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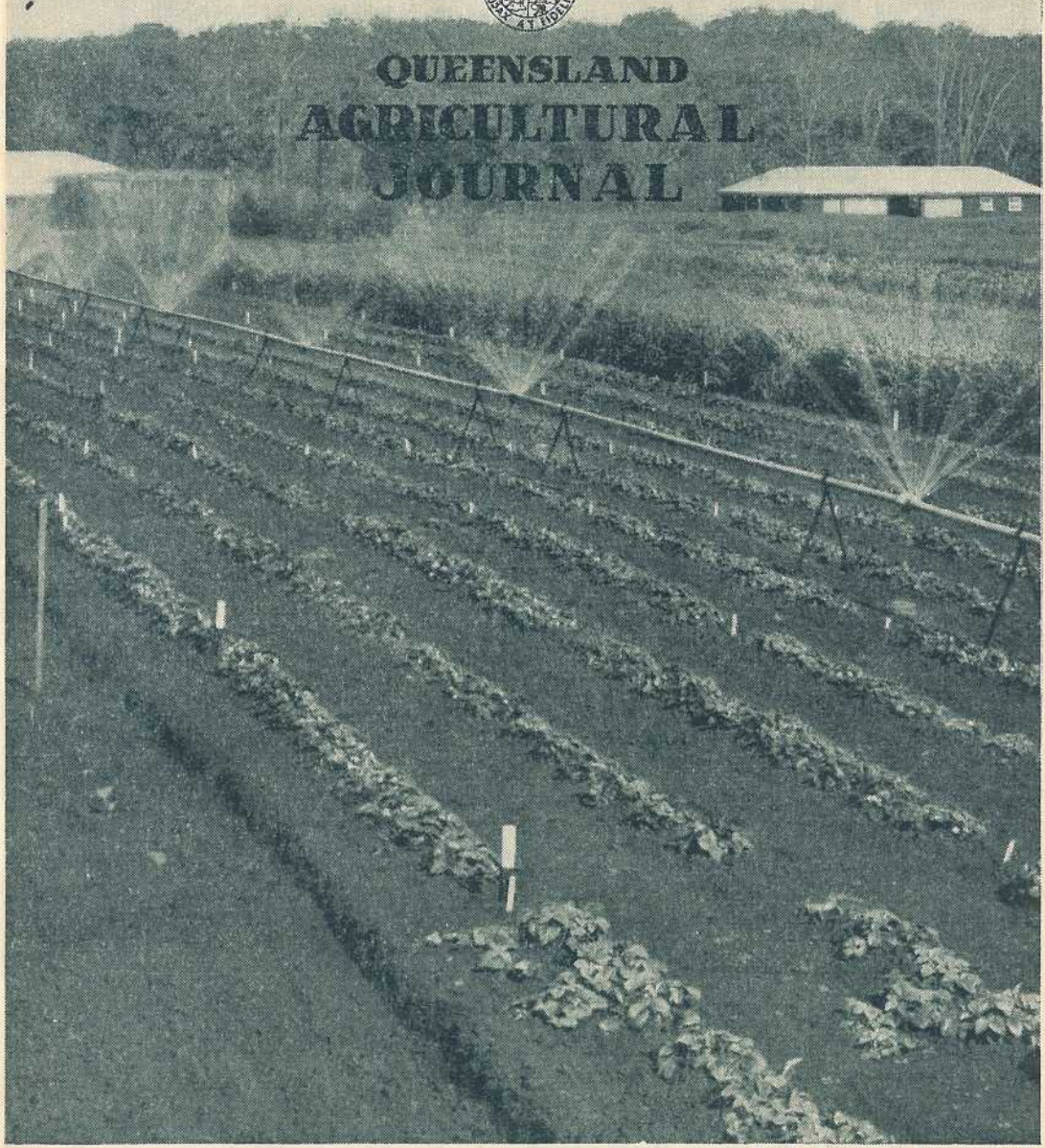

Small Crops on the Redlands Horticultural Experiment Station.

LEADING FEATURES

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Contents

SEED POTATOES

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Bovah—A New Grazing Oat for Queensland.

L. G. MILES (Assistant Director of Agriculture) and
D. ROSSER (Senior Plant Breeder).

Oats has always been the most favoured winter grazing crop with dairy farmers in Queensland. In recent years it has been customary for over 90% of the State's total oat crop to be sown for grazing purposes.

While the Darling Downs normally grows more oats than all other districts combined, an appreciable acreage is grown in coastal and sub-coastal dairying districts of central and southern Queensland.

Until a few years ago, Queensland oats growers were almost entirely dependent upon southern States for their seed requirements. Consequently, the only varieties available were such as were well suited to New South Wales and Victorian conditions but were not necessarily best for Queensland.

One serious defect of southern varieties, particularly for coastal Queensland conditions, has been their extreme susceptibility to crown rust. Crown rust has been so serious in some years as to ruin a young crop of oats before any grazing whatever could be obtained.

This situation was greatly alleviated in recent years by the introduction of a strain of Vicland (Victoria x Richland) and Fultex (Fulghum x Victoria) from the United States. These varieties possessed excellent field resistance to crown rust. This enabled them to be grown with complete success in wet winter seasons under conditions in which such varieties as Belar and Algerian were partial or total failures.

In the country of their origin, both Vicland and Fultex had one serious defect; they were (like their common parent, Victoria) highly susceptible to a leaf blight disease which is generally known as Victoria blight.

Recently, this disease has also appeared in Queensland. In trials in the Gympie district, in which the new disease was first noticed, Victoria crossbreds such as Vicland and Fultex were the only varieties affected.

It is too early yet to forecast whether Victoria blight is likely to be of serious annual occurrence. It is known, however, that a serious attack of this disease may be just as destructive as a bad attack of crown rust. If, therefore, the new blight were likely to be of annual occurrence, the crown-rust-resistant varieties Vicland and Fultex would no longer enjoy their customary advantage over southern Australian varieties.

Plate 1.

Bovah Oats in Grazing Trial, Gympie District, 1952. This crop is quite healthy and free from Victoria blight.

Plate 2.

"Bligh No. 1" Oats in the Same Trial as Bovah in Plate 1. "Bligh No. 1", like Vicland and Fultex, is a Victoria crossbred oat which was severely attacked by Victoria blight in this trial.

Recent Breeding Work.

Recent breeding work in Queensland, which was initiated by Mr. R. E. Soutter before his retirement from the Department, has resulted in the production of a new variety, Bovah, which has proved in the field to be resistant to both crown rust and Victoria blight. The variety has resulted from a three-way cross in which Bond was crossed with Victoria, and the resultant hybrid then crossed with Hajira.

The second of the two crosses used to produce Bovah was made in Brisbane in 1940. Seven years later, a number of selections from that cross were transferred to Hermitage Regional Experiment Station, near Warwick, on the Darling Downs. It was here that the final selection work was carried out.

At the same time, observation and seed increase plots were conducted at the Queensland Agricultural College by Mr. E. C. Tommerup, who reported very favourably on the ability of a number of these strains to produce fodder and seed under conditions which caused other varieties to collapse completely.

Strains from this cross finally proved their adaptability and usefulness under actual grazing conditions. The best of these was named Bovah in 1953, and made available as a new grazing oat for Queensland conditions.

Description.

In the early stages of development, Bovah makes fairly strong, upright growth and possesses a reasonable tillering capacity. Thus the variety produces early feed, although it would be classed as of mid-season maturity with regard to the production of grain. The half-grown plant produces

Plate 3.

Panicles of Bovah Oats from a Seed Plot at Hermitage Regional Experiment Station, 1953. This picture shows the short panicle branches and the weak awns.

a reasonable profusion of foliage, the individual leaves being free of hairs and fairly erect. The variety is of medium height when ripe, with yellow straw of average thickness and strength.

