frac{1}{4}$ in. across, which release the spores of the disease into the atmosphere.

Control

The progress of the disease is closely determined by the amount of moisture in the air around the plants, being most severe following prolonged periods of wet or cloudy weather.

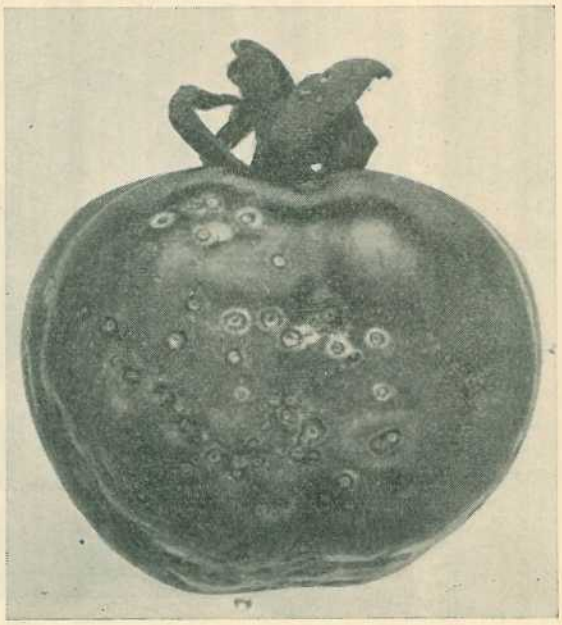


Plate 13
Bacterial Canker on Fruit.

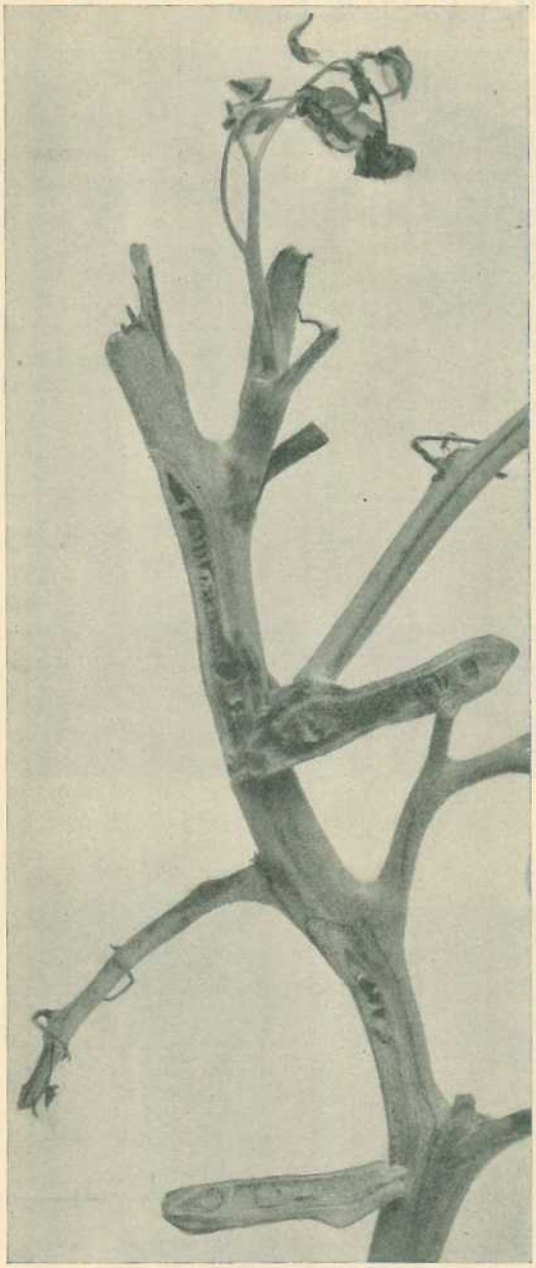


Plate 14
Pith Rot.

Available fungicides have been of no use in combating the trouble. Since its occurrence is limited to the cooler months, areas having a history of sclerotinia rot might well be avoided for crops which mature during this time.

PITH ROT

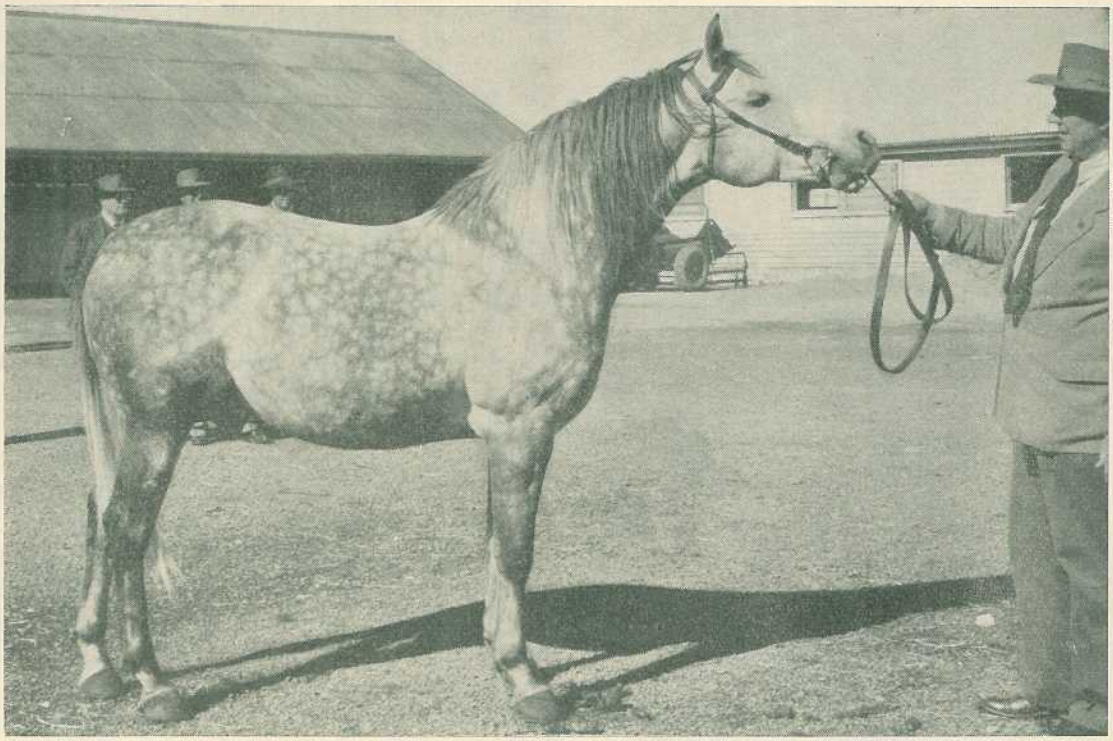
As the name implies, pith rot causes the interior of tomato stems to become hollowed out (Plate 14). The hollowing may involve the major part of the stem system, or it may be localised in the lower portion, or in one or several branches only. When the rot is extensive the stem can be easily flattened between the thumb and fingers. Small lumps due to a tendency to form aerial roots occur along the affected stems. Longitudinal cracks may occur, revealing a hollowed out interior, which may be olive green to dark brown in colour. Affected branches may wilt and perhaps die off, leaving other branches of the same plant apparently normal, or the whole plant may die. Under other conditions there may be extensive hollowing of the stem with little or no adverse affect upon vigour and cropping capacity.

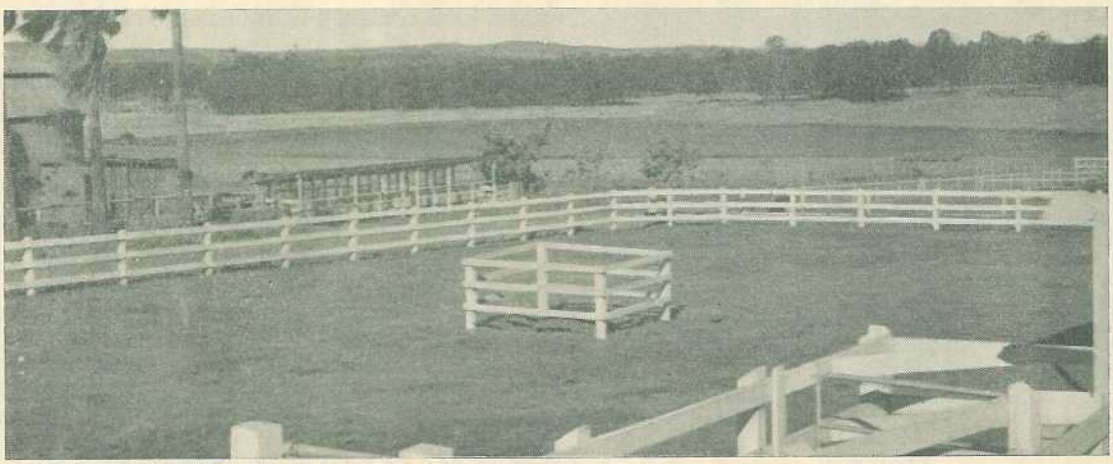
There is little doubt that this trouble has at times been confused with bacterial canker disease, which it closely resembles. The absence of yellowish bacterial slime in the cavities formed inside the plant, and the absence of one-sided wilting of leaflets serve to distinguish it from this trouble.

There is a close association between the quantity of fertilizer applied and the incidence of this disease, and it appears to be a form of fertilizer injury. Several bacteria have been isolated consistently from rotted pith tissue, but it is thought that these organisms alone have not the power to decompose healthy stem tissue.

(To be continued)

More Scenes From the R.N.A.–Shell Tour





Top: Mr. Wally Mason, Instructor in Animal Husbandry at the Queensland Agricultural High School and College, Lawes, with a Pure Bred Arab Stallion. Bottom: In the background of these neat yards may be seen the 10½ million gal. dam which has been constructed at the College and which has been used to irrigate winter pastures. These and other pictures in this issue, showing "Woodland" Stud (cover), "Glenroy" Stud (page 534), Oakey Abattoir (page 554), and Canning Downs (page 592) were taken on the R.N.A.–Shell 1960 Journalists' Tour.

Measuring Grain Moisture Before Storage

By W. T. KELSO, Senior Cereals Chemist.

So that grain can be safely stored, its moisture content must be known. An approximate figure can be obtained by testing the hardness of the grain, making allowance for the variety. Grain sampling procedures are outlined, together with methods of measuring moisture. The limitations in the use of moisture meters are discussed.

Normal moisture is the amount of water put into the grain by the growth processes of the plant. Grain also absorbs moisture from dew and rain.

Moisture transports the foods within the plant to the seed-head and in the early stages of growth, moisture accounts for four-fifths of the total plant weight. At flowering time, in wheat, the amount of water present is reduced to two-thirds of the weight of the head. From then onwards, as the grain matures, water is lost to the atmosphere, until at maturity the grain is in equilibrium with the atmosphere. At this stage the moisture content, under hot dry conditions, would be approximately 10 per cent.

Rate of Moisture Loss

In an experiment at the Hermitage Regional Station (Warwick), the effects of rainfall and temperature on the rate of moisture loss in wheat were recorded, as shown in the following table:

The rate of moisture loss in the grain during the 1957 pre-harvest period was 6 per cent. per day, while in 1958 it was only 1.2 per cent. per day, thus illustrating the delaying of maturity by the cooler, wetter conditions.

Is Moisture an Asset?

Moisture occurs in almost every known substance; the tendency is to disregard it as being an accepted thing and of not much importance. With grain, it all depends on whether you are buying or selling. If you are buying the grain, then you want as little water present as possible, because it has no economic value. A buyer wants the solid material and not the water.

Take a grain with a moisture content of 12 per cent. That means that every 100 lb. of grain has 12 lb. of water. The buyer doesn't want to buy this water but the seller wants to sell it.

Year	Rainfall in points		Temperature (°F.)			% Moisture in grain					
	Oct.	Nov.	Oct.	Nov.	Dec.	3rd Nov.	13th Nov.	15th Nov.	19th Nov.	21st Nov.	8th Dec.
1957 ..	131	6	81·3	88·4	93·2	..	..	47	16	11	..
1958 ..	295	303	78	83	84·6	52	21	..	..	..	10

Moisture can be regarded as an adulterant of the essential chemical constituents and in most grains the amount of moisture is equal to the amount of protein. Australian grain finds favour with overseas buyers because of its low moisture content, when compared with that of other countries.

In order to avoid the effect of moisture on the composition of the grain, laboratories either report the constituents at a moisture-free level, or at some specified moisture level. When a moisture-free basis is used, it means that if you took 100 lb. of grain with 12 per cent. moisture and dried it so that no moisture was left in it, you would have 88 lb. of dry material left. Say, for instance, that this 100 lb. of grain had 12 per cent. protein, that is 12 lb. per 100 lb. of grain, and on drying to a moisture-free basis, there would still be 12 lb. of protein in 88 lb. of dry material. The protein content has now risen to 13.6 per cent. If water was added to the original grain so that the moisture was raised to 13.5 per cent, then the protein content would have fallen to 11.8 per cent. Therefore the moisture content plays an important role in assessing the dry constituents of the grain.

In the wheat industry, it is convenient to report figures at a 13.5 per cent. moisture, but as long as the moisture level is stated it doesen't matter how the figures are reported, because the relevant figures at other moisture levels can be derived. Figures calculated on a moisture-free basis have not much meaning for farmers and find their favour in laboratories and scientific journals.

When is Moisture a Hazard?

Most grain crops are subjected to storage, either in bags or in silos. Grain never improves with storage, so in order to hold the grain in its original condition, strict attention must be paid to the moisture content.

Deterioration of grain results mainly from an incorrect moisture level in relation to the external temperature conditions, and length of storage. The lower the outside temperature, the higher would be the safe storage moisture level and vice versa. Excessive moisture causes overheating, increased insect infestation, musty odours and LOSSES IN GRAIN.

Experience has shown that, in Queensland, the safe storage levels of moisture are of the order of 12 per cent. The kind of grain and the variety would determine the allowable variation in moisture content from the 12 per cent. level.

Furthermore, if the grain is to be stored in bags, where there is access to the air, an increase of 0.5 per cent in the moisture content at storage would be permissible.

Over the years, handling authorities have derived their own storage moisture levels and naturally have played safe. No experimental evidence is available at present to alter these figures and any change should be treated with caution for it is a costly experience to experiment with higher moisture levels. Everyone has to be protected. It is also costly to remove moisture by artificial heating devices, and far wiser to let the grain come to full maturity in the field.

Estimation of Moisture

There are three main processes involved in the estimation of moisture, namely:

1. Sampling
2. Preservation of the sample
3. Measurement

1. *Sampling.* Before a sample can be analysed, the operator must satisfy himself as to the uniformity of the sample and its relation to the bulk. Sampling errors can arise because all grains have not the same moisture content. When these grains are thoroughly mixed, it takes a very long time before all the grains have the same moisture content. However, within a few days of mixing, equilibrium will be established.

In the field, equilibrium is not obtained because every head has not reached the same stage of maturity.

The Standards Branch of this Department lays down standards for the sampling of bag lots, as follows:

1 bag to 9 bags, sample every bag

10 bags to 19 bags, sample every bag

20 bags to 39 bags, not less than 20 bags to be sampled

40 bags to 59 bags, not less than 28 bags to be sampled

60 bags to 79 bags, not less than 32 bags to be sampled

80 bags to 99 bags, not less than 36 bags to be sampled

100 bags to 199 bags, not less than 40 bags to be sampled

200 and over, a portion from each of not less than 20 per cent. of the total number of bags

The whole sample is then thoroughly mixed and subsampled.

For bulk receivals a trier of about 6 ft. in length should be inserted in at least 10 places, evenly distributed. A sample of at least 3 lb. should be drawn, compounded from each trierful, mixed and subsampled. The design of the trier should be such that several samples are drawn for each insertion of the trier.

In the field a sample can be drawn from the header.

2. *Preservation of Sample.* A 2 lb. tin with a "press on" lid, such as a syrup tin, is the best type of container to use to transport and preserve the sample. It is stressed that at no time should the grain be touched with your hands as this act could transfer moisture to the grain. The tin should be filled and the lid firmly secured, and placed in a cool, shady place.

If exposed to the sun or heat the grain will sweat and the moisture will condense on the metal when it cools off, and so reduce the moisture content of the grain.

When the sample is required for testing by a "humidity type" moisture meter, the storage tin should be about 6 in. deep and about 6 in. in diameter. About 5 lb. of grain will be required to fill this tin. The important point is to have a deep tin, and the diameter can be varied to suit the availability of tins. There is no need to stress the importance of the tin being thoroughly dry before using it as a storage container.

3. *Measurement.* It is possible by feeling grain to tell whether it is wet or dry, but as the grain becomes drier it becomes virtually impossible to estimate the moisture content. From a knowledge of the grain and the particular variety, and using a hardness test, such as biting the grain, it is possible to store grain safely, since a very hard grain is most likely to be dry. However, as the moisture level tolerance for safe storage is small, recourse has to be made to some form of measurement.

A laboratory estimation of moisture content is carried out by heating the grain above the temperature of boiling water (100 deg. Centigrade or 212 deg. Fahrenheit). Moisture is driven off and escapes to the atmosphere and, after sufficient time, no moisture remains. The sample is then termed *moisture free.* A knowledge of weight of the sample before and after drying allows the percentage of moisture to be calculated. Moisture can also be determined by measuring the amount of moisture recovered when a sample is boiled in a mineral oil.

A new group of instruments, called moisture meters, has become available to the general public. These instruments take on various forms and measure moisture by indirect means using electrical properties, or the amount of moisture within the air spaces between individual grains. All instruments are portable and the one using electrical properties generally operates from an internal battery supply. It is necessary that these instruments be checked, and the necessary correction error applied.

Some moisture meters work with whole grain and others with coarse ground grain. A small coffee grinder is useful for grinding purposes, and as all grinding liberates heat, with subsequent loss of moisture from the sample, care must be taken to grind only small amounts and then seal the sample in a small container, if measurement cannot be effected immediately.

It is also necessary to record the temperature of the grain and a thermometer is thus required. Should the grain temperature vary from the air temperature, then time should be allowed for temperature equality to be reached. The grain temperature is then set on the meter and the moisture read on the scale provided.

The second type of meter, the "humidity type", measures the amount of moisture in the air spaces surrounding the grain, the moisture coming from the grain itself. After the meter has been

adjusted, the probe is inserted into the bag or bulk and the moisture content is read on the scale.

Choice of a Meter

Factors in the choice of a meter are: (1) Ease of operation; (2) speed; (3) accuracy; (4) cost; (5) degree of portability.

Intending purchasers should acquaint themselves with the various types of meters and select the one which suits their requirements. One feature which all moisture meters have in common is that they give inaccurate readings for grain which has been recently wet or recently dried. Under these conditions, sufficient time should elapse for the grains to have a uniform moisture content from the surface to the interior.

For accuracy, every meter requires to be calibrated against a laboratory standard. The Agricultural Chemical Laboratory of the Department of Agriculture and Stock maintains a service in this regard and growers are invited to avail themselves of it.

Oakey Abattoir

Skinning of Carcasses at the Oakey Abattoir of Fred. Keong Pty. Ltd. Drawing stock from all over the Darling Downs and south west Queensland, the abattoir claims a monthly kill averaging 3,000 bullocks and cows, 2,500 calves, 800 sheep and 160 pigs. The buildings, covering 32 acres of the 600 acre property, include modern houses, an administrative block, garages, and a mechanical section for livestock transport and the fleet of refrigerated trucks that carry the chilled and cartonned meat to Brisbane for cold storage and shipment overseas.

Calf Scours

By E. R. JOHNSON, Veterinary Officer,
and A. HUTCHINGS, Senior Adviser in Cattle Husbandry.

The various causes of scours in calves are outlined, and methods of prevention and treatment are given.

Diseases affecting calves cause serious economic loss to dairymen. Deaths are the most conspicuous but by no means the only loss, for loss of production through delayed maturity and retarded growth is less evident but no less real.

Scour is probably the most common ailment which affects calves during the first few weeks of life.

Calves are born with very small reserves of vitamin A and little resistance to disease. They are therefore susceptible to numerous diseases which are harboured in old yards, buildings, and heavily stocked paddocks.

Colostrum

Colostrum, the first milk after calving, is particulary rich in antibodies, and contains up to 70 times the vitamin and four times the protein content of ordinary milk. Colostrum's rich antibodies protect the animal from disease. It is therefore important that the new-born calf obtain this colostrum—preferably by suckling.

The antibodies can only be fully absorbed by the calf during the first days of life. They are normally produced in the cow's body as she builds up resistance to acquired infections and transmitted to the calf in the colostrum. Buying of very young calves without their dams in saleyards, therefore, is often a hazard as far as resistance to disease is concerned.

The cases sometimes mentioned of calves being reared successfully without colostrum are the exception rather than the rule.

There is no real substitute for colostrum.

Nutrition during the First Month

The stomach of dairy cattle is composed of four compartments and this enables the animals to digest roughage. At birth only the fourth compartment—the true stomach—is functional.

For this reason the calf can digest concentrated feeds only. Furthermore, it can properly digest only milk or milk products during the first four weeks of life. Undigested material passes to the lower bowel, to further aggravate the digestive upset, and scour is started.

It is better to give slightly too little than too much feed during the first two weeks, for overfeeding will cause a scour as a result of passage of undigested food to the lower bowel. While the individual feed can be adjusted to suit the size and health of each calf, a sound guide is to give a daily allowance of milk equivalent to 10 to 12 per cent. of body weight. As an example, an average A.I.S. calf would receive 3 pints at each feed twice daily.

All liquid feeds should be given at blood heat (roughly 100 deg. F.) particularly during the first month. Feeding times should be as regular as possible. Errors in either of these conditions will set up conditions for scour.

Plate 1
Well-Developed, Healthy Calves Are the Product of Good Husbandry.

Milk with 5 per cent. butterfat sometimes causes digestive upsets. Thus Jersey milk and some A.I.S. milk should be reduced to a 3·5 to 4 per cent. test. For example, 3 pints of milk with 5 per cent. test should be broken down with four-fifths of a pint of water.

The addition of a cupful of lime water to the regular feed has been found beneficial in some instances. Lime water is prepared by adding a double handful of lime to a bucket of water and allowing it to settle. The clear liquid is then taken as required. The bucket should be covered to exclude dust and rain.

Milk Substitutes

As much wholemilk as possible is sold during quota periods on wholemilk supply farms. Under these conditions it is necessary to use substitutes. Wholemilk must be fed for two weeks, preferably longer. Until a month of age the only suitable milk substitutes are buttermilk powder and skim-milk powder. Three and a-half oz. of powder replaces 1 pint of wholemilk or 2 pints of skim-milk in energy value.

All changes in feeds should be gradual, taking at least a week for the complete change. When making the change the quantity of liquid should be kept constant.

Giving free choice of good-quality, leafy green lucerne hay from the age of 3 weeks promotes the early development of the paunch (the first compartment of the stomach). Feed must be of good quality and must not be forced on the calf for if this is done some undigested material will pass to the lower bowel and cause scour.

Calves should be encouraged to eat dry meal as early as possible, for with dry meal feeding there is less risk of digestive disturbances and scour.

Individual calf bails are beneficial in this respect in that calves mimic each other and this

is encouraged in open bails. Furthermore, the use of calf bails prevents calves sucking each other and so reduces risk of transmitting some diseases.

Simply constructed wooden sword bails are quite suitable for the job.

Treatment of Nutritional Scour

The skill and careful observation of the husbandman is all important in preventing, and treating, scour. Early treatment is most helpful. When scouring occurs the affected animal should be starved for one day, given a dose of 2 oz. of castor oil to remove the undigested material, followed by water which has been boiled, and an antibiotic.

Poor calf husbandry and infectious scour are closely inter-woven. Two types of farmers will agree with this—those who have prevented calf scour and those who have successfully treated it.

To-day, with the available hard-hitting modern drugs on hand, there is a tendency to neglect management in the treatment of calf scour. This is false complacency. Corrective husbandry must be a part of therapy.

Calf scour can often be related to age groups.

White Scour

This type of scour is most commonly encountered in the first 7 days of life but calves up to 3–4 weeks may be affected. The cause is generally accepted as being due to a rod-shaped bacterium called *Escherichia coli.*

Escherichia coli is an organism which lives normally in the lower bowel of all calves and cows, and it will invade the bloodstream and intestines in adverse conditions. In an affected group, calves may be infected by mouth or via the navel.

Undoubtedly the biggest cause of white scour is failure to receive colostrum. Colostrum contains antibodies to the white scour bacteria, these antibodies finding their way to the bloodstream minutes after colostrum is ingested. A calf without antibodies finds it difficult to keep the bacteria confined to the lower bowel. Colostrum-fed calves, otherwise weakened, can be stricken, especially if the bacteria enter navel or mouth.

Symptoms.—The white smelly scour is well known. It usually develops at 2 or 3 days of life, is accompanied by loss of appetite, high temperature, dullness and a tendency to sleep. Deaths are frequent and follow rapidly due to blood-poisoning. Other calves may survive a few days then die from dehydration. In these cases the eyes are sunken, coat is harsh and dull, and the temperature subnormal.

Individual calves may die suddenly with no symptoms, not even a scour. This is due to very sudden blood-poisoning.

Surviving calves sometimes develop swollen joints and a limp. This arthritis is due to the lodging of *Escherichia coli* organisms in the joint during the fever stage.

Treatment.—In an affected calf group a thermometer is an essential tool. All temperatures should be noted and the normal-temperature calves shifted to clean quarters. Thereafter, their temperatures must be taken twice daily to detect any new cases.

The isolated affected group should be treated with an antibiotic such as streptomycin or oxytetracycline or possibly a sulphonamide such as sulphadimidine or phthalylsulphathiazole, together with lime water or chalk (1 or 2 oz. twice daily).

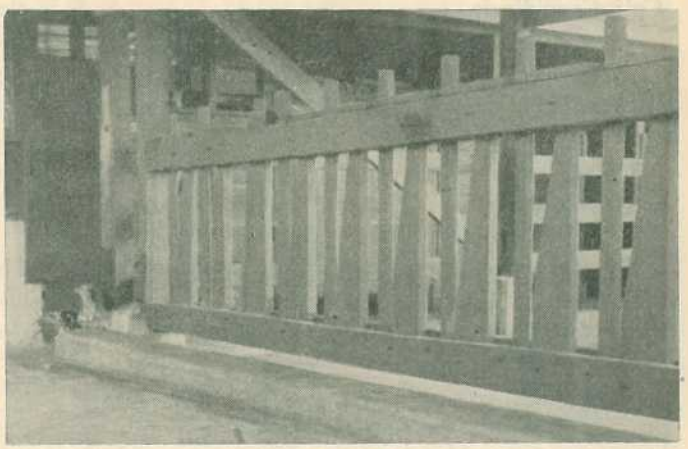


Plate 2

The Surroundings of These Calf Feeding Bails Are Easy to Keep Clean.

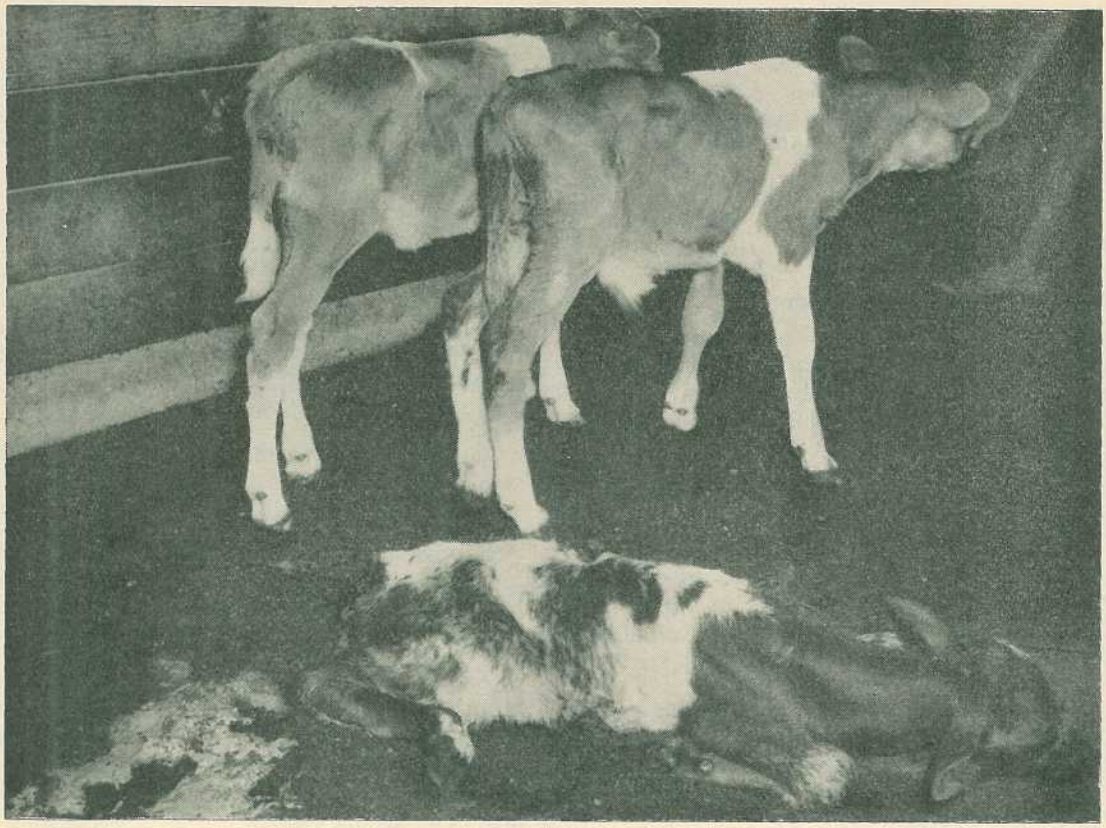


Plate 3
The Result of a Salmonella Infection.

This treatment is aimed at:

(*a*) The herd and the individual calf.
(*b*) The infection and the fluid loss.

Calf Coccidiosis

A blood scour in calves often indicates Coccidia organisms. These organisms attack the lining membranes of the intestines with severe consequences.

Calves between the ages of three weeks and three months are commonly affected, though older age groups are involved on some properties.

Humid and moist conditions can quickly cause a build-up of Coccidia and outbreaks may verge on the explosive, especially where calves are crowded together.

Symptoms.—A Coccidia scour may start directly as a blood scour but more commonly it begins as a non-blood scour which may resolve spontaneously or turn into a blood scour after a few days. Blood scour may follow on white scour. In severe cases pure blood is passed. Strips of intestinal lining are often shed and calves may die from haemorrhage. Straining after a motion is commonly observed. Appetite is depressed though affected calves usually tend to keep feeding.

Dehydration or blood loss, or both, are responsible for the deaths that occur.

Treatment.—Two specific drugs are available to counter the disease. One is sulphamezathine, the other is called mepacrine hydrochloride. Both give good results.

The sulphamezathine should be given by mouth.

Both treatments need to be combined with isolation of affected animals and elimination of wet or boggy areas.

Prevention.—Coccidia need temperature and moisture to multiply. You may not be able to do much about temperature but you can do much to eliminate the moisture factor.

Any system which rotates or disperses calves is to be commended. Set stocking of calves in any one area favours a flare-up of the disease.

Salmonellosis

Salmonellosis is a bacterial disease which is sudden and severe in cattle and other species. Calves of any age tend to be affected as a mob and the infection is commonly fatal.

Salmonella is a bacterium which first infects the gut and intestines, causing a gastro-enteritis. From the intestines it can quickly poison the bloodstream and cause sudden death. The organisms can be carried on to properties by rats, mice and other rodents and survive in moist organic matter from whence they multiply and may be ingested. However, carrier calves or adults are more often the origin of the infection.

Symptoms.—The disease is frequently sudden in onset. Some calves may be found dead, with others displaying a high fever, drooling and breathing with difficulty. Temperatures may top 106 to 107 deg. F. Scouring in sick animals is usual. The motion is largely fluid, green and profuse with flecks of blood through it. The odour is offensive.

Deaths follow within 2 or 3 days and are due largely to bacterial blood-poisoning. Few affected animals recover, whereas with Coccidiosis, *large quantities* of blood are usually passed and *most* affected calves recover.

Treatment.—Many treatments have been tried. None are wholly effective. Penicillin does *not* give good results. Sulphamezathine gives variable results, but some of the broad spectrum antibiotics may give satisfactory results.

Once again, isolation should be practised together with an attempt to trace the source of the infection.

Other Causes of Scour

(*a*) *Internal parasites*

The two most severe worm infestations affecting Queensland calves do *not* cause a severe scour. These are *Haemonchus* (barber's pole worm) and *Bunosotomum* (hookworm). However, there are types of worms that do cause a marked scour. One type is *Trichostrongylus* (hair worm) which is responsible for diarrhoea or "black scour" in calves between the ages of three months and two years. This condition nearly always depends for its appearance on a poor nutritional status as well as a Trichostrongylus infestation. Hence in Queensland it occurs in late winter to spring. Wet winters are usually a preliminary requirement for severe Trichostrongyle infestation. Successful treatment consists of provision of adequate good feed following phenothiazine drenching.

Oesophagostomum (nodule worm) is frequently encountered in Queensland calves, inhabiting the lower bowel with the formation of fibrous nodules. Symptoms are wasting and diarrhoea, with possibly a stilted gait. Phenothiazine is very effective, especially in large particle form. After drenching, fresh pastures should be provided.

(*b*) *Copper deficiency*

Copper deficiency occurs in many areas in Queensland. This can be responsible for a scouring disease but is, as yet, not fully understood. Furthermore, this deficiency is similar to and frequently associated with the parasitic infestations. If calves are shown to be deficient in copper, various forms of therapy may be tried.

(*c*) *Arsenic poisoning*

Arsenic poisoning is responsible for a profuse, non-blood, very fluid scour. Other signs will surely be present and, in a calf group, deaths are likely. Temperatures in these calves are either normal or subnormal. Cattle like the taste of arsenic and will seek it if it is accidentally available.