The panicle is erect, equilateral in shape, but fairly small in size. The

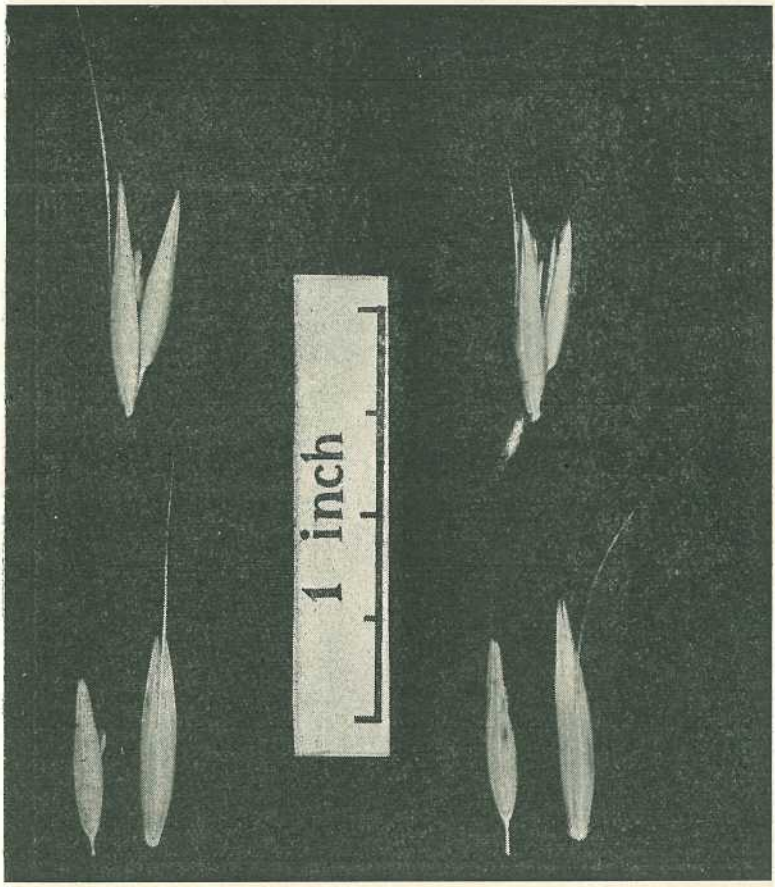


Plate 4.
Spikelets of Bovah Oats Showing the Two Grains Both Joined and Separated.

spikelets each produce two grains, the lower grain of each pair bearing a weak awn, and breaking from the panicle to leave a small but well defined "sucker-mouth" at the base. The grain is straw coloured, medium to small in size, and relatively poor in quality. Numerous short basal hairs are present, and these sometimes cause irritation during harvesting and grading operations.

The variety possesses one serious disability, namely the readiness with which the grain shatters when ripe. It should be stressed, however, that Bovah is intended solely as a grazing oat; and it is felt that the possibility of some grain loss will not prevent satisfactory returns from those crops grown especially for seed.

Grazing Tests with Bovah.

Bovah oats (under its progeny designation of BVH.4709) has been included in grazing trials at a number of sites over the past four seasons. At each of these trial sites it has behaved as an erect and fairly fast-growing oat. That is, it resembles Victand and Fultex in general type rather than the finer-leafed, slower-growing varieties such as Algerian and Klein.

The quick-growing varieties of oats have, however, proved eminently suitable for grazing in Queensland, particularly when grazed in cycles with a

few weeks' spell after each grazing period. When used in this way, Bovah has proved palatable to stock, and has shown good recovery after grazing.

The most detailed grazing results with oats over the past four seasons have come from the farm of Mr. G. Beattie of Lagoon Pocket, in the Gympie district. These experiments were started by Mr. A. Hegarty, Adviser in Agriculture, and taken over more recently by Mr. G. Cassidy, Adviser in Agriculture.

In these experiments, each season, a number of varieties of oats and wheat have been grazed at intervals, and then spelled until each variety has been considered ready to graze again. At each grazing, a record is kept of the number of cows on a given plot and of the length of time they spend on that plot. At the end of each season it is then possible to assess the total number of cow-grazing-hours per acre which each variety has provided.

Bovah and sister strains of (Bond x Victoria) x Hajira have been included in such trials during the past four years. In Table 1 are listed the grazing data for Bovah compared with those for Vicland and Fultex (both resistant to crown-rust and susceptible to Victoria blight), and also for Algerian (susceptible to crown-rust but resistant to Victoria blight). In this trial series the 1951 trial was a failure through drought, and provided no grazing information.

TABLE 1.

COW-GRAZING-HOURS FOR FOUR VARIETIES IN GYMPIE DISTRICT TRIALS.

Season.	Bovah.	Vicland.	Fultex.	Algerian.
1950 ..	488	508	528	400
1952 ..	599	257	492	642
1953 ..	298	266	296	209
Average ..	462	344	439	417

In the 1950 trial, crown-rust was moderately severe, and the resistant varieties Vicland, Fultex and Bovah all gave a better performance than the susceptible variety Algerian, although the season was one which would normally have favoured this late-maturing variety.

In the 1952 season (as in 1950), good rain was experienced over a number of months, and the late-maturing varieties were favoured. In this season, crown-rust was little in evidence, but Victoria blight was very severe on Vicland and Fultex. Under these conditions Algerian gave a very good performance, but Bovah also was well ahead of the blight-susceptible varieties.

The 1953 season was a very dry one, as reflected in the low grazing returns from all varieties. In this year neither crown-rust nor Victoria blight played any part, and the grazing results are really an indication of the ability of the varieties to stand up to dry conditions. Bovah's performance under these conditions was comparable with that of any other variety.

When the average grazing return for each variety is considered, Bovah is clearly in front. This is a really promising performance, especially when it is realised that the three years included one rust year and one blight year, but no year in which both crown-rust and blight appeared together.

Recommendations.

While Bovah has not yet been widely tested elsewhere in the State, its growth and behaviour have been observed on the Darling Downs, and in the Lockyer, Central Burnett and Callide Valleys, in addition to the Gympie district. In all tests it has shown promise as a grazing oat under a variety of seasonal conditions. As seed becomes more readily available, therefore, the variety is recommended for trial in any of the dairying districts of South and Central Queensland. If in future years Victoria blight should become a serious and widespread disease, then Bovah is confidently expected to replace Vicland and Fultex, particularly in the near-coastal districts.

A Farm Dam for Storing Irrigation Water.

O. L. HASSELL, Senior Adviser in Agriculture.

Interest in irrigation as a means of insuring against drought losses has increased steadily in Queensland in recent years.

A primary requirement is that a reliable supply of suitable water be available. Such a supply may not be present naturally on many farms. The alternative is for the individual farmer to take some action to prepare structures to conserve water. Plates 1-3 illustrate a dam on the property of Mr. Malcolm Newman, D'Aguilar, in which water is to be stored for irrigating crops and pastures.

A bank 25 ft. high was constructed across a gully in January 1954. The only earth moved in the construction of the dam was that required for the building of the bank. The work was carried out with a bulldozer at a cost of about £1,200. When filled the dam will hold 40 acre feet of water.

Kikuyu grass roots have been planted on the newly formed bank to assist in holding it. The newly constructed dam will not be allowed to hold water until the wet season of 1955. This precaution is being taken so that the high bank will be well compacted and less liable to erosion before water is stored. At present, during the period of soil compaction, water is allowed to escape through a pipe below the bank.

The watershed supplying the dam is about 100 acres. This area can be increased by forming contour furrows to carry water from an adjoining valley to the present storage site. A spillway from the dam, shown in Plates 2 and 3, carries water over a ridge to another dam or earth tank, which is used for watering cattle.

The area to be irrigated is approximately 30 acres. It is situated below the water supply. Water will be reticulated in pipes to the irrigation area and the supply will be controlled by a stopcock. Maize for grain and pastures are two crops which it is proposed to irrigate.

Plate 1.

View of Dam from Downstream Side.

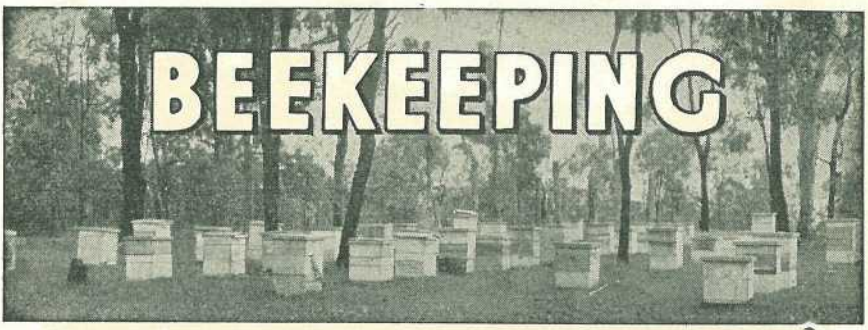
Plate 2.

Dam from Upstream Side. Note spillway constructed on far bank.

Although dams and earth tanks for stock water are well known, the principle of individual farmers constructing water storages for irrigation purposes on their own properties is one which has received very little attention in Queensland. It is considered that the approach adopted by Mr. Newman is one which could be followed with profit on many farms where there are no running streams available, but where the topography is suitable for the construction of cheap water storage units.

Plate 3.

Near View of Spillway Shown in Plate 2.



The Honey Flora of South-Eastern Queensland.

S. T. BLAKE (Botanist) and C. ROFF (Adviser in Apiculture).

(*Continued from page 273 of the May issue.*)

Dogwood.

Botanical Name.—*Jacksonia scoparia* R. Br.

Other Common Name.—Broombush.

Distinguishing Features.—A bushy green shrub or small bushy tree with many long slender angular green branches and yellow pea-like flowers; there are usually no true leaves (Plates 78, 79).