(*d*) *Bracken Fern poisoning*

Bracken fern can cause a severe, bloody foul-smelling scour. Like arsenic it will be attended by other severe general signs such as small haemorrhages over various body membranes, abdominal pain, high temperatures (note this, for in nearly all plant or mineral poisonings, temperatures are either normal or sub-normal) and sudden deaths. Treatment is of no avail.

(*e*) *Fevered Calves*

Calves fevered from various causes may show transient scour.

(*f*) *Virus Diarrhoea* (*Winter Dysentery*)

Quickly affects whole herd, including calves, with a watery diarrhoea.

pasture and crop

Fertilizer Distributor Care.—Care spent in preparing a fertilizer distributor for the spring will help to ensure accurate spreading and may also prevent stoppages which may interfere with your fertilizing programme.

The fertilizer used must be free flowing if calibrations are to remain accurate. This is equally true whether your machine is of the direct drop or of the broadcasting spinner type. Give your machine a fair chance by storing the fertilizer carefully so that it does not cake. If it has become lumpy, pour it into the hopper of the distributor through a framework of ½ in. wire netting. Any lumps left on the wire netting can be crumbled up by hand or rubbed through the sieve.

When an oil can is used to lubricate such parts as the feed gate setting control, take care that excess oil does not run on to the teeth of exposed gear wheels. Remember an oil surface holds fertilizer powder and this makes a grinding compound which will cause the gears to wear. When greasing a shaft bearing fitted with plain bearings, continue to pump grease into the housing until the old grease can be seen oozing out.

When greasing the bottom bearing of the agitator shaft of a spinner type distributor, use a good quality light grease which does not oxidise and become hard, because although there may appear to be plenty of grease, it may in fact not be in contact with the moving surfaces of the bearing.

The position of the arc of spread of spinner types can be adjusted by altering the position of the cut-off plate. Under certain conditions, such as hillside work, the careful adjustment of this control can make a big difference to the evenness of the distribution achieved.

—C. G. WRAGGE, Agricultural Engineer.

Water Penetration.—Study of water penetration in the heavy clay soils of the Burdekin River area has been a feature of the work conducted at Millaroo Regional Experiment Station for the past few years.

The heavy soils of the Burdekin range in type from massive clays to sandy clay loams, and generally contain undesirable amounts of the element sodium. The occurrence of sodium is associated with intractibility of the clay, and water penetration in these soils is very slow. Prolonged water-logging occurs on these soils after heavy rain or flood irrigation, and this condition greatly hinders the establishment of most crops and pasture species.

Methods of improving rate of water penetration have been investigated on the heavy soils of the Burdekin. Soil conditioners, designed to promote crumb structure, are useful in some cases, but are too expensive for large areas. Gypsum is a soil ameliorant, and large quantities of this substance may gradually improve structure. At Millaroo Station, gypsum has been broadcast on the heavy soils at rates up to 10 tons to the acre, in conjunction with deep ploughing practices. Due to the slow-acting effect of gypsum applied in this way, such trials require several years of observation. Cropping may help to renovate poor soil structure and the effect of grasses in this regard is well recognised.

Recent work carried out on the heavy soils of the Riverina district in New South Wales, has shown that water penetration can be greatly improved by using water containing a small amount of dissolved gypsum.

Preliminary work has indicated that similar results are possible with the heavy soils of the Burdekin. In one small scale trial, the pene-

tration rate of water with dissolved gypsum was up to four times that of ordinary irrigation water. These investigations are being continued to probe the implications of increased water penetration and its relation to crop growth. If successful, this work could lead to greatly improved ease of handling of the heavy Burdekin soils for the establishment of suitable crops.

—R. L. HARTY, Agronomist.

Roadside Plots Spread Pastures.—Roadside plots of buffel grass appearing unexpectedly in scattered parts of south-western Queensland are the result of a deliberate Agriculture Department plan. They did not get there by chance.

The Minister for Agriculture and Stock (Hon. O. O. Madsen, M.L.A.) said most of the plots had been planted by Mr. R. G. Wilson, Adviser in Agriculture in the Department. Mr. Wilson is specialising in pasture establishment work throughout the Toowoomba-Quilpie area.

Over the years, Mr. Wilson has made a practice of sowing small plots of buffel grass on suitable roadside sites. When he passes that way again, months or even a year later, he can look at the planting and observe the success of establishment and rate of spread.

Mr. Wilson is secure in the knowledge that buffel grass can only improve the country it is sown in. It can never become a pest.

On a recent 600-mile inspection tour from Charleville to Windorah and south to Bromaga, Mr. Wilson planted roadside observation plots at a number of likely sites. He planted six different buffel grass strains, all treated with an ant deterrent. The planting sites were largely protected—grids, fallen mulga branches, under mail boxes and signposts, moister river and creek crossings and sand dunes.

Mr. Madsen said these roadside plantings are an economical means of gauging the suitability of the various buffel grass strains in remote and widely separated districts. A few pounds of seed sown in these small plots over long distances of road can give a pretty clear picture of the range of buffel grass in the west.

He said it would be recalled that Mr. Wilson has also been active in establishing "hobby" plots on properties of interested graziers. These are small plots in which a variety of grasses are planted both with and without fertilizer. These plots are showing that buffel grass, green panic, blue panic and Rhodes grass have a place on various soil types on the western Downs and in south-western Queensland. The fact that many graziers are already expanding hobby plots into larger plantings is proof of their value.

Roadside plantings, he said, could be pointers to soil types that would merit a more thorough study of pasture species in hobby plots.

Tips on Buying Used Tractors.—Buying a used tractor? Now that's often the way to get an auxiliary power plant cheaply or to pick up a model that would have a special and useful place on your farm. But buying a used tractor can be a highly tricky business unless you're awake to all the pitfalls.

Many of the pitfalls are obvious, and avoiding them is just commonsense. But sometimes, experienced tractor buyers are taken in—and most farmers aren't experienced tractor buyers.

The inspection of a used tractor that interests you should proceed along these lines:

First, see how closely the unit corresponds to its original condition. If the various gauges and headlights have been replaced, make sure that the replacements can do the job efficiently. Try to discover the reason for the replacements and decide whether the original trouble is likely to recur. Then examine the visible moving parts. These include the king-pins, tie-rod ends, fan, steering box, tyres and the front and rear axle bearings. Even if only one of these vital parts has to be repaired, the cost of repairs is a figure to be deducted from the value of the unit. The next thing to inspect is the engine. Start the motor and check the oil pressure and the electrical system. After a warm-up period of three or four minutes, check the exhaust for indications of excessive oil burning.

Before looking at the transmission, examine the clutch to find out whether it has sufficient life left in it to do a good job for you. Testing the clutch is simple—just carry out normal gear changing, and listen for undue clashing of the gears. Without going to the expense of stripping the unit, you can test the condition of the transmission by ear.

If you hear peculiar noises, the chances are that the bearings or gears are badly worn or the gears are chipped. A whining sound indicates wear and a grating noise warns you of chipped gears. Cracked or welded transmission housings should be treated with the utmost caution. Misalignment of the shafts is a common fault after a welding job.

—C. G. WRAGGE, Agricultural Engineer.

Soils for Irrigation.—Where a choice is possible, selection of the most suitable soil type for irrigation allows the farmer to make the most efficient use of irrigation water. The water soakage and water holding capacity of a soil to be irrigated should be studied, and irrigation adjusted to suit each particular soil type.

A soil type's first requirement for irrigation is its ability to absorb water. It must be capable of absorbing water freely to the root zone of the crops. Clay soils absorb water slowly. These are said to have a low soakage rate, and difficulty in wetting the soil is often a problem. Small flows continued for a long time are necessary to wet the soil to the root zone.

Sandy soils have a high soakage rate and the water penetrates deeply. These require light applications at frequent intervals because heavy flows will soak beyond the root zone and the water is lost to the plants. An ideal soil for irrigation is a loam or medium clay loam. These soils not only absorb water freely, but also have the capacity to retain a great deal of it.

When a soil can retain no more moisture it is at field capacity. But all this water is not available to the plants. The capacity of a soil to hold water for plant growth may be illustrated in a simple if not exact way by placing a sponge in water. The water held by the sponge after the free water has drained away represents the field capacity. When the sponge is squeezed, the available water is removed. But some water is still retained by the sponge, and in a soil this represents the unavailable water. Wilting point is reached when only the unavailable water remains in the soil.

Clay loam and clay soils have a high field capacity, about 40 per cent., and a high wilting point, about 20 per cent. The available water in such a soil may then be in the region of 20 per cent. Sandy or sandy loam soils, on the other hand, have a field capacity of 12 to 15 per cent. and a wilting point of 5 to 8 per cent. The available moisture, therefore, is only 7 to 9 per cent. The advantage of irrigating soils that hold a large amount of water for plant use is clear. Fewer applications are needed for high efficiency.

—A. NAGLE, Irrigationist.

Control of Johnson Grass.—Once we've had some rain, Johnson grass will be showing through —on many Queensland farms.

The best time to spray is when Johnson grass has 7 leaves and is about 1 ft. high.

The best chemical to use is Dalapon and three sprayings a week to a fortnight apart of 5 lb. to the acre are better than one spraying of 15 lb. Use 100 gal. of water to the acre for each spraying.

There are practical difficulties in putting on 3 sprays and work is in progress with other chemical mixtures to try to reduce the treatment to one spraying. We'll know more about this next summer.

Whatever you use, don't expect to get rid of Johnson grass in one season. You're always likely to get some regrowth from the roots, and seedlings will keep coming up unless you put the ground under pasture.

—H. KLEINSCHMIDT, Botanist.

Row Direction and Blue Mould.—Field survey work has shown that row direction has an important bearing on the severity of blue mould in tobacco. During the 1958 and 1959 seasons, plantings in an east-west direction suffered an average of 36 per cent. more leaf mould than plantings in a north-south direction.

In the 1958 season, plantings in an east-west direction suffered 56 per cent. more stem mould infection than plantings in a north-south direction.

Of all the farms that showed stem mould in the 1959 season, two-thirds were planted in an east-west direction.

Of course it is not practical at times to plant tobacco in a north-south direction. But, wherever possible this row direction should be adopted to reduce blue mould losses.

—I. K. HUGHES, Plant Pathologist.

New Cheese Types For Queensland

By T. A. MORRIS, Dairy Technologist.

The manufacture of Continental types of cheese in Queensland will most probably be expanded considerably within the next four years. Investigations carried out during a recent study-tour of England, Denmark, Holland and France showed that the manufacture in Queensland of a number of these cheeses would be technically possible.

A detailed study was made of the characteristics of some non-cheddar varieties of cheese and of the manufacturing methods used in their production. While it was not always considered that the cheese variety being studied would be suitable to Queensland in its normal form it was thought that some adaptation of such cheese could be of advantage.

The varieties of cheese which were studied included the following:

Variety Name	Country of Manufacture	Main Characteristics
Cheshire ..	England ..	High acid taste, mild cheese flavour, moderately firm but crumbly, creamy white in colour, "loose" in texture
Stilton ..	England ..	Strong aroma but rich and mellow flavour. Fairly soft body, open texture, creamy grey colour veined with blue-green mould (Plate 2)
Samsoe Group	Denmark ..	Mild and aromatic flavour. Fairly firm waxy body, very smooth and completely close in texture except for a number of round uniform holes. Light yellow colour (Plate 3)
Samsoe Group with Carroway seed	Denmark ..	The same mild cheese flavour with the spicy flavour of Carroway seed. Holes are much more numerous and more irregular. The black seeds appear throughout the cheese
Maribo ..	Denmark ..	Mild, slightly acid, aromatic flavour. Fairly firm, slightly short body. Numerous small and rather irregular holes. Light yellow colour
Havarti ..	Denmark ..	Moderate, piquant and slightly proteinaceous flavour. Moderately firm to soft body. Numerous irregular holes. Yellow colour (Plate 1)
Danish Blue ..	Denmark ..	Mild aroma, clean sharp and piquant flavour. Soft body. Smooth texture with irregular openings permeated by blue-green mould, against a white background (Plate 4)
Gouda ..	Holland ..	Sweetish, mild and aromatic flavour. Fairly firm, waxy body. Smooth, close texture except for a small number of round holes. Light yellow colour (Plate 5)
Edam and Broodkaas	Holland ..	Similar to Gouda but slightly more dry and firm (Plate 6)
Antibiotic Gouda	Holland ..	Gouda cheese made using nisin producing cheese starters

Variety Name	Country of Manufacture	Main Characteristics
Friesian and Leiden	Holland ..	Mild, slightly acid flavour with the addition of the taste of cloves in the case of Friesian and cumin seed in the case of Leiden cheese. Fairly hard body, numerous irregular openings.Straw coloured (Plate 7)
Saint Paulin ..	France ..	Mild, aromatic and very slightly proteinaceous flavour. Soft pliable body. Close texture except for a few round holes. Yellow colour
Camembert and Brie	France ..	Moderate sweetish, aromatic flavour. Soft mellow body. Completely close texture. Yellow colour (Plate 8)
Carre de Lest	France ..	Similar to Camembert but slightly more mild in flavour (Plate 9)

Suitability for Queensland

There does not appear to be any technical reason why most, if not all, of the varieties of cheese studied could not be manufactured in Queensland. However, the successful marketing of some rather perishable varieties such as the mould-ripened cheese (for example Brie, Camembert and Carre de Lest of France, Danish Blue of Denmark and Stilton of England) would be difficult unless more widespread use of refrigerated transport was possible.

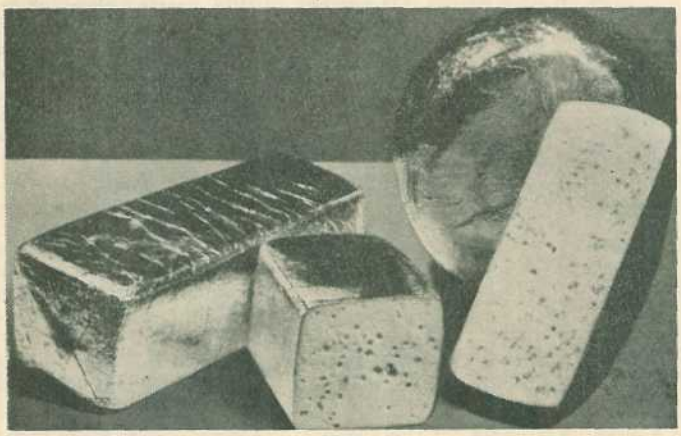


Plate 1
Danish Havarti Cheese Wrapped in Aluminium Foil.

A period of experimentation to adapt the methods employed in the countries visited to conditions within the Queensland industry would no doubt be necessary before any one variety could be fully commercialised in this country.

A further slight hindrance to rapid commercialisation of these non-cheddar varieties of cheese would be the necessity to train local cheesemakers in the manufacturing techniques necessary.

However, it is felt that a skilled cheesemaker, given the proper technological guidance, could soon adapt himself to the differing techniques required to produce cheese of different types.

The length of time required to develop the manufacture of the different types could be expected to vary according to the degree of similarity to cheddar cheese, with which Queensland cheesemakers are very familiar and in the manufacture of which many have acquired a high degree of skill.

Thus it could be expected that a variety such as Cheshire could be produced to a satisfactory standard of quality in a short time.

On the other hand, the adaptation of the process of manufacture for Stilton or Danish Blue cheese could be expected to take a longer time because of the vastly different manufacturing methods involved.

It is not considered that an exact replica of all of the varieties of cheese studied could be produced in commercial quantities in Queensland within the space of a few years. The acquiring of skill in dealing with possible variations in local conditions not experienced in the country of origin of a variety of cheese is something which requires considerable time. However, it is not felt that the production of an exact copy is necessary or desirable in the case of every variety of cheese. The development of commercialised manufacture to a satisfactory standard of quality, without strict adherence to the exact properties of the original variety, could be expected to be achieved in a reasonable time.

Plate 2
English Stilton Cheese Maturing on the Shelves of a Ripening Room.

It is felt that the first need is to supply the local market with a greater variety of cheese, thereby ensuring an appeal to as wide a range of tastes as possible. To do this it is not so necessary to reproduce other known varieties but rather is it necessary to ensure that the varieties produced are sufficiently different among themselves to ensure that each has an appeal in its own right.

It will be in the attaining and control of differences between differently named cheeses that the study of the manufacturing methods of specific varieties will prove of most value. That is, a manufacturing method should be considered as a means of attaining a certain desired end and not as an end unto itself.

The foregoing implies that the naming of any new variety of cheese may differ from that on which it is patterned. In some cases this may be an advantage rather than otherwise; for example, if the original variety is not one which is well known by name within this country or if the original variety may sell in free competition with the developed variety without a marked price difference. In the latter case what may be called the "genuine" article has a definite advantage and may be sold to the exclusion of the developed variety. If the developed variety has an appeal in its own right without being merely an attempt to duplicate the original type it has a greater chance of attracting new consumers.