Description.—This is a green bush, usually developing a stem with dark grey, rough, fissured bark, in all up to about 12 ft. high but it sometimes flowers as a trunkless shrub. The branches are very numerous, very slender, angular, green, and often drooping. A few small narrowly oval leaves may be found but they are often absent. The young growth is silvery. The flowers are pea-like in shape, bright yellow and about $\frac{1}{3}$ in. across.

Distribution.—Scattered through the forest country of south-eastern Queensland on sandy or stony soils. It is found as far north as about Rockhampton and south into New South Wales.

Usual Flowering Time.—August-October.

Colour of Honey.—Unknown.

Importance as Source of Honey.—Minor.

Importance as Source of Pollen.—Medium.

General Remarks.—Dogwood is a valuable and dependable source of pollen which is gathered eagerly by bees. This pollen is very stimulating, and colonies build up rapidly when flowering is profuse.

The nectar is of minor importance.

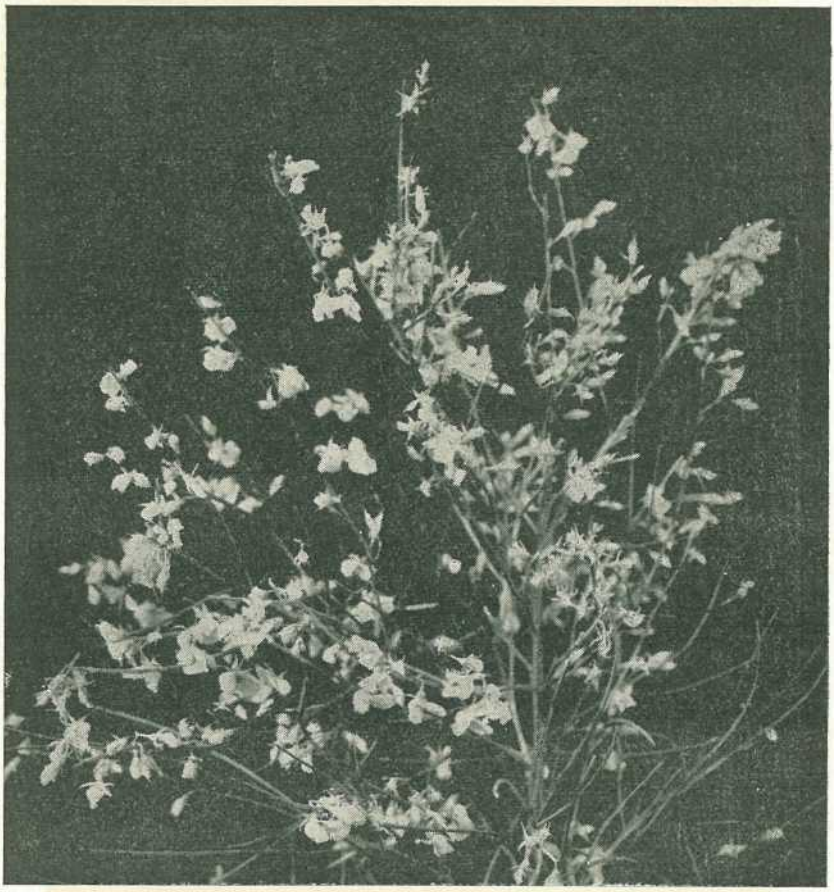


Plate 78.
Dogwood (Jacksonia scoparia). Flowering twigs.

Plate 79.

Dogwood (Jacksonia scoparia). Mt. Gravatt.

[TO BE CONTINUED.]

PLANT PROTECTION

The Control of Common Pests of Citrus in Central Queensland.

T. MANEFIELD and T. PASSLOW, Assistant Entomologists.

Insect attacks on citrus may cause fruit blemish, reduced yields and damage to trees.

In central Queensland, the major causes of fruit blemish by pests are Maori mite* infestations, and sooty mould resulting from the presence of pink wax, soft, and white wax scales. Hard scales, such as red scale, mussel scale and circular black scale, and white louse also become encrusted on the fruit, as well as on the leaves and branches, when reduced yields and tree damage may result. Fruit fly attacks can reduce crop yields severely and spectacularly during late autumn and early spring.

Effective control of these citrus pests depends primarily on four factors: a sound appreciation of the economic value of control measures; ready recognition of the different pests; the correct timing of the appropriate spray; and thoroughness of spray application.

In central Queensland at the present time, citrus is grown to supply local market demands during the harvesting period. Because of this economic condition, and the complexity of the pest position and climatic conditions, attempts to raise fruit appearance to standards required by metropolitan markets would be economically unsound. A schedule has been designed, therefore, to give with a

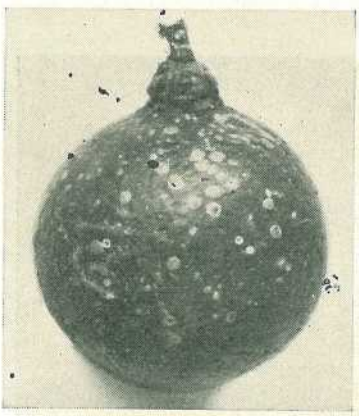


Plate 1.
Red Scale on a Young Mandarin.

Plate 2.
White Louse on a Small Branch of a Citrus Tree.

* A list of scientific names of the pests referred to appears at the end of this article.

minimum of spraying a suitable standard of fruit appearance and reasonable tree protection.

In the wet humid coastal districts, soft scales and wax scales accompanied by sooty mould are the most troublesome, while in the drier, inland areas hard scales predominate, particularly where irrigation is used. It will be noted that allowance is made in the schedule for this pest distribution.

Maori mite and its damage and sooty mould are the only causes of fruit blemish for which descriptions and comments may be required to supplement the illustrations.

The mite itself is yellowish, tapering to the posterior end, and hardly visible to the naked eye. Its feeding does not produce an immediate blemish, and may be unnoticed unless a careful watch is kept during the warmer months. The dusty appearance of fruit, sometimes called "gold-dust", is an early warning of mite attack and

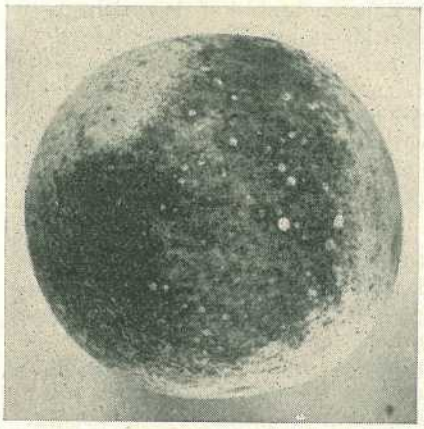


Plate 3.

An Orange Discoloured by Maori Mite. Red scale is also present.

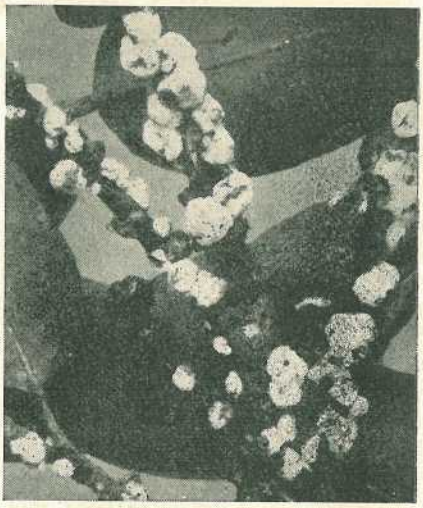


Plate 4.

White Wax Scale on a Citrus Branch.

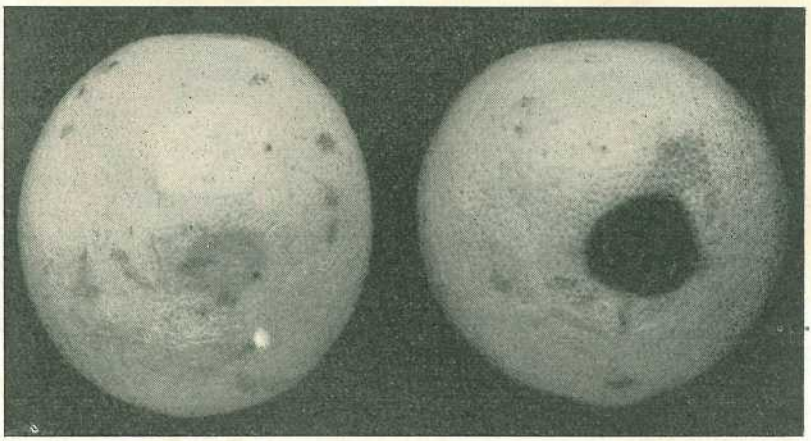


Plate 5.