This does not eliminate the need for some manufacture of certain "name" varieties and indeed some production of fairly well-known cheese such as "Gouda" and "Edam", is considered desirable, especially if such production is required to fill a gap in imports or if the local product can be marketed, at a price which is highly competitive with that of the "genuine" cheese. The obvious advantage of the manufacture of a known variety is that its marketing can

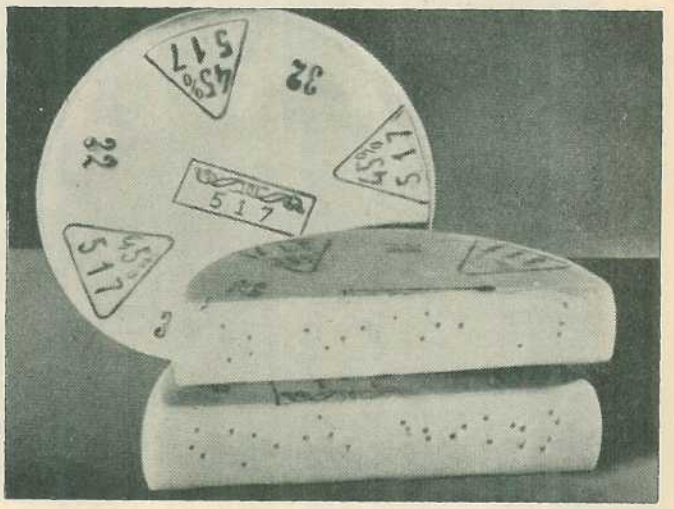


Plate 3
Danish Samsoe Cheese.

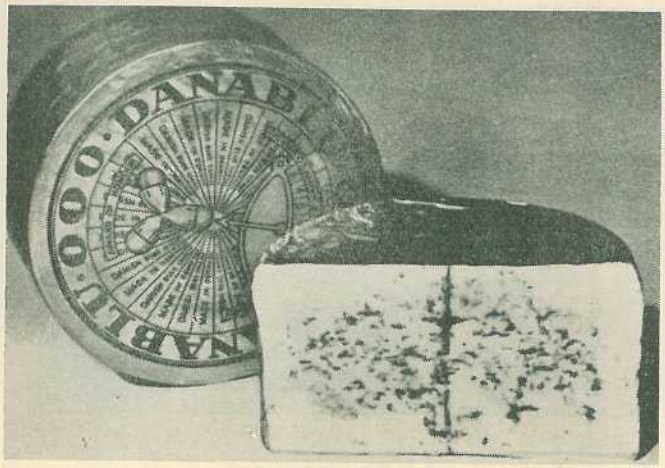


Plate 4
Danish Blue Cheese.

be carried out without the same need for intensive efforts to make the product familiar to cheese consumers.

Stages in Development

Bearing all these factors in mind it would therefore seem that a fairly logical procedure for the development of commercial production of non-cheddar varieties of cheese in Queensland would be as follows:

1. The improvement of techniques and an expansion of the manufacture of Edam, Loaf Edam and Gouda cheese which is already proceeding on a small scale as a result of previous experimental work.
2. The continuance and the intensifying of experimental cheesemaking previously begun with the intention of developing a distinctive product especially adapted to local conditions but based on hard Dutch and Danish cheese varieties and employing various additives such as spices or "smoke essence" to give as wide a range of flavours as possible.
3. The further development of methods for the production of high acid cheese of the cheddar or Cheshire type employing a stirred curd technique.
4. The carrying out of research and experimental work to develop a suitable type of blue mould cheese for manufacture and marketing under Queensland conditions.
5. The development of methods of manufacture for the production of lactic type soft cheese for city areas.
6. The development of the manufacture of soft mould ripened types of cheese for city areas.

Plate 5
Packing Gouda Cheese in a Large Dutch Cheese Store.

Plate 6
Edam Cheese on Shelves in a Curing Room.

Stage 1. While the manufacture of small quantities of Edam and Gouda cheese has been carried out fairly successfully in previous work, much has been learned in regard to how the quality of this cheese may be improved and how manufacturing methods may be placed on a commercial basis. No major changes in existing factory equipment appear to be necessary but some small special pieces of equipment would be required and a cheese brining room would have to be added to factory buildings. Some provision of specially shaped shelving is also needed for Edam cheese.

One major difficulty in the past has been the obtaining of a supply of the characteristically shaped moulds for forming the cheese. However, it was found that plastic moulds are now being produced in Holland at a much lower cost than the traditional wooden moulds and it is thought that a number of such forms could be imported or else manufactured within Australia.

Stage 2. The production of a low acid, rindless cheese, with excellent slicing properties and a distinctive flavour, which could be very useful for the cafe and sandwich bar trade—as well as for ordinary household purposes—has been the object of experimental manufacturing previously carried out. With the experience gained in Denmark and Holland it should now be possible to carry this work much further.

Since the trade which is being specially catered for demands a low-cost cheese, it is expected that the use of partly skimmed milk will be to advantage. (Much cheese in Denmark and Holland is produced with only 40 to 45 per cent. fat in the dry matter.) It is thought that as a further advantage the one basic curd-type could be used to produce cheese of different flavours by the addition of smoke essence or spices such as cloves and carroway seed.

Stage 3. The popularity of high acid cheese of the cheddar type can be expected to continue and the provision of some greater range within this type is warranted. The rather time-consuming and laborious nature of the traditional cheddar (and Cheshire) processes necessitates a consideration of the use of methods capable of being highly mechanised. It is suggested that the "stirred curd" type of cheese previously produced in Queensland, could be developed to supply the need in regard to this class of cheese.

The possibility of producing cheese of this type suitable for exporting to the United Kingdom should not be completely discounted, especially if more economic manufacturing methods than the traditional ones can be developed.

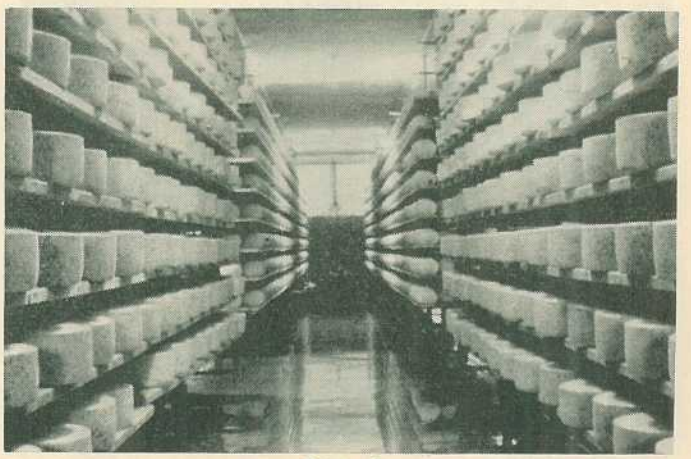


Plate 7
Friesian Cheese Showing the Black Spotting Due to the Addition of Cloves.

Stage 4. The sales of cheese of the blue-mould type forms a fairly considerable portion of the total sales of non-cheddar cheese in Queensland and consideration should therefore be given to the possibilities of local production.

However, many more changes in cheese factory buildings and equipment would be necessary for the production of a blue mould cheese than for the production of the types concerned in the previous three stages. It is commonly found essential for the manufacture of this type of cheese to be isolated from other cheesemaking operations in order to have better control over the mould growth. Special salting and curing rooms are also necessary since a very high humidity has to be maintained at least until the cheese is 6 to 8 weeks old.

Before any company could be expected to undertake the expense involved in such major additions to its cheese factory it would be necessary to ensure that a blue mould cheese of a suitable type for Queensland could be produced. I feel that some experimental work to first find a means of combining the best features of Danish Blue and Stilton cheese would be very worthwhile even though it is felt that cheese similar to Danish Blue could be fairly readily produced, given the proper facilities.

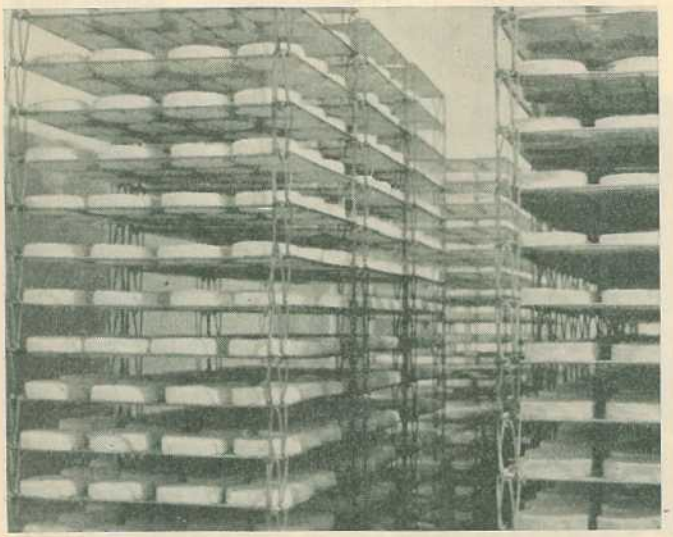


Plate 8

Brie Cheese on Rustless Metal Racks in a Cheese Curing Room in France.

Stage 5. The production of cottage cheese has been carried on in Brisbane for some years and for the present there does not appear to be much scope for the expansion of this trade in soft unripened cheese by the introduction of new types. However, one popular type of cheese noted in England and known locally as St. Ivel cheese could have future possibilities in city areas. This cheese is basically a mixture of a *Lacto-bacillus bulgaricus* curd with minced mature cheddar cheese.

Stage 6. This rather distant stage would involve the manufacture of cheese of the Camembert, Brie and Carre de Lest type. In this group the Carre de Lest type may eventually be most suitable as its manufacture is based on the use of pasteurised milk.

Stages 1, 2 and 3 could be carried on concurrently and are regarded as worthy of equal priority. Stage 4 involves a fairly long-term operation and could not be considered as offering any quick results. It is felt however, that it forms an important part of the overall programme of development, and should receive attention just as soon as the first three stages are carried to a satisfactory degree of completion.

Stage 5 involves the manufacture of soft rather perishable cheese suited only for production close to the region of consumption. To gain sufficient sales to make production economical, the location of manufacture would need to be close to a large city such as Brisbane. The present limited possibilities for the significant production of cheese of this type necessitates giving a rather low priority to this stage.

Similarly Stage 6 offers very limited possibilities and for the present can only be regarded as a provision for possible future changes in eating habits and increases in urban population.

Rationalised Production and Advertising

In the conducting of such a programme for the development of the commercial manufacture of non-cheddar varieties of cheese one important fact which should be borne in mind is the need to maintain rationalised production of the different varieties. It would be rather pointless

for a number of factories to be each producing a small quantity of the same variety of cheese, just as it would be inconvenient and uneconomical for each factory to be producing a small quantity of a number of different varieties.

The most economical pattern for development would therefore seem to involve the confining of the manufacture of each variety of cheese to one or two particular factories and the limitation of the number of varieties produced at any one factory. The most desirable means of achieving this would be by voluntary co-operation on the part of the factories. If this most satisfactory state of affairs could not be attained then production could be rationalised by Government regulation and the issue of special cheese manufacturing licences for the production of varieties of cheese.

Plate 9

A French Dairy Technologist Tends Ripening Carre de Lest Cheese.

If any programme for the development of the production and marketing of new varieties of cheese is to succeed it must be conducted concurrently with a campaign of advertising and publicity designed to bring the availability of the new types of cheese to the notice of the public. It is considered rather pointless to produce a wider selection of varieties of cheese if the public are not to be adequately informed in regard to what cheeses are being made available and what the special attractions of those cheeses are.

The growth of awareness of new types of cheese is very slow if it is left to the chance interest of the buying public, and under these circumstances the rapid development of production must result in a quantity of cheese being stored much longer than is desirable with poorer quality and higher costs as a possible consequence.

Increased Consumption

It is natural to expect people to tire of a foodstuff when it is served repeatedly without any variation. The production of a greater variety of cheese in Queensland would allow a change to be obtained readily whenever a consumer desired it. An appeal would be ensured to a wider range of tastes than is achieved by presenting only Cheddar cheese.

These factors would combine to promote a greater consumption of home-produced cheese, with a resultant benefit to the cheese industry, not only in this State but in the whole of Australia.

This Age of Oil

The history of the oil industry in Australia and the part which it has played in the development of this country are traced in a handsome, lavishly illustrated book, "This Age of Oil". A chapter on farm machinery says: "If the Industrial Revolution was based on coal, the agricultural revolution is based on oil. Petroleum, an indispensable ally in almost every phase of food production, must play an increasingly important part not only as the source of fuels and lubricants but also as the base material for the manufacture of fertilizers, pesticides, weed-killers and other products."

stock and station

Culling Your Breeders.—Let's suppose that you have decided which cows will comprise your breeding herd. From then on the number one yardstick as to whether they stay in the herd should be the regularity with which the individual cows produce calves.

I can well imagine you saying, "But what about quality and conformation of the calves and the ability to grow quickly? Surely, they're important," you say.

I agree, they *are* important. You'll agree, too, I'm sure, that you must have a calf before you can have any of those things. So I repeat, look for a calf a year from your cows; and of course, you'll cull any really poor type heifers before they have the chance to enter the breeding herd.

You can't afford to cull for many points in your breeding herd; when the shy breeders have been taken out you will probably find you have reached the culling limit for the year.

That is not to say that you can't do anything about selection for growth rate and conformation. You do this in the selection of herd bulls; and of course you can improve faster by selection for these characteristics in bulls rather than in cows.

To sum it up, concentrate selection on regular calf production in the cows, and on desirable beef characteristics in the bulls.

—J. G. YOUNG, Senior Husbandry Officer.

Salt Poisoning of Sheep.—Many bore and subbore waters contain salt and other minerals which become concentrated when evaporation takes place. In a classical case of salt poisoning of sheep, analysis showed 1,650 grains of salt per gallon of water in the trough, this was about four times as high as the salt content of the water in the delivery pipe (420 grains per gallon).

If gradually conditioned to it, sheep can take 600 grains of salt per gallon or higher. Care is necessary where sheep not used to it are put on waters high in salt content. Sheep tend to drink more of water containing salts such as sodium or magnesium chloride than of salt-free water. This tendency is aggravated under hot summer conditions. Where magnesium chloride content is high sheep eat less than normally. Over 200 grains per gallon of calcium or magnesium chlorides or sulphates in water can cause death. Over 150 grains can cause scouring. Care should be taken with any waters for sheep with over 1,000 grains of total soluble solids to the gallon.

If you have a new bore or are doubtful about the safety of mineral contents in existing bores, call your nearest Sheep and Wool Adviser to obtain samples for analysis.

Where existing waters are mainly salty, provision of alternate surface water may make considerable improvements in the economic returns yielded by the flock.

—R. B. YOUNG, Senior Adviser, Sheep and Wool.

Promise in Supplements for Beef Cattle.—Supplementary feeding trials during the last two years have given valuable leads on suitable methods and materials for use with beef cattle. This information can be used to advantage when such a form of feeding is undertaken.

A small quantity of protein-rich food allows the animal to make better use of dry, standing pasture. The high quality feed also maintains the animal's appetite. In this way the extra food provided is added to the value of the standing grass. The supplement is not used merely to replace some of the grass the animal would otherwise have eaten. This is the whole idea behind supplementary feeding.

On central coast and central highlands properties, trial groups of cattle have responded very well to supplementary feeding in the winter. These cattle were given a little lucerne hay or cottonseed meal to supplement standing, mature grass when its food value was low and it was unpalatable. At the end of the feeding period, cattle fed the supplement were 70 lb. a head heavier than those fed pasture alone. However, the unsupplemented stock made up some of the leeway in the following summer.

In the trials, the stock were fed twice a week. Where lucerne hay was used as the supplement it was fed at 3 lb. a head a day, which is roughly equal to one ton a week for 100 head. On properties that used cottonseed meal, this supplement was fed twice a week at 1 lb. a head a day.

Although different properties were involved, the response to lucerne hay and cottonseed meal at the rates fed was roughly the same. At these rates, the supplement provided about ½ lb. of digestible protein a day for each animal.

There seems no reason why other protein-rich foods supplying ½ lb. of digestible protein a day should not give results of equal value.

Lucerne hay is the easiest supplement to feed equitably to stock. This is because it is bulky and can be spread over the ground. Meals have to be placed in troughs. Because cattle can eat meals quickly, there must be sufficient trough space for all the animals to eat at once.

—D. N. SUTHERLAND, Director of Cattle Husbandry.

Arsenical Poisoning in Cattle.—Banana plantations often turn out to be death traps for cattle. This is because the stock, usually house cows and their calves, are constantly getting into banana patches where the weeds have been sprayed with arsenical weedkillers.

Every summer brings its quota of reports from banana growers who have lost cattle from this cause. Arsenical weedkillers are cheap and effective in keeping down weeds in banana plantations, and can be expected to remain in use for a long time yet.

The best safeguard against losses from arsenical poisoning is a secure fence around banana patches likely to be sprayed. Until internal fencing is completely overhauled, farmers combining dairying with banana growing should always be prepared for odd cases of arsenical poisoning among their cattle. The salty flavour of arsenic makes weeds and grass sprayed with the poison palatable to stock. For an emergency, a supply of photographic hypo (sodium thiosulphate) should always be kept on hand.

The sooner poisoned animals are treated the greater their chance of recovery. Immediately you find a beast suffering from arsenical poisoning, drench it with 2 oz. of photographic hypo dissolved in 1 pint of water. Continue drenching at intervals of four hours for two days. If the beast has not commenced to feed at the end of the second day, continue drenching for another day. If the poisoning effect continues, the animal may not feel inclined to eat for some time. In this case, dose three times a day with 1 gal. of milk in which 3 lb. of sugar have been dissolved.

A veterinary surgeon should be called at the first sign of arsenical poisoning and he has drugs and skill at his command which will increase the chance of recovery. It is most important, however, that any treatment must be commenced at the earliest possible moment.

—K. M. GRANT, Assistant Director of Veterinary Services.

Avoid Using Crossbred Boars.—Use of crossbred boars in the piggery is unwise. On occasions there are good reasons for using crossbred sows, but crossbred boars will eventually produce a wide diversity of types.

Most farmers are aware that hybrid vigour in crossbred pigs generally leads to faster growth. Taking this a stage further, the progeny of matings between a purebred boar and crossbred sows would retain the advantages of crossbred vigour and yet be reasonably uniform in type.

But if you use a crossbred boar you are likely to fill your piggery with a number of different types of pigs. Then you will have all the complications arising from a multiplicity of breeds.

Where one or two breeds only are involved, the pigs in a litter are usually sufficiently uniform to go forward to market about the same time. Where a crossbred boar is used, especially over crossbred sows, there is little uniformity in the

litters. It is even likely that you will be marketing porkers and light, medium and heavy baconers from the same litter at the one time. This multiplicity of types gives the farmer a lot of extra bother in yarding and sorting them to keep all those of one type and size together.

Farmers who take pride in breeding an even line of baconers cannot do this successfully when they have a crossbred sire. If you want to develop a good type of pig, the easiest and quickest way is to use a first-class purebred boar. Purebred sires are the result of a planned breeding programme, not chance matings. If you buy your boar from a reputable stud, you can be reasonably sure that he will bring a measure of uniformity and correct type into your herd. At all costs, resist the temptation to buy crossbred boars at apparent bargain prices.

—F. BOSTOCK, Senior Husbandry Officer, Pig Branch.

Breeding Your Own Pigs.—Costs of pig production are influenced greatly by the number of pigs reared to pork or bacon weights from a litter. Those of you who breed your own pigs can improve results considerably by observing a few simple rules.

For a start, you should keep only those sows which farrow and rear large litters of healthy pigs. Sow upkeep is much the same for one with 10 pigs as for a sow with only six or seven, but the cost per weaner reared is lower in the larger litter.

Correct sow management, including mating at the right time, helps to keep up litter numbers.

Once the sow farrows your aim should be to keep losses of young pigs to a minimum. A warm, dry shed and access to clean pasture and a creep will give little pigs a chance to thrive, and avoid disease and parasites. Adequate feeding of the sow will also help.

By castrating early, and taking normal precautions on cleanliness, you should not have any losses or setbacks in the litter at this time.

Before they are eight weeks old, have the suckers eating the ration they will get as growers, and at weaning time take the sow away altogether.

Plan ahead to have ample feed on hand when you have pigs to finish as porkers or baconers.

Normal precautions against disease and parasites, together with good housing and adequate feeding after weaning, will ensure that you put a finish to a job begun well.

—T. ABELL, Senior Adviser, Pig Branch.

Test Pigs Show Promise.—An encouraging report has been made on the first four teams of pigs tested at the Agriculture Department's new Rocklea Pig Testing Station. Average daily weight gains, times to reach slaughter weight, and carcass appraisal reached a very high standard. The station has vacancies for test pigs and applications are invited from studmasters.

Three stud breeders are at present having their stock tested. Several others have applied to have their boars tested later, but there is room for more.

Results of the first four teams of pigs slaughtered were: Average food conversion 2·79 lb. (certification standard 3·5 lb.); average daily gain 1·55 lb. (1·35 lb.); average number of days to complete the test 100 (115); and average carcass appraisal 71·7 per cent. (70 per cent.).

Mr. Clay said the aim of pig testing is to help stud breeders in selection for herd improvement. Test results are a measure of the pigs' utility value, and this measurement can be compared with international standards. Pig testing has been centralised at the Rocklea station to even out differences in environment at the various studs.

Standardisation of the feed mixture, management and environment (which involves providing year-round uniform temperature and humidity in a very variable climate) made construction of the special test centre essential. The pig testing station has been specially designed and well insulated and equipped to ensure control of the environment.

Feeding and management of test pigs under uniform conditions not only evens out the effect of different environments on the carcass: it also makes it possible to determine the comparative food requirements to make 1 lb. of liveweight gain in pigs of different breeding. In itself, this is an important indication of the worth of the animals tested.

Stud breeders wishing to have their stock tested should apply as quickly as possible. Application forms may be obtained from district Pig Branch advisers at the Brisbane, Beaudesert, Warwick, Murgon, Biloela and Atherton offices of the Department of Agriculture and Stock.

—A. L. CLAY, Director, Division of Animal Industry.

Spray To Eradicate Pig Lice

By D. B. HARRIS, Adviser, Pig Branch.

Why let pigs be tortured by the biggest of all lice that infest domestic animals? The remedy is simple, inexpensive and effective.

Pig lice are so common that they are often considered as one of the evils that must be endured. These sucking insect parasites, however, are so easily controlled that there is little excuse for letting pigs suffer from the constant irritation they cause, or for the owner to put up with the loss they occasion. The loss in heavily infested herds is considerable.

The lice feed frequently and puncture the skin in a different place at each feeding, and the affected animal will rub itself against posts or the side of the pen. Constant rubbing produces sores that do not heal because the lice congregate around the raw tissues and keep them irritated.

Lice eggs can be readily seen attached to the hair behind the ears, and along the underline. Adult lice move all over the animal's body but generally are found on the softer portions along the underline and the forequarters.

Sprays containing benzene hexachloride, readily obtainable, control and eradicate pig lice most effectively.

In treating pigs for lice the entire herd should be treated regardless of the number showing infestation. Spraying only those that appear infested will not eradicate lice, as any member of the herd may at any time carry the lice.

Regular sprayings at 10-day intervals will not only eradicate lice but also control mange, another hazard to pig producers.

Give the floors and walls of sleeping quarters a thorough wetting to kill any lice that have been dislodged from animals.

The use of sump oil sprays, while keeping lice and mange to a reduced level, will not eradicate the trouble. Thorough treatment with the spray mentioned is the most efficient method for control of these parasites.

Lucerne Tops Grazing Trial

Lucerne easily retained its crown as king of fodders in a 7-year trial just ended at the Agriculture Department's Biloela Regional Experiment Station. This long-term study has shown that irrigated lucerne will outyield irrigated grazing crops by almost two to one,

The Minister for Agriculture and Forestry (Hon. O. O. Madsen, M.L.A.) said the trial proved beyond doubt that in central Queensland and under irrigation lucerne was more rewarding than annual grazing crops. But under other conditions, annual grazing crops will still have an important part to play.

A report on the trial by Mr. G. H. Allen, Senior Agronomist, records that in the 7 years lucerne gave 59 grazings. The yield was 46 tons of hay to the acre. Annual fodder crops of oats and field peas in winter and cowpeas or mung beans with giant setaria in summer gave 40 grazings. The yield was 24 tons of hay to the acre.

Lucerne made the bulk of its growth in the summer. Its summer production of 4.6 tons of hay to the acre was double the winter yield. Summer and winter production from annual crops was much more even, at 1.9 tons an acre in summer and 1.6 tons in winter. It is well to remember that the land under annual crops was out of production for at least one-third of each year while it was being prepared for the following crop.

Throughout the 7 years of the trial, lucerne consistently contained 20 to 25 per cent. of protein with an average of 23 per cent. Annual crops range in protein from 9 to 25 per cent., with an average of 17 per cent.

Tuberculosis-Free Cattle Herds

(As at 1st September, 1960)

Aberdeen Angus

Crothers, G. H. & H. J., "Moorenbah", Dirranbandi
Elliott, A. G., "Ooraine", Dirranbandi
Mayne, W. H. C., "Gibraltar", Texas

A.I.S.

Cox, T. L. & L. M. J., Seafield Farm, Wallumbilla
Crookey, J., Arolla A.I.S. Stud, Fairview, Allora
Davis, W. D., "Wamba", Chinchilla
Dennis, L. R., Diamondvale A.I.S. Stud, Mundubbera
Edwards Bros., "Spring Valley" A.I.S. Stud, Kingaroy
Evans, E. G., Lauraven A.I.S. Stud, Maleny
Green, D. B., Deloraine A.I.S. Stud, Fairdale
Heading, C. A., "Wilga Plains", Maleny
Henry, Mrs. K., Greenmount
Henschell, W., "Yarranvale", Yarranlea
H. M. State Farm, Numinbah
Littleton, H. V., "Wongalea", Hillview, Crow's Nest
Marquardt, A. C. & C. R., "Cedar Valley", Wondai
McShane, A. H., Handford Road, Zillmere
Mears, G. S. & E., "Morden", M. S. 755 Toogoolawah
Moore, S. R., "Sunnyside", West Wooroolin
Neale, D. G., "Groveley", Greenmount
O'Sullivan, Con., "Navillus", Greenmount
Pinwill, A. A., Gaylands A.I.S. Stud, Gayndah
Power, M. F., "Barfield", Kapaldo
Messrs. Mitchell and Mulcahy, Rosenthal
Queensland Agricultural High School & College, Lawes
Radel, R. R. & Sons, "Happy Valley", Coalstoun Lakes
Roche, C. K., Freestone, Warwick
Sanderson, W. H., "Sunlit Farm," Mulgildie
Schloss, C. J., "Shady Glen", Rocky Ck., Yarraman
Scott, M. E. & E., "Wattlebrae" A.I.S. Stud, Kingaroy
Scott, W. & A. G., "Walena" A.I.S. Stud, Blackbutt
Shelton, R. A. & N. K., "Vuegon" A.I.S. Stud, Hivesville, Murgon
Estate Sokoll, A. H., "Sunny Crest", Wondai
Sperling, G., "Kooravale", Kooralgin, Cooyar
Sullivan Bros., "Valera", Pittsworth
Sullivan, D., "Bantry", Pittsworth
Sullivan, F. B., "Fermanagh", Pittsworth
Thompson, W. H., "Alfavale", Nanango
Webster, A. H., "Millievale", Sabine, via Oakey
Wieland, A. W., "Milhaven", A.I.S. Stud, Milford, via Boonah

Ayrshire

Dudgeon, C. E. R., Marionville Ayrshire Stud, Landsborough
Dunn, T. F., "Alanbank", Gleneagle
Goddard, B., Inverell, Mt. Tyson, via Oakey
Holmes, L., "Benbecula", Yarranlea
Mathie, E. & Son, "Ainslie", Maleny
Scott, J. N., "Auchen Eden", Camp Mountain
Zerner, G. F. H., "Pineville", Pie Creek, Box 5, Post Office, Gympie

Friesian

Behrendorff, E. C., Inavale Friesian Stud, M.S. 786, Boonah
Macdonald, S. E. G., "Freshfields", Marburg
Naumann, C. H., "Yarrabine", Yarraman
Pender, D. J., Lytton Road, Lindum
Stumer, A. O., Brigalow, Boonah

Guernsey

Doss, W. H., Degilbo, via Biggenden
Fletcher, A. B., "Cossart Vale", Boonah
Holmes, C. D. (owner Holmes L. L.), "Springview", Yarraman
Johnson, G. L., "Old Cannindah", Monto
Miller, G., "Armagh Guernsey Stud", Armagh, M.S. 428, Grantham
Ruge, A. & Sons, "Woowoonga", via Biggenden
Scott, C., "Coralgrae", Din Din Rd., Nanango
Swendson, A. C., Coolabunia, Box 26, Kingaroy
Wissemann, R. J., "Robnea", Headington Hill, Clifton

Jersey

Beckingham, C., Trout's Rd., Everton Park
Birt, W. C. M., Pine Hill Jersey Stud, Gundiah
Borchert, Mrs. I. L. M., "Willowbank" Jersey Stud, Kingaroy
Burrows, R. N., Box 23, Wondai
Bygrave, P. J. L., The Craigan Farm, Aspley
Carpenter, J. W., Flagstone Ck., Helidon
Conochie, W. S. & Sons, "Brookland", Sherwood Rd., Sherwood
Crawford, R. J., Inverlaw, Kingaroy
Farm Home For Boys, Westbrook
Fowler, P. & Sons, "Northlea", Coalstoun Lakes
Harley, G., "Hopewell", M.S. 189, Kingaroy
H.M. State Farm, Palen Creek
Hutton, D. R., "Bellgrath", Cunningham, via Warwick
Johnson, H. G., Windsor Jersey Stud, Beaudesert
Lau, J. F., "Rosallen", Goombungee, Toowoomba
Matthews, E. A., "Yarradale", Yarraman
McCarthy, J. S., "Glen Erin", Greenmount, Toowoomba
Meier, L. E., "Ardath Stud", Boonah
Noone, A. M. & L. J., "Winbirra", Mt. Esk Pocket
Porter, F., Conondale
Q.A.H.S. & College, Lawes
Ralph, G. H., "Ryecome", Ravensbourne
Scott, Est. J. A., "Kiaora", Manumbar Rd., Nanango
Semgreen, A. L., "Tecoma", Coolabunia
Seymour, B. T., "Upwell" Jersey Stud, Mulgildie
Smith, J. A. & E. E., "Heatherlea" Jersey Stud, Chinchilla
Tatnell, W. T., Cedar Pocket, via Gympie
Toowoomba Mental Hospital, Willowburn
Verrall, F. W., "Coleburn", Walloon
Weldon Brothers, "Gleneden" Jersey Stud, Upper Yarraman

Poll Hereford

Anderson, J. H. & Sons, "Inverary", Yandilla
Hill, W. W., Mathalla
Hutton, D. R. & M. E., "Bellgrath", Cunningham, via Warwick
Maller, W., "Bore View", Pickanjinnie
Maller, W., "Bore View", Gowrie Junction
McCamley, E. W. G., "Eulogie Park", Dululu
Wilson & McDouall, Calliope Station, Calliope

Poll Shorthorn

Leonard, W. & Sons, Welltown, Goondiwindi
Yamburgan Pastoral Company, Noondoo

bucket and bail

Correct Belt Tension.—Slack engine belts can be responsible for variations in cream tests and for lowering cream quality.

The engine belt drives the vacuum pump, pulsators, separator and, in some cases, a skim-milk pump or a home lighting generator.

A loose belt will slip when the full load is applied at milking time and this will reduce the rate of milking and the speed of the separator.

Slow separator speeds reduce the test and the quality of the cream because cream deteriorates more rapidly as the test is reduced.

If separating is still in progress when milking is finished, the separator speed increases because the belt ceases to slip when the load of the vacuum pump and pulsators is removed. This increase in speed will again bring about a variation in test and may affect the quality of the cream.

Flat leather belts are better than canvas-rubber composition belts because they do not vary so much in length with weather changes. Flat belts should be fairly long and, when in motion, the upper half of the belt should be the slack portion and should have sufficient slack to allow the centre to be moved up and down about one inch. V belts should grip the sides of the pulley V and should not touch the bottom of it. "Brammer" belting must travel in the correct direction. The outside end of each segment points in the direction of travel.

You can avoid variations in cream tests and cream quality as well as improving the overall efficiency of your milking machines by regularly adjusting the tension of the belts.

—R. R. FANNING, Dairy Officer.

Champion Keeps Going.—Champion A.I.S. cow at the 1957 R.N.A. Exhibition has been admitted to the Elite section of the Register of Merit for dairy cows. She is Sunny View Thelma 39th, owned and bred by Messrs. J. Phillips and Sons, of Sunny View, Kingaroy. She is the ninth dairy cow in Queensland to qualify for the elite section.

Thelma's entry into the elite section of the register was announced by the Minister for Agriculture and Forestry (Hon. O. O. Madsen, M.L.A.). Until May, 1960, when three of the cows completing lactations qualified, no cows had been admitted to the elite section of the register for two years.

Mr. Madsen said Thelma had yielded 38·8 tons (86,943 lb.) of milk and 1·8 tons (4,056 lb.) of butterfat in five milking seasons. The average test of her milk was 4 per cent. of butterfat. Her butterfat yield is equivalent to 4,946 lb. or more than 88 boxes of commercial butter.

Thelma was born in July, 1953, and still has many years of production ahead of her. If she continues to produce at her present level, she could easily yield something in the region of 7,000 lb. of butterfat in her lifetime. It is certain that farmers will watch her future yields with interest.

Mr. Madsen said that a tenth cow had also been admitted to the elite section. She is Lauraven Mermaid, an 11-year-old A.I.S. cow who has produced 3,640 lb. of butterfat in nine lactations. She has yielded 95,999 lb. of milk with an average butterfat test of 3·8 per cent. Mermaid is owned by her breeder, Mr. E. G. Evans, of Maleny.