Lemons Showing Fruit Fly Damage.

indicates that immediate spraying is necessary. Eventually, if mite feeding is allowed to continue, a dark brown discolouration of the rind of oranges and mandarins is produced, whilst on lemons it causes a silver-grey appearance, sometimes with surface cracking.

Sooty mould is composed of the massed threads of a number of fungi which are not parasitic on the plant but grow in the sug..ry secretion or honey-dew produced by some of the scale insects. When these are eliminated the mould dies, and is removed eventually by rain and wind.

ROUTINE SCHEDULE.

Midwinter.

A lime sulphur spray is essential in all districts for the control of Maori mite and white louse. A complete tree cover at a strength of 1:15 should be applied, preferably in July after the crop has been harvested. If at this time fruit is still hanging, as for example with Late Valencias, the lime sulphur strength should be reduced to within the range of 1:20 to 1:25.

Early November.

Apply a wettable sulphur spray according to label directions for the control of Maori mite.

Summer.

Scalicides.

In coastal districts with a mixed scale population, chiefly wax scales and soft scales, the following mixture should be applied in early December.

Washing soda .. (or soda ash 4½ lb.)	12 lb.
Soft soap	6 lb.
White oil	2 gallons
Water	100 gallons

In drier districts where mainly hard scales are present, two white oil sprays at a strength of 1:60 should be used in early December with a fortnight between applications.

Miticides.

A further wettable sulphur spray should be applied only if Maori mite is active.

Warnings.

(1) To avoid fruit drop and other damage, applications of oil sprays and sulphur sprays must be separated by at least three weeks.

(2) Oil, soda, and lime sulphur sprays can cause severe damage to drought affected trees. When the dry conditions ease, the grower may use his discretion as to the application of the most suitable spray. In irrigated

Plate 6.
Soft Brown Scale on a Mandarin Leaf.

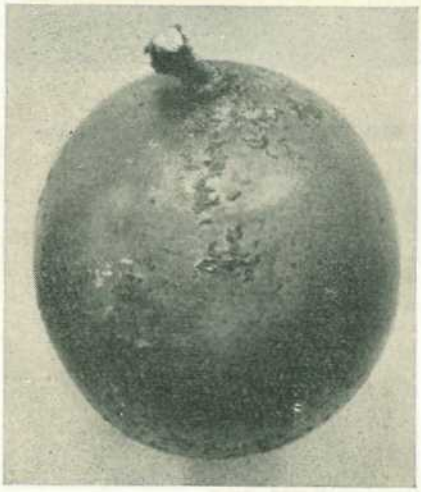


Plate 7.
Meyer Lemon Infested With Mussel Scale.

orchards, the spraying practice need not be varied, as trees can be watered before spraying.

(3) When daily temperatures are persistently over 90 deg., sprays should be applied early in the morning, and operations should cease when the temperature rises above this reading.

FRUIT FLY CONTROL.

A 0.2% DDT spray applied at fortnightly intervals during periods of fruit fly activity will give excellent control of this pest in citrus. The spray should be aimed at the inner side of the tree canopy, using 1 gallon per tree on large trees. With the continued use of DDT, abnormal activities of mite and scale populations have been experienced by most growers. Strict attention therefore must be given to the routine schedule for the control of these pests.

CLEANING THE FRUIT.

Should it be necessary to remove sooty mould from fruit, this may be done efficiently in the packing shed by the use of one of the modern detergents. The fruit should be dipped in a 1 in 2,000 solution, brushed, and then allowed to dry well before being packed.

Plate 8.
Pink Wax Scale Infestation on Leaves.

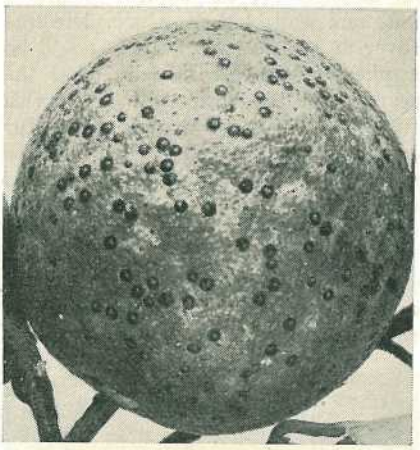


Plate 9.
Fruit Infested With Circular Black Scale.

Scientific Names of Pests.

Circular black scale	*Chrysomphalus ficus* Ashm.
Fruit fly	*Strumeta tryoni* (Frogg.)
Maori mite	*Phyllocoptruta oleivora* (Ashm.)
Mussel scale	*Lepidosaphes beckii* (Newm.)
Pink wax scale	*Ceroplastes rubens* Mask.
Red scale	*Aonidiella aurantii* (Mask.)
Soft scales	*Coccus hesperidum* L. *Pulvinaria cellulosa* Green.
White louse	*Unaspis citri* (Comst.)
White wax scale	*Ceroplastes destructor* Newst.

Agricultural Chemistry

Boron as a Plant Nutrient.

J. D. HUGHES, Analyst, Plant Nutrition Section.

In recent times increasing importance has been attached to the role of boron in agriculture. It is now realised that adequate amounts of this element in the soil are essential to healthy plant growth.

Many crop failures at one time attributed to other causes are now known to be due to boron deficiency, and large areas of land previously thought to be non-productive are contributing to the nation's wealth through the use of boron and other trace element fertilizers.

The exact function of boron in plant metabolism is not known, but it has been shown that a relation does exist between calcium and boron in the growing plant, and there is some evidence to suggest that the availability of calcium to the plant from the soil is dependent on the presence of adequate supplies of boron.

The plant will make normal growth only when the balance between calcium and boron is maintained, and for this reason, heavy applications of lime to an acid soil can so unbalance the calcium/boron ratio that symptoms of boron deficiency may become evident immediately.

If the balance is upset by a small intake of calcium, such as occurs on very acid soils, the plant will have a low tolerance for boron. On strongly acid soils, therefore, even small additions of boron applied to the soil could cause boron injury.

Care must be exercised at all times when applying boron to the soil, so that the recommended rates of application are not exceeded.

Testing for Deficiency.

The need for addition of boron to the soil can be confirmed in two ways, either by observing deficiency symptoms in the plant itself, or by the chemical determination of the amount of available boron in the soil.

The observation of leaf symptoms has found wide favour among technical men, using indicator plants in trial plots. However, symptoms of boron deficiency appear in a plant only when the available boron in the soil falls to a very low value. For this reason, response to boron is often obtained when actual leaf symptoms of deficiency are not present; the absence of such symptoms, therefore, is not a completely reliable indication that the plant is not suffering from boron deficiency.

Signs in Crops.

Where signs of a deficiency do appear, they are not difficult to recognise in the field.

Garden beet exhibit the condition known as "heart rot." The crown leaves die and the crowns themselves become covered with small deformed leaves. The roots may rot on the crowns and down the sides, and present a wrinkled and cracked appearance. On cutting the root, dark necrotic areas will be seen around the edges, and in severe cases these may extend towards the centre.

Boron deficiency is common in cauliflowers. It causes stunting and deformation of the leaves surrounding the head, the head itself being of reduced size and covered in brown patches. Brownish water-soaked areas appear in the flesh and stalks. Curling of the leaves may be noticeable, and in some cases there is poor root development.

In the case of boron deficiency in lucerne, the terminal leaves turn to a yellowish or yellowish red colour and the plant has a generally stunted appearance.

Tobacco is of considerable interest in regard to boron deficiency, since this crop is being grown, in some parts of Queensland at least, on soils which are deficient in boron. The symptoms exhibited on leaves from these plants were distorted growing points, while the older leaves became darker green in colour and thickened considerably. It is hoped that applications of boron will help towards the production of high-grade leaf from these areas.

Chemical Tests.

Chemical tests can be made to determine the amount of boron present in a soil, but the figures obtained are at best only a guide, since there is a wide variation in the capacity of various plants for absorbing boron. However, chemical analysis combined with field observations has proved invaluable in correcting many cases of boron deficiency in this State. In general, if the soil contains less than 0.5 parts per million water-soluble boron, plants growing in this soil could be expected to show response to boron.

Knowing the amount of boron in the plant itself can also be useful in determining the value of a field trial. This knowledge has been used on tobacco trials in Queensland, where a higher boron content of leaves from a treated area has confirmed a suspected increase in uptake of boron from the soil.

Correcting Deficiency.

Where boron deficiency exists in a soil, it can be corrected by an application of borax, a chemical containing appreciable amounts of boron. In Queensland, for small crop farming, boron deficient soils will respond to applications of borax at the rate of 10-20 lb. per acre, but amounts in excess of this should be avoided unless specially recommended.

While boron is essential to growing plants, it must be remembered that it is required in only very small amounts, and an excess can easily ruin a whole crop. It occurs widely in nature and is present in most soils in sufficient amounts. Its occurrence in soils is mainly as the mineral tourmaline, a form in which it is not readily available to plants. Processes in the soil itself convert small quantities to an available form, and for this reason, the probability of boron toxicity in virgin soils is low. However, the margin separating the amount of boron in a deficient soil and that which may be toxic to plants is narrow. Hence, great care must be exercised in the application of fertilizers containing boron.

Some crops, such as cucumbers and beans, are very sensitive to boron, whereas beet and cauliflowers can stand comparatively heavy applications.

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ANIMAL HEALTH

St. George Disease of Cattle.

M. S. STEVENS, Assistant Veterinary Officer, Veterinary Services Branch.

St. George disease of cattle is a disease characterised by the development of extensive swellings under the skin of the head, neck and brisket. Its cause is unknown, but a deficiency of some kind is thought to be involved. Cattle of all types and ages are affected.

The disease is of considerable economic importance, causing a great loss of production in affected areas in years when it is prevalent.

History.

The earliest reports of this disease came from the St. George district; hence its name. It was first investigated there in 1938, but it had probably occurred in the area for at least 10 years previously. During the years 1939-1943, it was again present on properties in the St. George district, and isolated outbreaks occurred in the Cunnamulla, Roma and Chinchilla districts.

All the cases investigated up to this time had occurred on inferior type sheep country where cattle were run as a sideline. However, in 1945 cases were observed in the Rockhampton district, on a reserve consisting of good heavy soil, but badly eaten out. A further extension occurred in 1946, when many cases occurred on one property near Aramac and several properties in the spinifex country between Barcaldine and Yalleroi.

Plate 1.

St. George Disease. Showing swelling between the two bones of the lower jaw, an early stage of the disease. It is necessary to differentiate this type of case from the "bottle jaw" of worm infestation in young stock.

Affected Country.

The great majority of outbreaks occur on properties of similar soil type and pasture cover. These are the poorer type of light red sandy soils, carrying mainly box, ironbark, sandalwood and cypress pine, with wiregrass (species of *Aristida*) the main pasture cover. The affected properties in the Barcaldine-Yalleroi area were of similar soil types, but carried a spinifex pasture cover in place of the wiregrass.

The disease was invariably linked with these light soil types until in 1945 typical cases occurred on good quality heavy alluvial soil on the Angle Island Reserve, Rockhampton. Then, early in 1946 it appeared on a first class property at Aramac consisting of heavy black-soil Mitchell grass country. In May, 1948, it occurred on good Rhodes grass country in the Proston district.

Plate 2.

Swelling of the Brisket Causes This Animal to Hold the Right Foreleg, Shoulder Blade and Upper Arm Well Away from the Body.

Since that time, the disease has appeared periodically on properties in the light-soil regions, but it has never again been reported from heavier types of country.

In March, 1952, the disease occurred in hilly granite and traprock country in the Warwick area, the pasture being composed mainly of spear grass of the southern type (species of *Stipa*).

Seasonal Incidence.

It appears that a period of some months on dry, coarse feed is necessary to render the animals susceptible. Following a dry winter with no rain in the spring or early summer, cases begin to develop. Should this state of affairs continue, a few affected animals can be found on most properties in the affected areas. If this is followed by a moderate fall of rain giving a quick shoot to herbage and natural grasses, large numbers of cattle may rapidly develop the disease, and losses may be heavy. If the rain is sufficient to establish good green feed, the affected animals will recover rapidly, within a week in some cases. The condition will not re-appear until another predisposing dry period is experienced.

Most cases, then, appear from early November till the end of January. However, this is not invariable and cases have occurred at Roma in August and in the spinifex country in July. Summer heat, therefore, is not consistently associated with the condition.

Animals Affected.

The disease affects only cattle. All the breeds and types are susceptible at any age. Calves three months old have been affected, as have aged bulls, bullocks and cows. Generally, animals in the 18 months to 2 years age group are most commonly affected.

Beef cattle appear to be more resistant than dairy cattle, for when the disease appears on a property running both types, the dairy cattle are the first to show signs.

The condition of the animals is not important. Cattle in fair condition may develop the disease while poorer cattle on the same property do not.

Symptoms.

The first sign of the disease is a profuse, dark, foetid scouring. With this appears a soft swelling, generally about the size of a tennis ball,

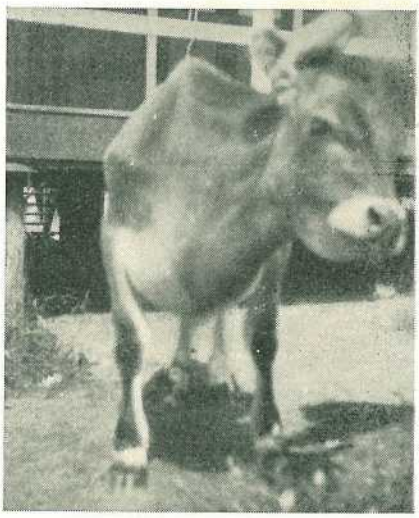


Plate 3.

Front View of the Animal Shown in Plate 2.

between the two bones of the lower jaw. This swelling enlarges and may spread to the face and lips, greatly enlarging the size of the head. The lower part of the neck becomes swollen and the brisket enlarges to an enormous size. The swelling may or may not extend down the front legs and under the belly.

Loss of condition is rapid, so the animal becomes thin along the back and hindquarters. An advanced case presents a peculiar appearance with its large head, brisket and forelegs, coupled with a thin back, rump and hindlegs. The coat becomes rough and stary, adding to the general picture of misery. Animals may remain in this condition for several weeks before they recover or die.

The membranes round the eyes and lining the inside of the lips are always very pale. The animal's temperature is normal (100.5°–103°), whilst the breathing becomes rapid and shallow and the pulse weak.

There is no cough and no discharge from the eyes or nose.

Animals are disinclined to move and when forced to do so may die suddenly should they be in the advanced stages.

Differential Diagnosis.

In the early stages of the disease, when the swelling is only under the jaw, it may be confused with helminthiasis (that is, heavy worm burdens), this being particularly so with young stock.

The stock-owner can tell the difference by drenching with phenothiazine and otherwise guarding against worms, whereupon within one week the swelling should go provided the stock have enough fodder.

Individual animals, particularly of the dairy breeds, may show a large swelling of the neck and brisket when suffering from traumatic pericarditis (that is, when a piece of wire or some such sharp foreign body has passed from the reticulum (honeycomb) to the heart). In this case, more than one animal in a herd is unlikely to be affected at one time.

The best plan to adopt is always to contact your local Veterinary Officer or Stock Inspector when you suspect sickness in your stock.

Post-mortem.

When the skin over the swellings is cut, literally gallons of pale, clear fluid will drip away. This is oedema fluid and consists of blood from which the red corpuscles have been removed.

As much as 10 gallons of this fluid may be found in the chest cavity. The lungs will be "waterlogged" up to the level of this fluid. The heart is invariably pale and flabby.

Fluid may also be present in the abdominal cavity.

The liver is often discoloured and mottled, thickened, congested, very friable, and almost pulpy.

The lining membrane and walls of the intestines are very pale. Sand and gravel are frequently found in the fourth stomach (abomasum), in the first part of the intestines (duodenum), and in the caecum. Very little internal fat will be found.

The spleen is pale and shrunken and the kidneys pale and watery.

Cause of the Disease.

No harmful bacteria have so far been found in affected animals and the disease has not been transmitted from one animal to another. The indications are therefore that the disease is not contagious.

It is thought by some investigators that the disease may be caused by a deficiency of certain essential items in the diet known as amino-acids.