To qualify for entry into the elite section of the register, a cow must produce at least 3,600 lb. of butterfat in not more than 10 lactations.

Holidays.—The following item appeared in a popular primary producers' paper recently: "*A Change.*—This week at the seaside we met a number of families down from the country. We watched their children and the parents put on weight and take a new lease of life. It emphasised the importance of the holiday in the life of country dwellers, whether they are employers or employees. Surely there is nothing so refreshing to the average family as a holiday by the sea—so much so that everything possible should be done to make their holiday a regular yearly event."

This article stresses one of the advantages claimed by officers of the Department of Agriculture and Stock in respect to seasonal calving for dairy cows.

This practice not only allows the farmer and his family to have a yearly holiday at the seaside but also contributes towards the expenses. Calving all the herd in the months of the year most favourable for higher yields increases the production of the herd at no additional expense to the owner. Adopt seasonal calving and have an annual seaside holiday.

—S. E. PEGG, Chief Adviser, Herd Recording.

Tractor Testing In Australia—II

By G. H. VASEY,
Officer in Charge of Tractor Testing,
and W. F. BAILLIE,
Testing Officer, University of Melbourne.

Australian test procedures*, though differing in some details, and in some ways going further and telling more about the tractor, conform in essentials to overseas standards.

The tests are in four main parts:

(*a*) the physical properties of the tractor;

(*b*) the power of the engine, and its stationary outlets—the belt and the p.t.o.;

(*c*) the power on the drawbar when working on a formalised test surface or track;

(*d*) the reliability of the tractor when running under test, and its condition after the test.

1. PHYSICAL PROPERTIES

The first thing is the identification of the tractor, from engine number to weights and dimensions; checking the fuel pump delivery, analysing the fuel used in the tests. Among the dimensions, for example, are the ground clearance, length, width and height.

The position of the centre of gravity is found, turning circles are run and measured. P.t.o. speed and style are compared with international standards; so also is the linear speed of the belt.

The wheel equipment is examined, added ballast checked; the total weight and tyre pressures are checked against the weight recommended for use in the field.

If the tractor works through an automatic linkage that can continually support an implement while at work, a static test is run to decide what ballast may fairly be added to the (light weight) tractor, so as to represent in the test the weight transferred from the implement.

The seat and controls are tried for accessibility and comfort; the usefulness of the instruments is noted throughout the running of the tests.

The sum total of these critical observations, and the reporting of them are an important part of the treatment, since they represent those features of the tractor that the user is immediately concerned with. Most users are rightly more interested in these than in the power output, provided the power is enough.

But if the tractor is uncomfortable, noisy, hard to steer, awkward to handle, inconvenient in its controls, then the user of it has to put up with a lot of hardship all the time he is on it, even though it may do his work for him.

2. THE POWER UNIT

Since the modern tractor is in effect a mobile power plant, with a power unit—the engine—and several power outlets in the belt pulley, p.t.o., hydraulics and drawbar, it is important to know the performance of the engine itself, the source of power.

Though the power put out by any of the outlets must necessarily be less than the corresponding power of the engine, the performance

* The Tractor Testing Committee, which controls the Australian scheme, is a joint body established by agreement between the Commonwealth, the States, and the University of Melbourne; under this agreement, the tests are carried out by the University of Melbourne. The address of the Tractor Testing Committee is: care of Department of Primary Industry, 301 Flinders Lane, Melbourne, Victoria.

of an outlet will of course reflect and correspond to the performance of the engine.

(a) Full Power at Rated Speed

The first step therefore is to measure the performance of the engine itself. For this purpose the engine, complete with all auxiliaries and controls, is taken out of the tractor, set up on a test bed, and direct coupled to the torque dynamometer. In this way the torque* on the engine shaft, and the power output at the engine shaft (shaft horsepower, s.h.p.)† are directly measured. Maximum engine power is established by running a test for two hours, at full power (that is, the fuel supply not restricted by the governor) at rated speed, shown at A in Plate 1.

there must be a variation, that might amount to plus or minus 5 per cent.—in effect a manufacturer's tolerance. Since the top value of this range can be reached only by perhaps 1 in 50 engines, to quote the top value alone is doubly misleading—it implies that all engines are alike, and all at top value.

To bring the test to realities, it is sufficient to see whether the maximum shaft h.p., found in the test just described, on the random sample, falls within the range of expected values nominated by the manufacturer. The manufacturer is asked, in the Conditions of Test, to nominate this range. This test therefore is in the true nature of a formal acceptance test.

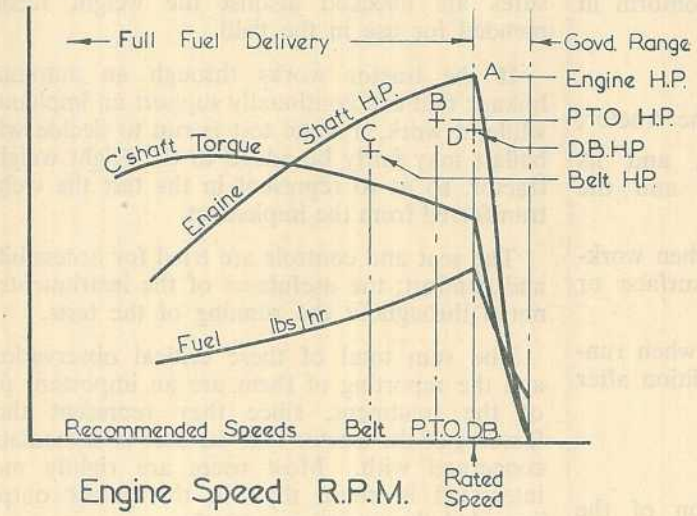


Plate 1

Performance of Engine and Outlets.

NOTE 1. *Engines of the Same Model not Identical*

For any production model of engine (or tractor) the maximum power output at rated speed of the individual units cannot be exactly the same; over the whole production or stock

NOTE 2. *Avoid "Bare Engine" Power*

Some engine companies are apt to quote what they call brake h.p. on the bare engine, that is without fan and generator, and possibly without water pump. Since these essentials may account for 3 or 4 h.p. in a 50 h.p. engine, the value is misleading (and confusing, even if the term "bare engine" is employed to make the meaning clear).

NOTE 3. *Avoid "Brake" H.P.*

A further confusion comes from the use of "brake h.p." Brake simply means that the power is absorbed and measured on a torque brake or dynamometer, as it always is. The important thing to say is where, on the engine or its outlets,

*TORQUE in the shaft is the twisting moment that drives things connected to the shaft. It is the product of tangential force and radial distance from the centre of the shaft; for example, any combination of force and distance whose product is say 100, means a torque of 100 ft. lb.

†POWER in a shaft is the product of torque and rotational speed. In horse-power units, shaft horsepower (s.h.p.) = 2π × torque × speed (r.p.m.) ÷ 33,000. This comes to s.h.p. = torque × speed ÷ 5,250.

the power is measured. Hence shaft h.p. (better than flywheel h.p.) is the only proper term for this. There is no occasion for brake h.p., or for b.h.p. since this may be confused with belt h.p.; for this latter it is better to spell it out, as belt h.p.

NOTE 4. *Rated Speed Important*

A speed of special importance in governed engines is rated speed; this is the speed nominated by the maker (usually in round numbers like 1,600, 1,750, 2,200 r.p.m.) as the recommended speed for running more or less continuously at full output. Maximum power, as a characteristic measure of governed engine performance, is only meaningful when measured and quoted at rated engine speed; its full title is "Full-power-at-rated-speed."

NOTE 5. *Fast Idling Setting of Governor*

For the purposes of formal test, it is essential to establish full, or maximum power in this way, namely at rated speed; this is so, notwithstanding the practice sometimes employed of providing a fast-idling setting in the governor that may bring the engine on to full power at above rated speed. This fairly ensures that full power is available at rated speed, perhaps with something to spare; but the procedure is not intended to take any account of the "something to spare". Equally fairly, if the fast idling setting does not yield full power at rated speed, the setting will be raised accordingly.

(b) Governed Speed Running

At part loads, the governor takes over, allowing the speed to rise eventually—at no load—to fast idling speed. A series of tests is run, at part loads, to see how speed and fuel consumption vary under the governor. This is called running under the governor, or in the governed range, shown to the right of rated speed in the graphs of Plate 1.

(c) Full Fuel (Full Throttle) Running

Starting again at full load and rated speed, as the load, that is, the torque, is still further increased, the governor keeps the fuel open, so the speed will fall, down to the lowest available speed. At about half rated speed of the torque output will reach its maximum; maximum torque and the rise in torque output from full load at rated speed are points of some interest, since they indicated "lugging" capacity.

A series of tests is run in this region of performance so as to establish the full torque characteristic shown to the left of rated speed in Plate 1.

(d) Part Loads, Lower Speeds: Best Economy

By resetting the governor at a succession of lower speeds, the whole part-load performance of the engine can be traversed so as to reveal that combination of load and speed that gives best economy, a point of some interest when farm tasks require only a fraction of the full output of the engine.

NOTE 6. *Fuel Consumption—Specific Fuel Consumption*

Fuel consumption is measured during all of these tests; this is stated in the report in a variety of ways.

Though the simplest unit may be gallons per hour, this takes no account of load or whether the engine is doing much or little work at the time. A much better indication of fuel performance is the specific fuel consumption: this is quoted in lb. per s.h.p.-hour, which should be low for good economy, or s.h.p.-hour/gallon, which of course should be high.

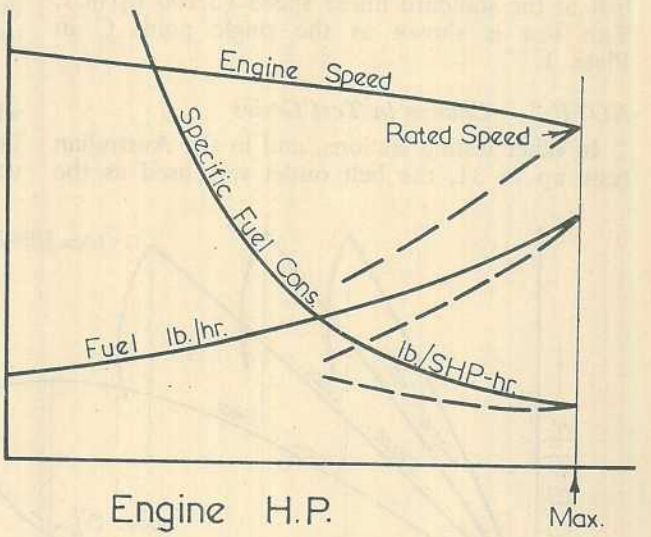


Plate 2

Engine Performance. In governed range shown as continuous line; at full fuel delivery shown as broken line.

Specific fuel consumption enables us to compare the economy not only of one engine at various loads; but of one engine with another regardless of differences in type and size. How specific fuel consumption varies with power output on both governed and full throttle running is shown in Plate 2.

3. OTHER STATIONARY OUTLETS—P.T.O. AND BELT

(a) P.T.O. Power

When the engine has been put back into the tractor, a full power test on the p.t.o. outlet is run, that is, with the p.t.o. direct coupled to the dynamometer, and with the governor control set to run the engine at full power at the speed required to give the specified or standard p.t.o. speed. (This engine speed may or may not be rated speed.) This test is shown as the single point B in Plate 1.

(b) Belt Power

Similarly by coupling the belt pulley to the dynamometer by a suitable belt, a single test of full power on the belt outlet is run; again the governor control may have to be reset so as to run the engine at the speed recommended for belt work, or at the speed required to run the belt at the standard linear speed (3,100 r.p.m.). This test is shown as the single point C in Plate 1.

NOTE 7. Change in Test Codes

In other testing stations, and in the Australian tests up to 31, the belt outlet was used as the only means of testing the engine. Other testing stations use, or shortly will use the p.t.o. instead of the belt outlet as the main test; if there is no p.t.o., then the engine will be tested directly on the crankshaft as described above. Clearly the trend is away from the belt outlet and towards the direct engine test as the main test in the series.

NOTE 8. Ambient Conditions during Test

Throughout the tests, especially the longer runs of 20 min., 1 hr., and 2 hr., the temperature and barometric pressures of the ambient air are observed, as well as the temperature of the radiator water, and of the lubricating oil and fuel. It may be necessary to avoid testing, at any rate for the purpose of establishing maximum power, on days that are particularly hot or particularly cold. On the other hand, it would be fair to introduce a test at high air temperature, say 100 deg. F., to see how performance may suffer in the hot weather.

4. TESTS ON THE DRAWBAR

(a) Introduction

Drawbar power is, by definition, the product of pull and speed; in particular d.b.h.p. = Pull (lb.) × Speed (m.p.h.) ÷ 375. To apply a drawbar load to a tractor it is necessary only to cause it to pull something.

For test purposes the load is a special vehicle whose resistance to pulling can be varied at will (rather like applying a brake to the towed vehicle). The pull in the towbar is measured,

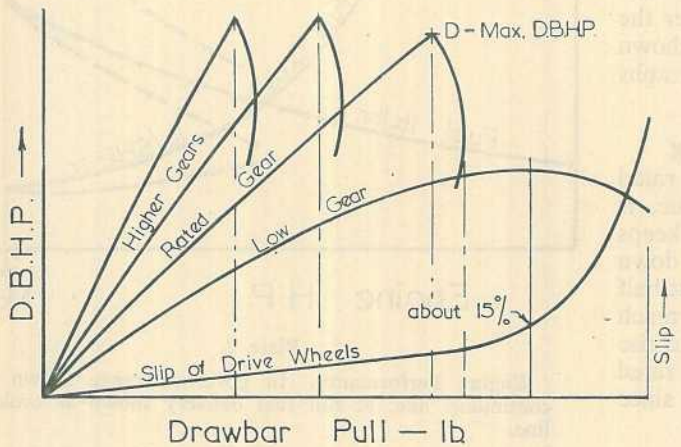


Plate 3
Drawbar Performance in the Gears.

for example by a hydraulic cylinder and pressure gauge, while speed is measured by timing the tractor over a measured course on the test track. In any event, no statement about d.b. power and pull are meaningful unless the weight of the tractor (total and rear axle loads) and height of drawbar are also quoted.

(b) Test in Each Gear

For each gear (except the high speed road gear) in a series of runs over measured courses of 200 to 500 ft., the load is steadily increased until full engine power and rated engine speed are reached. As the pull is still further increased, the speed will fall rapidly corresponding to the full torque/speed characteristic of the engine, until a maximum sustained pull is reached, corresponding to maximum torque in the engine.

These characteristics of d.b.h.p. are shown in Plate 3 for the several gears (above the low gears that will be mentioned) by the sloping lines leading to the peaks, followed by the hooks down to and past the maximum sustained pulls.

(c) Maximum d.b.h.p. defined by Rated Gear

Although these peaks of d.b.h.p. in the various gears may not be equal in value, it is the peak in rated gear that defines, for the tractor, the maximum d.b.h.p., where rated gear corresponds to the speed of heavy farm work, for example ploughing, at about 3 m.p.h.

It will be noted that maximum d.b.h.p. will be less than maximum engine power: naturally, because of the losses in the transmission and in the wheels, including slip: point D in Plates 1 and 3.

(d) Low Gear Output Limited by Slip

An exception to this behaviour will (usually, that is, unless the tractor is specially and improperly heavily weighted for the purpose of the test) appear in the low gear or gears, where the heavy pulls cause the wheels to fail by slip before the engine is fully loaded; in those circumstances neither full engine power, nor full d.b. power is reached. This situation is shown by the low curve in Plate 3. Nevertheless, it is usual for the pull at the "hill" of this curve to be higher than the pulls available in the higher gears.

(e) Ten-hour Test

Rated gear is then chosen for a much longer run—the 10-hr. test, still on the test track. In the original Nebraska tests, this run of 10 hr. was done under a fairly high drawbar pull—three-quarters of maximum for the rated gear. The idea was to see whether the tractors could run continuously for that long—many of them failed to do so.

The Australian test splits it up into 4 x 2½-hr. sessions, the sessions being run at four different loads from nearly full load down to below half load. Clearly in modern tractors, this arrangement does not particularly look for failure in 10 hr. of running, but gives values of fuel consumption at a variety of likely loads on 2½-hr. runs.

NOTE 9. Warning on Drawbar Values

Performance on field soils, unless they are hard and dry like the test track, will be different from the performance measured in the test: pulls will be less and slip more. Plate 4 suggests the sort of differences in pull, slip and d.b.h.p. that might arise in a given gear on some unspecified soil.

5. RELIABILITY DURING TEST: FINAL INSPECTION

Before the test is started, the tractor, being new, is given the usual pre-sale checks and treatment such as the vendor is supposed to give for the purchaser; and, being new, the tractor is run-in for an arbitrary period of 12 hr. before applying the formal tests.

Defects and mishaps that occur at any time during the tests, requiring adjustments or replacement of parts, are of course corrected and noted in the record.

New oil is charged to the engine after run-in, and drained out at the end of tests, the weight of oil at start and finish being noted. Similarly the weight of cooling water added during the tests is noted.

The total time of running is added up from the daily logs; in an average test this would amount to 50 or 60 hours, including run-in.