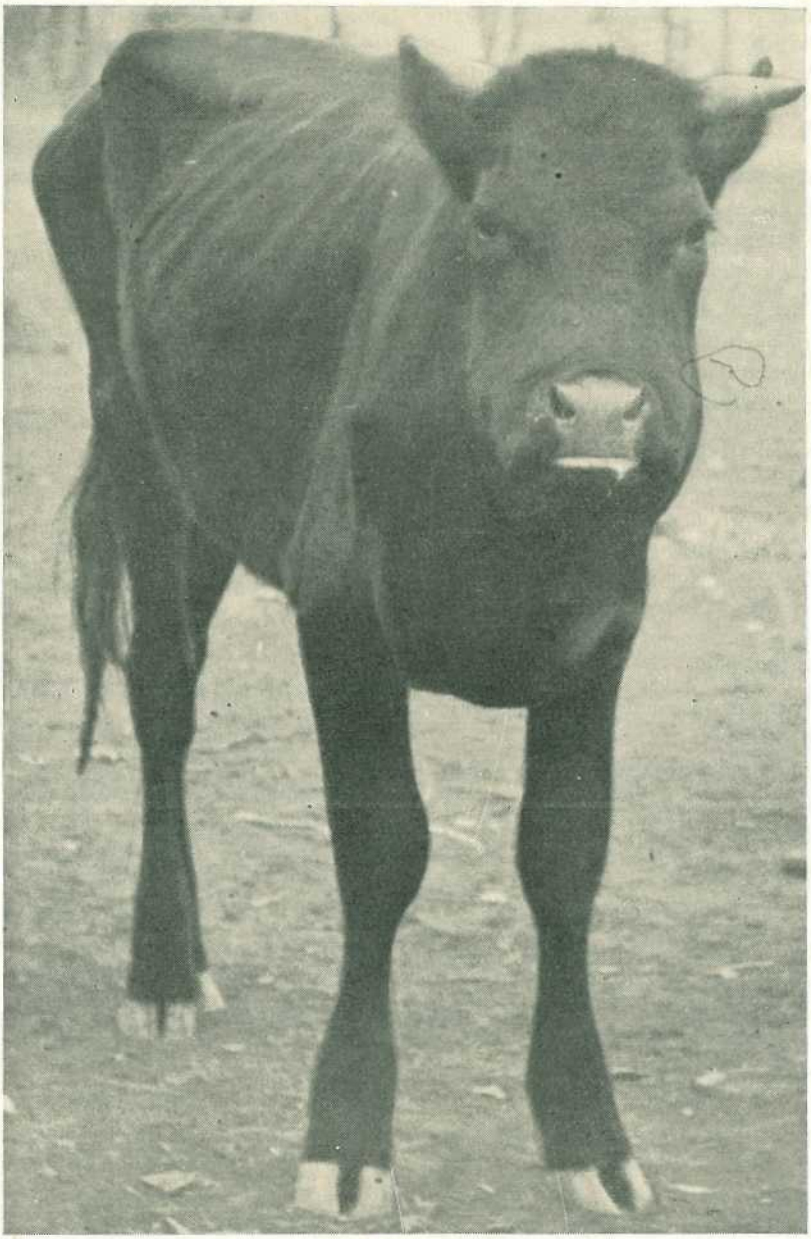


Plate 4.

Swelling of the Face, Legs and Brisket is Shown by this Affected Beast.

Amino-acids are the components which, when put together in various ways, form the different proteins found in grass and other types of food. Several of these amino-acids contain sulphur and are essential for the proper working of the liver. If one or more of these amino-acids become sufficiently scarce in the pastures on affected country, following certain seasonal conditions, the theory is that St. George disease will appear in cattle grazing those pastures.

control is, of course, uneconomical when large numbers of cattle are involved, but it is a simple and effective method of treating stud stock and dairy herds.

Many affected animals will recover if meatmeal is added to the diet. It may be administered as a lick, consisting of 10% by weight of meatmeal in a mixture of 1 part of salt and 2 parts of bonemeal.

The difficulty with this treatment is to get the cattle to eat the meatmeal

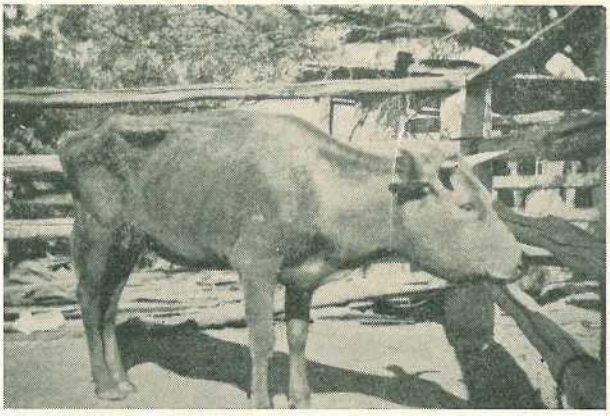


Plate 5.

Swelling of the Face is Shown in this Case.

Control by Management.

If possible, stock should be moved from light sandy country to heavier country, preferably river frontage. This will usually result in an immediate improvement with ultimate recovery and no further cases will develop.

Some owners claim that shifting cattle onto mulga scrub will hold them satisfactorily until the susceptible season is over.

Control by Supplementary Feeding.

Animals fed on lucerne hay or good quality wheaten hay generally recover within 2–3 weeks. This method of

for a start, though once they have taken to it they will eat it avidly. Mixing 1 part of coarse salt with 2 parts of meatmeal and sprinkling molasses over the mixture will often induce cattle to take it if needs be.

Control by Drenching.

Various drenches usually containing copper and cobalt trace elements have been tried, but have not been found of any benefit.

Incising Swellings.

On no account should the swelling be incised to drain out the fluid, as this only weakens the animal further and is of no benefit.

Brucellosis Testing of Swine.

A herd listed by the Department as "brucellosis tested" is one in which all such animals as may be determined by the Director of the Department's Division of Animal Industry have been subjected to two successive tests for brucellosis, at intervals determined by him, without any positive reactors being found.

In order for a herd to be retained on the list of Tested Herds, a semi-annual or annual re-test of the herd, as determined by the Director, is required. If at a re-test any animal gives a positive reaction to the test the herd is removed from the list; it is not listed again until subsequent tests, as determined by the Director, have been carried out.

TESTED HERDS (As at 17th May, 1954).

Berkshire.

S. Cochrane, "Stanroy" Stud, Felton
G. Handley, "Handleigh" Stud, Murphy's Creek
J. L. Handley, "Meadow Vale" Stud, Lockyer
R. G. Koplick, "Melan Terez" Stud, Rochedale
O'Brien and Hickey, "Kildurham" Stud, Jandowae East
E. Pukallus, "Plainby" Stud, Crow's Nest
G. C. Traves, "Wynwood" Stud, Oakey
E. Tumbridge, "Bidwell" Stud, Oakey
Westbrook Farm Home for Boys, Westbrook
M. K. Collins, "Kennington Stud, Underwood Road, Eight Mile Plains
H.M. State Farm, "Palen" Stud, Palen Creek
A. R. Ludwig and Sons, "Cryna" Stud, Beaudesert
H. H. Sellars, "Tabooba" Stud, Beaudesert
D. T. Law. "Rossvill" Stud, Trouts road, Aspley
R. H. Crawley, "Rockthorpe" Stud, *via* Pittsworth
F. R. J. Cook, "Alstonvilla," Wolvi, *via* Gympie
Mrs. I. M. James, "Kenmore" Stud, Cambooya
H. L. Stark ," Florida," Kalbar
J. H. N. Stoodley, "Stoodville," Ormiston
H.M. State Farm, Numinbah
V. G. M. and A. G. Brown, "Bardell," Goovigen
R. E. Paulsen, "Crest" Stud, Binjour Plateau, M.S. 670, Gayndah
M. G. and R. H. Atkins, "Diamond Valley" Stud, Mooloolah
L. Puschmann, "Tayfeld" Stud, Taylor
Dr. B. J. Butcher and A. J. Parnwell, 684 Logan road, Greenslopes
W. F. Ruhle, "Felbar" Stud, Kalbar
C. E. Edwards, "Spring Valley" Stud, Kingaroy
G. J. McLennan, "Murcott" Stud, Willowvale
H. M. Wyatte, "Deepwater" Stud, Rocky Creek, Yarraman
C. F. W. and B. A. Shellback, "Redvilla" Stud, Kingaroy
R. J. Webber, "Webberberry" Stud, 35 Caxton st., Petrie Terrace
J. C. Lees, "Bridge View" Stud, Yandina
F. Thomas, "Rosevale" Stud, M.S. 373, Beaudeser

Large White.

H. J. Franke and Sons, "Delvue" Stud, Cawdor
Garrawin Stud Farm Pty. Ltd., 657 Sandgate road, Clayfield
J. A. Heading, "Highfields," Murgon
K. B. Jones, "Cefn" Stud, Pilton
R. G. Koplick "Melan Terez" Stud, Rochedale
R. Postle, "Yarralla" Stud, Pittsworth
B. J. Jensen, "Bremerside" Stud, Rosevale, *via* Rosewood
E. J. Bell, "Dorne" Stud, Chinchilla
L. C. Lobegeiger, "Bremer Valley" Stud, Moorang, *via* Rosewood
H. R. Gibson, "Thistleton" Stud, Maleny
H.M. State Farm, Numinbah
K. A. Hancock, "Laurestonvale" Stud, Murgon
V. P. McGoldrick, "Fairymeadow" Stud, Cooroy
S. T. Fowler, "Kenstan" Stud, Pittsworth
H. L. Larsen, "Oakway," Kingaroy
C. Allison, "Colrene" Stud, Lake and Reserve roads, Slacks Creek
Mrs. I. G. Utting, "White Lodge," Mountain road, Cooroy
N. E. Meyers, Halpine Plantation, Kallangur
Dr. B. J. Butcher and A. J. Parnwell, 684 Logan road, Greenslopes
G. I. Skyring, "Bellwood" Stud, *via* Pomona
O. J. Horton, "Manneum Brae" Stud, Manneum, Kingaroy
M. E. Bryant, "Maryland Brae" Stud, Blunder road, Oxley
Miss G. R. Charity, Coondoo, Kin Kin.
W. J. Blakeney, "Talgai" Stud, Clifton
F. K. Wright, Narangba, N. C. Line
O. B. Vidler, Manneum, Kingaroy

Tamworth.