After the tests, the tractor is partly stripped down: the engine head and sump removed, valves and pistons withdrawn, transmission covers taken

off, so that any obvious signs of undue wear or overheating can be detected after so many hours of running.

6. TEST REPORT

The whole series of events is recorded in a formal report which would show in tables the full power values on the crankshaft and at the outlets, as well as the performance shown in the graphs of Plates 1, 2 and 3, and other graphs also. As well as giving a brief specification of the tractor, the report will state the manufacturer's expected range of values for full engine power for this model.

While the information on the properties the proportions of the tractor, and on the tests of the engine and its stationary outlets, will need no particular interpretation (they will behave the same way in general use), tests on the drawbar must be interpreted in the light of Plate 4 and Note 9.

Though the Technical Report is limited in numbers, the briefer Farmers' Edition is readily available throughout Australia, and State Departments of Agriculture and offices of the Department of Primary Industry.

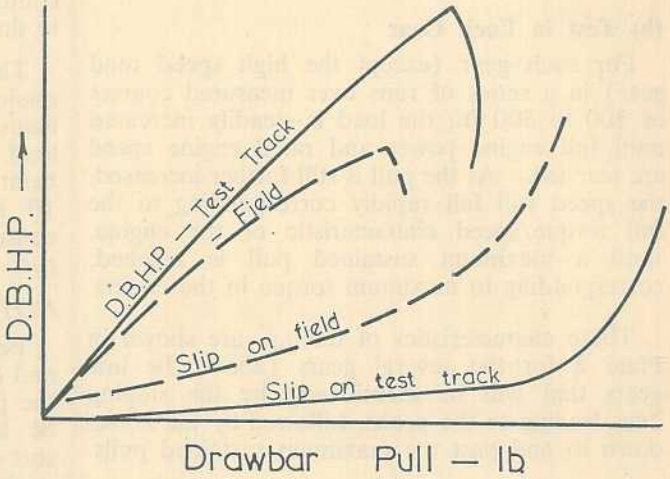


Plate 4
Typical Difference Between Test Track and Field.

Studs' Record Testing Year

More stud dairy cattle than ever before were tested in the purebred dairy cattle production recording year just ended, the Minister for Agriculture and Forestry (Hon. O. O. Madsen, M.L.A.) said. The 3,078 cows' production recorded represented a 33 per cent. increase on the 1958-59 total. They came from 153 herds.

Average production of the 2,971 cows that completed a full milking season was 645 gallons of milk containing 282 lb. of butterfat. This is equal to 340 lb. of commercial butter. Of the cows that completed lactations, 989 yielded sufficient butterfat to reach or exceed the age standards for entry into the advanced register of the various herd books.

During the year, several new production records were established for the various ages and breeds. The outstanding performance was that of a mature A.I.S. cow, Kenstan Opal 7th. She set a new record of 1,060 lb. of butterfat in 300 days. The butterfat was contained in a milk yield of 25,220 lb., or 11 tons. The record number of herds and cows submitted for production recording last year showed that stud breeders were recognising the need for accurate records of their herds' performances.

Fordson Delta, Rowcrop Model

Australian Tractor Test No. 32A

Following is an abridged report of the Australian Tractor Testing Committee on the Fordson Delta, Rowcrop Model:

The tractor used in test No. 32 was converted to the Rowcrop model by the fitting of the alternative wheel equipment.

Minor modifications to front axle, steering, and mudguard mountings were made with standard parts supplied by the Ford Co. from stock. A swinging drawbar was fitted.

Performance Summary

1. Governed engine speed: 2000 r.p.m.
2. Maximum* belt h.p., rated speed (Test No. 32): 30·0.
3. Max.* d.b.h.p. on test track, rated engine speed: 27·5
4. Rated† d.b.h.p. under governor control: 21
5. Maximum shaft h.p. at rated speed: 33·0.

Steering, Stability

Track width as tested: front 53 in., rear 53 in.; wheelbase 74 in.

Turning Circles: outside diameters on consolidated gravel surface:

No brakes: L.H. and R.H. 21 ft. 4 in.

With brakes: L.H. and R.H. 17 ft. 4 in.

Steering: Manual, easy and sensitive at all loads.

Centre of Gravity: 3½ in. below, 23½ in. ahead of rear axle; tested in maximum weight condition including driver and fuel; rear 3,220 lb.; front 1,500 lb.; total 4,720 lb.

Ground Clearance: Without swinging drawbar—20 in. With swinging drawbar—15 in.

Height of Drawbar: 16½ in.

Tyres, Wheels and Weights

1. *Rear Wheels :*	
Type	Pressed centres, detachable rims
Ballast :	
Liquid, lb./wheel	370*
Iron, lb./wheel	75*
2. *Rear Tyres :*	
Size and ply	11 x 38, 6 ply
Make and Type	Dunlop Super Trakgrip open centre chevron tread
Air pressure, p.s.i.	12
Static Deflection	1⅜ in.
3. *Front Wheels :*	
Type	Pressed assembly
Ballast :	
Liquid, lb./wheel	Nil
Iron, lb./wheel	75
4. *Front Tyres :*	
Size and ply	6·00 x 16, 6 ply
Make and Type	Dunlop Farm Tractor Circular rib tread
Air pressure, p.s.i.	28
5. *Weight of Tractor :*	
Rear axle, lb.	3,220
Front axle, lb.	1,500
Total (as tested with operator), lb.	4,720
6. *Weight Condition :*	Maximum†
7. *Height of Drawbar :*	16½ in.

* No atmospheric corrections are applied to diesel engines.
† *Rated drawbar h.p.* is defined as 75 per cent. of maximum d.b.h.p.

* Equivalent to 90% liquid (anti-freeze) ballast.
† Maximum recommended weight.

DRAWBAR TESTS. Tractor running on Tarmac Test. Note: One fuel setting in all tests. Rated gear—2nd

Gear	At Rated Engine Speed					Overload			Temperature °F		Barom. Inch Mercury
	D.B.H.P.	Drawbar Pull lb.	Speed m.p.h.	Slip of Drive Wheels %	C/Shaft r.p.m.	Max. Sustained Pull lb.	Limit Set By	C/Shaft Speed r.p.m.	Radiator	Air	
TESTS F. & G. MAXIMUM D.B.H.P.—All gears. Maximum weight, standard tyres. Rated gear—2nd defines max. d.b.h.p											
1	20·2	3,750	2·02	13·6	2,150	4,000	wheelslip	2,150	165	55	30·0
*2	27·5	2,450	4·36	7·0	2,000	2,700	engine torque	1,300	165	55	30·0
3	28·9	1,875	5·78	5·4	2,000	2,100	engine torque	1,300	165	55	30·0
4	29·1	1,475	7·40	3·8	2,000	1,650	engine torque	1,300	165	55	30·0
5	29·1	850	12·85	1·7	2,000	950	engine torque	1,300	165	55	30·0
6	Not tested										

Farmers Can Now Tame Nutgrass

Queensland farmers now have a method of controlling nutgrass sufficiently for good crops to be grown. Developed at the Agriculture Department's Ayr Regional Experiment Station, the method combines strategic cultivation with hormone spraying.

The Minister for Agriculture and Forestry (Hon. O. O. Madsen, M.L.A.) said the cost is about £20 an acre for materials. This is not regarded as excessive if high value crops are grown because, with careful management, normal cropping can be resumed for two or three years.

He said nutgrass is one of the most troublesome weeds in cultivations. Because of the reserves of plant food it stores in its underground nuts, nutgrass can seldom be got rid of completely. But it is possible to reduce the number of live nuts in the top 6 in. of soil to a point where the nutgrass is no longer a serious competitor with the crop.

Nutgrass grows prolifically in the sandy soils of the Burdekin district. Sugar-cane will escape damage if it is grown quickly enough to shade the land, restricting nutgrass growth. This calls for fairly liberal fertilizing. If crops other than fast growing sugar-cane are to be produced, another method of nutgrass control is needed.

This was supplied from a long term trial just completed at the Ayr Regional Experiment Station. There it was found that many of the nuts in the top 3 in. of the soil would die if severed from their roots and exposed in the hot, dry soil for a few weeks.

In the trials, the soil was ploughed and then disced at regular intervals during the dry season in spring and early summer. Counts showed that the number of live nuts was reduced by an average of 88 per cent. During the wet season in late summer, the land was sprayed several times with 2, 4-D. By March, the number of live nuts in the soil was reduced by a further 9 per cent. At this stage, nut grass infestation had thinned out sufficiently for good crops to be grown.

It was realised that hormone sprays could not always be used because of the risk of damaging crops in nearby fields. Further trials showed that if this were the case, reinfestation of nutgrass could be checked by establishing a dense stand of cowpeas early in the wet season.

Queensland Fauna Sanctuaries

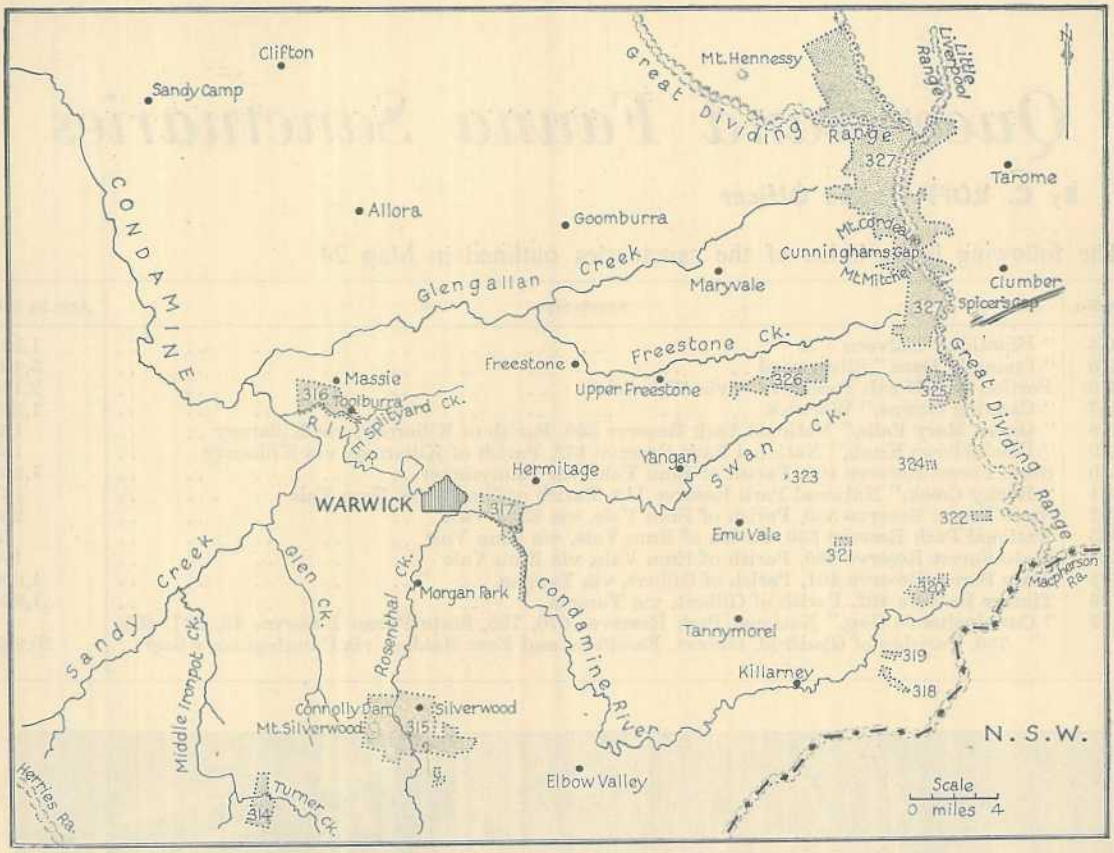
By C. ROFF, Fauna Officer

The following is an index of the sanctuaries outlined in Map 24.

Index No.	Sanctuary	Area in Acres
314	" Braeside," Dalveen	1,221
315	" Connolly Dam," Silverwood	5,400
316	Portion of " North Toolburra," via Warwick	2,130
317	" Canning Downs," Warwick	1,510
318	" Queen Mary Falls," National Park Reserve 569, Parish of Killarney, via Killarney	192
319	" Blackfellows Knob," National Park Reserve 452, Parish of Killarney, via Killarney	135
320	State Forest Reserve 400, Parish of Emu Vale, via Tannymorel	1,220
321	" Rocky Creek," National Park Reserve 115, Parish of Emu Vale, Emu Vale	157
322	State Forest Reserve 559, Parish of Emu Vale, via Emu Vale	258
323	National Park Reserve 550, Parish of Emu Vale, via Emu Vale	10
324	State Forest Reserve 560, Parish of Emu Vale, via Emu Vale	100
325	State Forest Reserve 401, Parish of Gilbert, via Yangan	1,600
326	Timber Reserve 402, Parish of Gilbert, via Yangan	1,830
327	" Cunningham's Gap," National Park Reserves 670, 705, State Forest Reserves 49, 327, 405, 750, Parishes of Gladfield, Gilbert, Fassifern, and East Haldon, via Cunningham's Gap	20,837

Plate 12

The Sanctuary near Spicer's Gap Provides Refuge for Koalas.



Map 24

Map Showing Sanctuaries in Part of Fauna District No. 1. The sanctuary boundaries (as at December 31, 1957) are delineated by dotted lines enclosing the stippled areas.

Stop that Raindrop Erosion

A great deal of the erosion which occurs on cultivated land can be attributed directly to the pounding and puddling effect of raindrops on the bare soil.

When the soil surface becomes puddled the intake rate is reduced and the resultant run-off water carries away the soil already dislodged by the chiselling action of the raindrops.

It won't be long now before the spring and early summer storms commence and the erosion risk will increase. It is desirable to counter this risk by avoiding fine fallows and by providing where possible a protective blanket of crops or crop residues.

It is a wise policy to avoid stubble burning and to preserve the crop residues as a surface mulch for the protection of the soil.

—J. E. LADEWIG, Chief Soil Conservationist.

orchard and garden

Water Young Citrus Trees.—Young citrus trees in an orchard need frequent watering. Newly planted citrus trees have a limited root system and watering is necessary every few days until the trees are well established.

If the root system is allowed to dry out, the setback to growth can be serious and may even kill the tree. Poor growth can often be traced to faulty irrigation.

Trees in sandy soil need more frequent waterings than trees in heavy soils, but in the absence of rain, give each tree some 8 to 10 gal. of water every two or three weeks after planting. More frequent watering may be necessary in hot, dry weather.

Rule of thumb watering, however, is scarcely good enough. Keep a probe or auger handy and check the soil moisture near the roots of the young trees every week.

—R. L. PREST, Senior Adviser in Horticulture.

Tomato Pests in Southern Queensland.—Insect pests of tomato crops are persistent in their attacks and growers in southern Queensland normally make routine applications of insecticides especially for the control of those attacking the fruit and foliage. This control is based on mixtures containing lead arsenate or DDT.

Lead arsenate will control chewing pests of tomatoes and DDT will also check sucking insects. The addition of sulphur will control species of mites.

These materials can, as required, be used alone. However proprietary mixed dusts containing DDT and sulphur or lead arsenate and sulphur are available. These materials are also compatable in combination sprays.

At all times thorough applications are essential and on the vegetable farms of southern Queensland machines manually operated have proved most effective.

—A. R. BRIMBLECOMBE, Senior Entomologist.

Preparing Banana Land.—In south eastern Queensland, the banana planting season is restricted by legislation to the period August to January inclusive. Normally, plantings take place after temperatures have risen appreciably about October. September to December, therefore, is preparation time. The banana is no different from other crops in preferring a well-prepared soil which permits root movement and free uptake of moisture and nutrient.

Early soil preparation, starting well before planting is intended, is best. If practicable, banana land needs and benefits from a couple of ploughings and harrowings. Do it thoroughly. Provide the depth and tilth and *then* hole-out and plant your material—suckers or bits. I know that sometimes the area is steep and cultivation impossible. Then, of course, it means the mattock, and hard work, and perspiration; but it's worth the trouble to get those new plants properly established!

Don't forget your erosion hazard! Look to preventive measures before even considering cultivation. You need a diversion bank or drain above the planting area to divert and carry away dangerous and erosive water from higher up.

When the land is prepared, put in contour drains at suitably spaced intervals across the slope. These drains are another form of insurance against soil losses. They will slow down and collect surface waters and safely lead them to disposal waterways and gullies.

—D. DOWDLES, Adviser in Horticulture.

Brucellosis-Tested Swine Herds

(As at 1st September, 1960)

Berkshire

Bernoth, B., Wyreema
Clarke, E. J., Mt. Alford, via Boonah
Cochrane, S., "Stanroy", Felton
Cook, F. R. J., Middle Creek, Pomona
Crawley, R. A., Rockthorpe, Linthorpe
Edwards, C. E., "Spring Valley" Stud, Kingaroy
Farm Home For Boys, Westbrook
Fletcher, A. C., "Myola" Stud, Jimbour
French, A., "Wilson Park", Pittsworth
H. M. State Farm, Numinbah
H. M. State Farm, "Palen" Stud, Palen Creek
Handley, J. L., "Meadow Vale", Lockyer
Handley, G. R. "Lochlyn" Stud, Lockyer
James, I. M. (Mrs.), "Kenmore" Stud, Cambooya
Kath, E. E., "Topcamp", via Toowoomba
Kimber, E. R., Block 11, Mundubbera
Law, D. T., "Rossvill" Stud, Aspley
Lees, J. C., "Bridge View" Stud, Yandina
Ludwig & Sons, A. R., "Beau View" Stud, Beaudesert
O'Brien & Hichey, J., "Kildurham" Stud, Jandowae East
Orange, L. P., "Eula", Flagstone Creek
Pfrunder, P. L., Pozieres
Potter, A. J., Ascot, via Greenmount
"Tayfield" Stud, Taylor
Q.A.H.S. & College, Lawes
Regional Experimental Station, Hermitage
Rosenberger, N., "Nevrose", Wyreema
Rosenblatt, G., Rosevilla, Biloela
Schellback, B. A., "Redvilla" Stud, Kingaroy
Smyth, E. F., "Grandmere" Stud, Manyung, Murgon
Stark, H. L., "Florida" Stud, Kalbar
Thomas & Sons, F., "Rosevale" Stud, Laravale
Traves, G., "Wynwood" Stud, Oakey
Weier, V. F., "La Crescent", Clifton
Wolski, A., "Carramana", Warra
Young (Jnr.), W., Kybong, via Gympie

Large White

Assenbruck, C., Mundubbera
Barron Bros., "Chiltern Hill", Cooyar
Bell & Son, E. J., "Dorne", Chinchilla
Behm, A. M., "Aleun", Wondai
Bishop, C. E., Beerwah
Butcher, Dr. B. J. & Parnwell, A. J., Plunkett, via Tamborine
Clark, L. D., Greens Creek, Gympie
Coller, R. H., "Relloc", Tallegalla, via Rosewood
Duncan, C. P., "Colley", Flagstone Creek
Fowler, S., "Kenstan", Pittsworth
Franke, H. J., "Delvue" Stud, Cawdor
Garawin Stud Farm Pty. Ltd., 657 Sandgate Rd., Clayfield
Gibbons, A. E. H., Mt. Glorious
Gibson, H., "Thistleton" Stud, Maleny
H. M. State Farm, Numinbah
Hall, M., "Milena" Stud, D'Aguilar
Heading, J. A., "Highfields", Murgon
Hickson, K. L., "Warra", Calliope
Horton, C. J., "Mannuem Brae" Stud, Mannuem, Kingaroy
Hutton, G., "Grajea" Stud, Cabarlah
Jensen, S., Rosevale, via Rosewood
Jones, K. B., "Cefn" Stud, Clifton
Kahler, J. & S., "Karajoy", East Nanango
Kanowski, A., "Exton", Pechey
Kennard, R. B., "Collar" Stud, Warwick
Larsen, H. L., "Oakway" Stud, Kingaroy
Law, D. T., "Rossvill" Stud, Aspley
Lees, J. C., "Bridge View", Yandina
Lobegeiger, L. C., "Bremer Valley" Stud, Moorang, via Rosewood
Mack, A. J., Mundubbera
"Marcliff", Wecker Rd., Mt. Gravatt
Neilsen, L. R., "Sunny Hill," Ascot, via Greenmount
Neilsen, A. R., Ascot, via Greenmount
Palmer, V. P. & Son, "Remlap", Greenmount
Pampling, G., Watch Box Rd., Goomeri
Port Curtis Co-operative Dairy Association Ltd., Stud Piggery, Biloela
Postle, R., "Yaralla" Stud, Pittsworth
Powell, R. S., "Kybong", Gympie
Q.A.H.S. & College, Lawes
Radel, V. V., Coalstoun Lakes
Radel, R. M., Coalstoun Lakes
Regional Experimental Station, Biloela
Robinson, O. R. & O. J., "Linvale", Argoon, Biloela
Rosenblatt, G., Rosevilla, Biloela
Skyring, G. I., "Bellwood" Stud, via Goomeri
Stanton, H. R., "Lanherne" Stud, Tansey, via Goomeri
Stehn, L. W., "Hodgson Vale", via Toowoomba
Stewart, L., Mulgowie, via Laidley
Stumer, K. F., French's Creek, Boonah
Wharton, C. A., "Central Burnett" Stud, Gayndah
Wieland, L. C. & E., Lower Cressbrook, Toogoolawah
Zahnow, W., Rosevale, via Rosewood

Tamworth

Armstrong, H. J., "Alhambra", Crownthorpe, Murgon
Booth, J. D., Swan Creek, Warwick
Campbell, P. V., "Lawnhill" Stud, Lamington
Coller, R. H., "Relloc", Tallegalla, via Rosewood
Fletcher, A. C., "Myola" Stud, Jimbour
Herbst, L., "Hillbanside", Bahr Scrub, Beenleigh
Kanowski, S. E., "Miecho", Pinelands
Potter, N. R., "Actonvale" Stud, Wellcamp
Regional Experimental Station, Kairi
Salvation Army Training Home For Boys, "Canaan" Stud, Riverview
Skerman, D. F. L., "Waverley", Kaimkillenbun
Stephen, T., "Withcott" Stud, Helidon
Thomas & Sons, F., "Rosevale" Stud, Laravale
Wieland, L. C. & E., Lower Cressbrook, Toogoolawah

Wessex Saddleback

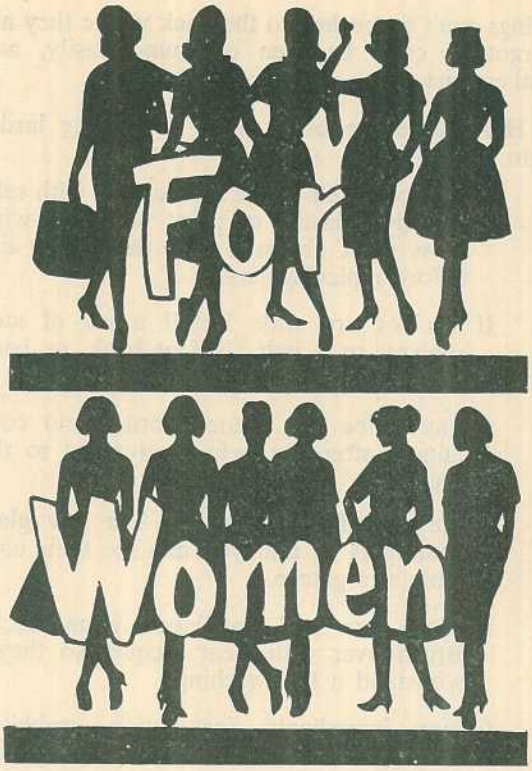
Ashwell, J., "Green Hill", Felton South
Cooper, G. J., Neumgua
Douglas, W., "Greylight" Stud, Goombungee
Dunlop, J. B., "Kunawyn", Acacia Rd., Kuraby
Kingsford, D., "San Antone", Toowoomba
Kruger & Sons, "Greyhurst" Stud, Goombungee
Lau, D. E., "Homevale", Goombungee
Law, D. T., "Rossvill" Stud, Aspley
Mack, A. J., Mundubbera
Scott, A., Wanstead Stud, Grantham
Smith, C. R., "Belton Park", Nara
"Wattledale" Stud, 432 Beenleigh Rd., Sunnybank

Landrace

Ashwell, J., "Greenhill", Felton South
Behm, A. M., "Aleun", Wondai
Crawford, G. L., "Glenvillan", Manneum
Crothers, B. M., "Booligar", Clifton
Duncan, C. P., "Colley", Flagstone Creek
Fowler, K. P., "Northlea", Coalstoun Lakes
Grayson, D. G., Killarney
Itzstein, R. A., "Hyde Park", Gooroolba
Jensen, A. P., & Grace, V. S., Theodore
Kath, E. E., "Topcamp", via Toowoomba
Kingsford, D., "San Antone", Toowoomba
Law, D. J., Rossville Stud, Aspley
Lush, P. B. I., Westbrook
Neilsen, A. R., Ascot, via Greenmount
Neilsen, L. R., "Sunny Hill", Ascot, via Greenmount
Orange, L. P., "Eula", Flagstone Creek
Semgreen, A. L. & D. T., "Tecona", Kingaroy
Stehn, L. W., "Hodgson Vale", via Toowoomba
Stummer, K. F., French's Creek, Boonah

Large Black

Pointon, E., Goomburra



Pattern Plans

Check measurements before buying the pattern. One that requires little, or no, alteration is obviously a time saver.

If alterations cannot be avoided try to use the same make of pattern as often as possible so that the necessary alterations can be made almost automatically.

Accurate cutting saves sewing time. Smooth seam edges are easier to sew evenly and straight, and do not require additional trimming. Use sharp scissors and make long cuts.

Fold material with right sides together before placing pattern, so that marking can be done on the wrong side.

When sewing for children it can save time to cut more than one garment at a time. Be sure the layers of fabric are laid out straight and smooth, with edges pinned to prevent slipping.

No more than six layers of a lightweight fabric can be pinned and cut with ease, speed and accuracy.

Some time spent in marking is necessary for accurate assembling of pieces, but where possible use pins, chalk or tracing wheel in preference to stitching.

Follow the assembly directions on the instruction sheet. It is compiled by trained people who have planned for the garment to be put together with the least trouble to preserve line and style, and reduce handling.

Time can be saved by planning how much stitching can be done at the one time (without interfering with the next steps) before leaving the machine; and then how much trimming, turning and tacking and pressing before returning to the machine.

By placing the iron and board at right angles to the machine further time can be saved.

Between handlings place or hang pieces to prevent creasing.

Aim to reduce the number of fittings. Style, accurate pattern measurements and accuracy of cutting and marking will help achieve this.

Progressive pressing will reduce time needed for final pressing.

Save Labour in the Larder

A well-stocked larder is one of the things in which most women take pride and joy and accordingly it is generally kept in order.

The regular "turning-out", which can be a real bug-bear, can be considerably eased and lessened if a few minutes are devoted daily to maintaining order and cleanliness.

One other factor which has contributed greatly to tidier and better organised larder storage is the design of modern storage. When shelves are narrow—only two jars' depth at the most—

things can't be pushed to the back where they are forgotten, can't be seen or found easily, and gather dust.

Here are some other ways of making larder care easier:

Throw out shelf-paper and replace with self-adhesive plastic, or paint with easy-wipe gloss paint (be sure it is thoroughly dry before replacing jars).

If shelves are wide install a set of step shelves, or a half shelf at back, or back and sides.

Always wipe jars, sauce bottles and containers after use before returning to the shelf.

Make an effort to get the last few glass containers so that you can see their contents at a glance.

Replace torn and lost labels immediately. Brush over with clear lacquer so they'll withstand a few washings.

Group ingredients for quick grabbing, keeping sweet and savoury things apart.

When more than one row of jars are placed on a shelf stagger their arrangement—do not place them one in front of the other.

Keeping the New Look

Fortunately for today's busy homemakers the new finishes which add brightness and colour to kitchen, laundry and bathroom equipment, are easy to care for, and so save time and labour.

Nevertheless it is wise to read the cleaning recommendations in the general instruction booklet or tag, and to check on the labels of new cleaners to find out which surfaces they are suitable for and how to use them.

The following methods of cleaning some of the newer finishes and materials are given by Miss Nancy Foskett, Senior Extension Officer, N.S.W. Department of Agriculture:

Always follow the manufacturer's directions for defrosting and cleaning the interior of a refrigerator.

Mop up spilled liquids immediately.

The plastic fittings on the inside of the door tend sometimes to acquire a smeary look.

To restore the shine, use liquid soapless detergent, undiluted, then rinse and wipe dry with a clean cloth.

The outside surface will respond to an occasional sparing application of a good furniture cream. (Check the label and follow instructions.)

The old advice to wipe over the oven with a damp cloth while it is warm holds good, as most ovens are still lined with vitreous enamel.

If the oven has become greasy, use a mild abrasive paste containing a grease solvent.

A caustic preparation is useful if the surface is more heavily soiled, but be sure to protect your skin.

For more drastic cleaning use a caustic preparation on a special applicator and leave for a few hours. Be sure to follow instructions.

Stainless steel sinks usually need only be cleaned with hot water, soapless detergent, and a stiff brush.

A paste cleanser will remove stubborn marks.

A sink mat helps to protect the sink.

In order to preserve the finish, polish with metal polish.

Silicone Polishes

"Silicones" has now become a familiar household word, for it appears in conjunction with so many products from polishes for floors, furniture and footwear to fashion fabrics.

With regard to silicone polishes, it should be remembered that in domestic polishes they are used in two ways.

There is the polish which contains very little or no wax, in which the silicone is the main polishing agent.

This type of polish produces a very durable gloss, and leaves a thin protective film.

It is usually recommended for furniture which is intended to have a highly polished finish.

There is also the wax polish in which silicone fluid is a complimentary ingredient, acting as a spreading agent and increasing the gloss.

This is suitable for wood surfaces, cork floors and lino. (except where the latter are in tile form and stuck to a sub-floor with bitumen adhesive, in which case an emulsion polish is better).

The British Good Housekeeping Institute's general comment on the silicone wax polish is "don't apply too much, or too often".

Care of Fine China

Fine china with its infinite variety of design and quality, adds much to the enjoyment of living. Some of the finest, most delicate and well-designed china is a joy to behold irrespective of its purpose, while well-proportioned, artistically coloured and decorated china is part of every perfect meal.

Unlike many beautiful things in our homes, fine china is very durable and will stand a great deal of hard use. But, like anything beautiful, it deserves reasonable care.

Here are some hints for the care of your fine china:

Individual, separate storage of cups is preferable to stacking.

Narrow, or half-shelves in cupboards make this possible.

Hanging cups on hooks is sometimes recommended, but when you are in a hurry there is a risk of breaking the handles or they may be broken if there is not enough clearance below the cups.

It is not a good idea to have too many plates in one stack because of the load placed on those at the bottom.

The most desirable method of storing large platters is to place them in upright "filing" racks.

Cupboard space is then used to best advantage and there is less likelihood of breaking and chipping.

Before washing fine china it is well to rinse it with a spray of water, brush it with a soft brush or wipe it with a rubber wiper.

Wash the china soon afterwards.

In general, avoid using a scouring pad or scouring powder on fine china.

Wash the china with a packaged detergent, rinse with clean hot water and drain dry or wipe with a soft linen towel.

Fine china is safe even in a dishwasher, if the dishwasher has rubber or plastic-coated racks and one of the effective but harmless detergents is used.

To avoid scratching the glaze or decoration, plates and saucers should be dropped gently into the rack of the dishwasher rather than slid into place.

Coffee should not be allowed to dry in cups as the stain is hard to remove.

Don't rub aluminium or silver against hard glaze as it may leave metal marks that are hard to remove.

Fine china is heat resistant and may safely be warmed before use, but remember that there is a difference between "warming" and "heating".

China ornaments should be examined frequently as dust mars their appearance.

Wash when necessary, using a soft bristle brush for ornamental parts.

Uses for Baking Soda

When next you put bicarbonate of soda in the peas to keep them green, pause and call to mind that this chemical has special qualities that make it very useful for many household tasks.

Being a mild alkali it emulsifies and dissolves grease and oil.

It dissolves completely, so that it causes no abrasion, or scratching, when used in solution as a cleaner.

Many homemakers will have discovered some other uses for bicarbonate of soda, but for those who don't know them all Miss Nancy Foskett, Senior Extension Officer, Women's Services, New South Wales Department of Agriculture, has listed these:

Wash glassware in a solution of 3 tablespoons of soda to a quart of warm water; rinse in clean water and dry thoroughly.

Cover stains with a paste of soda and water, leave for a while, then wash, rinse, and dry.

Ring stains on glassware will usually disappear if the vessel is filled with a warm water and soda solution and allowed to stand for some time.

Wash food containers and plastic ware in hot, soapy water, then in a solution of soda and warm water (3 tablespoons to 1 quart), which will sweeten as well as clean; rinse and dry.

Food that has hardened on plastic ware may be rubbed off with a paste of soda and water; soda will not scratch the smooth surface of the plastic.

Place a large piece of aluminium foil in a large enamel or china bowl with 3 tablespoons baking soda, and add 3 quarts of boiling water.

Place silver in this solution, allow it to stand there for a few minutes, rinse in clean water, dry thoroughly, and polish with a soft, dry cloth.

Sprinkle a small amount of soda on a damp cloth and rub on any stained area on tea and coffee pots and cups; rinse, then wash in the usual way.

—New South Wales Department of Agriculture's "Press Notes."

Historic Homestead

Mr. C. E. Barnes, M.H.R., and His Wife, in the 120-Year-Old Iron Bark Slab Hut which forms part of their Home at "Canning Downs", in the Warwick District. The well-preserved slab homestead was built by pioneer settler, Patrick Leslie, in 1840. Mr. Barnes, whose racehorse stud is famous throughout Australia, showed his leading sire, "Dalray", to those who comprised the Royal National Association's 1960 Journalists' Tour, sponsored by Shell.