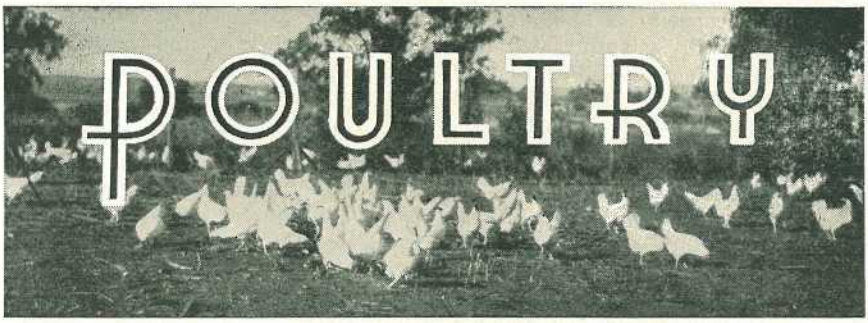
S. Kanowski, "Miecho" Stud, Pinelands
N. R. Potter, "Actonvale" Stud, Wellcamp
D. F. L. Skerman, "Waverley" Stud, Kaimkillenbun
A. C. Fletcher, "Myola" Stud, Jimbour
Salvation Army Home for Boys, "Canaan" Stud, Riverview
A. J. Surman, "Namrus" Stud, Noble road, Goodna
Departmen of Agriculture and Stock, Regional Experiment Station, Kairi
E. C. Phillips, "Sunny View," M.S. 90, Kingaroy
F. N. Hales, Kerry Road, Beaudesert
T. A. Stephen, "Withcott," Helidon
W. F. Kajewski, "Glenroy" Stud, Glencoe
A. A. Herbst, "Hillbanside" Stud, Bahr Scrub *via* Beenleigh
R. G. Koplick, "Melan Terez" Stud, Rochedale
H.M. State Farm, Numinbah
D. B. Alexander, "Debreczen" Stud, Kinleymore *via* Murgon
Dr. B. J. Butcher and A. J. Parnwell, 684 Logan road, Greenslopes
M. E. Bryant, "Maryland Brae" Stud, Blunder road, Oxley
G. H. Sattler, Landsborough
F. Thomas, "Rosevale" Stud, M.S. 373, Beaudesert
P. V. Campbell, "Lawn Hill" Stud, Lamington
H. J. Armstrong, Alhambra," Crownthorpe, Murgon

Wessex Saddleback.

W. S. Douglas, "Greylight" Stud, Goombungee
D. Kay and P. Hunting, "Kazan" Stud, Goodna
J. Gleeson, "Iona Vale" Stud, Kuraby
C. R. Smith, "Belton Park" Stud, Nara
H. H. Sellars, "Tabooba" Stud, Beaudesert
H. Thomas, "Eurara" Stud, Beaudesert
D. T. Law, "Rossvill" Stud, Trout road, Aspley
J. B. Dunlop, "Kurrawyn" Stud, Acacia road, Kuraby
A. Curd, "Kilrock" Stud, Box 35, Jandowae
F. K. Wright, Narangba, N. C. Line
C. Allison, "Colrene" Stud, Lake and Reserve roads, Slacks Creek
R. A. Collings, "Rutholme" Stud, Waterford
M. Nielsen, "Cressbrook" Stud, Goomburra
G. J. Cooper, "Cedar Glen" Stud, Yarraman
M. E. Bryant, "Maryland Brae" Stud, Blunder road, Oxley
A. H. Groves, "Kinvara" Stud, Ingleside, West Burleigh
J. E. Heath. "Springlea" Stud, Murgon
Mrs. R. A. Melville, "Wattledale Stud," Beenleigh road, Sunnybank

British Large Black.

W. F. Ruhle, "Felbar" Stud, Kalbar



Brooding Chickens.

Part 2. Brooding in Practice.

F. N. J. MILNE, Husbandry Officer, Poultry Branch.

When people with limited finance commence poultry farming on new ground, the first building or buildings they would erect would be those with the greatest utilitarian value.

Such buildings would be laying sheds, because during the period of gradual development and expansion, sections of laying houses can act as a brooder room, weaning shed, feed room and egg room. It might be mentioned that a number of the successful long-established farms of today in Queensland began in this way.

Because of the urgent necessity for an early return, provision is then made for further expansion of laying quarters without overmuch thought being given to providing a special place where chicks may be brooded. For the first two years the novice farmer can extemporise by brooding in portion of his laying accommodation. To keep on doing this is undesirable from a health point of view as well as leading to overcrowding.

Very early in the establishment of the farm, provision must be made for a proper "nursery" or brooder house as well as adequate rearing quarters when chicks are weaned from heat. It is not fully realised that the future egg potential of a laying flock is definitely influenced by the treatment received during the period prior to laying.

Placing the Brooder House.

As fairly frequent visits both by day and night must be made to the brooder house, it is logical to site it as close as health regulations permit to the farmer's dwelling. This is purely for convenience.

However, the brooder house should also be situated as far as practicable from sheds occupied by adult birds. It has been proved that the incidence of leucosis with its various symptoms of paralysis, blindness and loss of condition can be lessened by rearing chicks in isolation for the first four weeks of life.

Whilst strict isolation such as can be achieved in the laboratories is not possible on a farm, it is thought that the segregation of young and adult stock will help to combat leucotic diseases with some degree of success.

The Brooder House.

The size of the brooder house depends on the system of brooding to be followed. A suitably sized building to house a "colony" or "hover" brooder with a capacity of 300 day-old chicks would measure approximately 14 feet by 16 feet with a minimum height of 6 feet. The roof may be either hip or skillion.

A similar floor area where battery brooders are to be used would permit the use of three 4-tier battery brooders

with a total capacity of 1,800 day-old chickens. It will be appreciated that in a brooder house designed to hold tiered battery brooders the roof would have to be considerably higher.

Irrespective of the system of brooding, the brooder house should provide draught-free ventilation and ample light. The house itself may be built of timber, iron or asbestos-fibro cement. In the colder areas of the State, for example on the Darling Downs, consideration could be given to lining and ceiling the brooder room with fibro-cement. For economy sake, jute sacks sewn together and whitewashed will serve.

The floor should be concreted and a thin concrete baffle wall sunk into the ground to a depth of at least two feet to prevent rats burrowing under the floor.

SYSTEMS OF BROODING.

The various methods of brooding used in Queensland may be classified broadly into two classes—"on the floor" and "on wire" brooding. Included in the all-embracing title of "on the floor brooding" are hover brooding, infra-red ray brooding and radiant heat brooding.

Hover Brooding.

The "hover" or "colony" brooder consists of a heater with a metal hover or canopy for deflecting and retaining the heat. The heating "unit" may be an electric element or lights, kerosene lamp or, as used very extensively in the years before the second world war, sawdust burners, which are simple in principle and simple to operate.

In some very large brooder houses in other States, hot water circulation systems are used to provide the necessary heat.

The "hover" system is the most popular method of brooding, for it allows relatively large numbers of chickens to be reared in batches in the one compartment from day-old to five or six weeks of age. It also permits much freer movement of chickens once they know where to find warmth, food and water.

Plate 1 depicts chickens only a few days old being brooded under the "hover" or "colony" system. You will observe the "surround" of netting and hessian to prevent floor draughts and to train the baby chicks to seek warmth under the brooder.

Although by the end of the first week chicks can have the run of the whole of the floor area of the brooder compartment, they are rapidly growing and their demands for more floor space are becoming more and more urgent. For that reason it is a wise precaution to put only two-thirds of the stated capacity of a hover brooder under the brooder.

Plate 2 shows week-old chickens with full range of the brooder house.

Infra-red Ray Brooding.

A modern development in rearing chickens has been the introduction of infra-red ray brooding. The infra-red ray brooder consists simply of an electric infra-red ray lamp or battery of lamps.

One lamp of 250 watts should provide sufficient heat for 100 chicks when suspended at a height of 16 inches above floor level, provided the house fitted with these lamps is free from draughts. Infra-red lamps are simple to operate and the initial installation is much cheaper than in the case of either "hover" or battery brooders. They have their disadvantages also. The lamps are fragile and may shatter should drops of water from condensation on the ceiling fall on them when they are operating. Operating costs are rather high, as each lamp draws 250 watts. Should an electrical failure occur, heat is immediately lost, as there is no canopy or "hover" to assist in retaining the heat.

Radiant Heat Brooding.

A system of "on the floor" brooding which is used extensively in the United States is radiant heat or heated floor

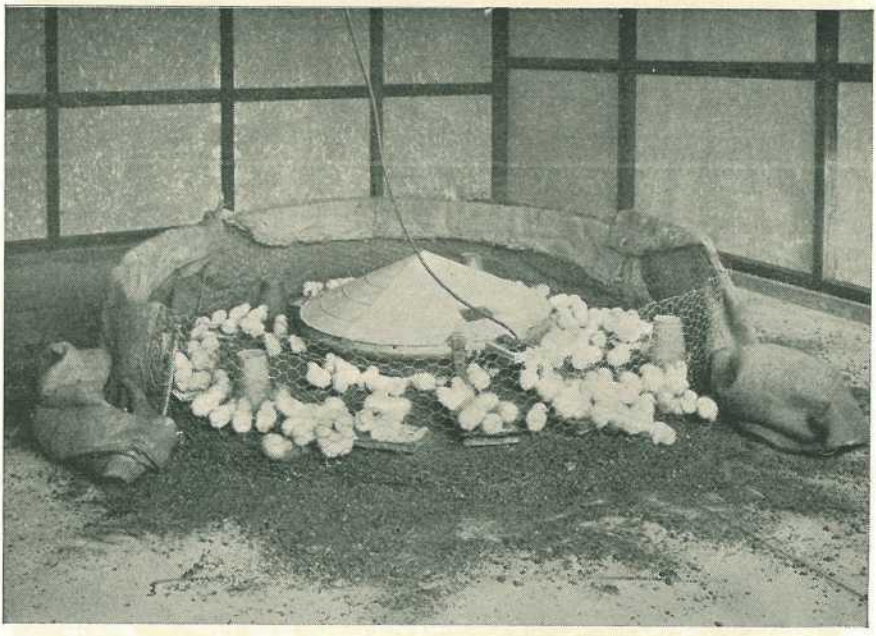


Plate 1.

A Colony Brooder Heated by Electricity. When chickens are first placed under the brooder they should be confined to within one foot of the outside edge and their range increased from day to day.

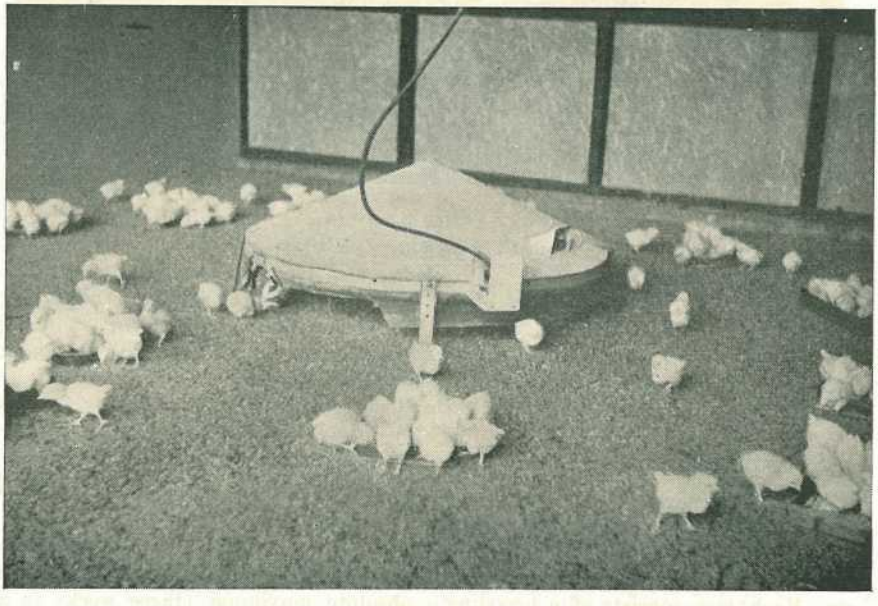


Plate 2.

Colony Brooding. Week-old chicks, with full range of the brooder house.

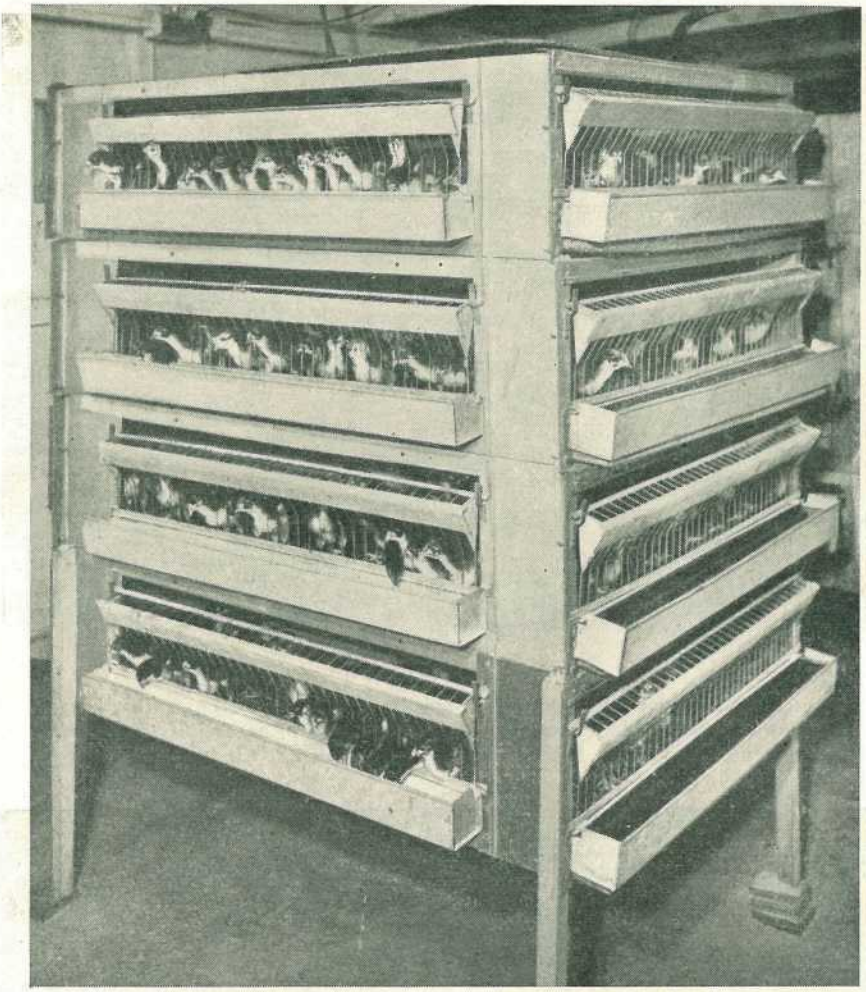


Plate 3.
Chickens in a Battery Brooder.

brooding. The installation of this system requires the use of electric heating cables or hot water pipes buried in the concrete floor of the brooder house.

Battery Brooding.

Battery brooders, since they are built in tiers, enable many more chicks to be handled in a given floor space than with "hover" systems of brooding. Each deck consists of a brooding compartment and a section completely enclosed with wire where chicks are fed and watered in troughs which hang on the outside of each deck. The floors are made of woven wire with dropping trays underneath. Heating may be by electric element or kerosene. The main advantage lies in the ease and convenience with which a large number of chicks can be brooded in a small area at any one time.

Chickens cannot be kept in them for any longer than four weeks as an absolute maximum (three weeks is a working maximum) without detriment to themselves. Unless rearing quarters

are available sufficiently roomy to cope with the large numbers brooded, you can realise how the early advantage to be gained from battery brooding can end as a definite liability.

As with "hover" brooding, the capacity of each battery brooder as stated by the manufacturers should be accepted with reservation, two-thirds of the stated capacity being put in the brooder at day-old.

Whilst the tendency to-day is to brood chicks in big numbers, it is felt that the maximum number started under a brooder should not exceed 250. E. C. Young, of the Indiana Experiment Station, recorded the percentage of mortality to 13 weeks of age in relation to number of chickens started per brooder. The results obtained were—

No. of Chicks Started per Brooder.	Percentage Deaths up to 13 Weeks.
Up to 250	5·1
251–349	11·0
350–449	15·3
450 or more	19·1

Chicks maintained in a battery brooder to four weeks of age do not have early contact with the floor and therefore do not have a chance to build up a degree of resistance to some poultry diseases. It is particularly noticeable that caecal coccidiosis appears to affect chicks which have been battery brooded and then put on the floor more severely than chicks reared on the floor since day-old.

Plate 3 shows Australorp cockerel chickens approximately 3 weeks old feeding and drinking through the grill-work sides of a battery brooder.

"ELBOW-ROOM" FOR CHICKENS.

To get the best results in growth, feathering and viability, avoid overcrowding. Chicks grow very rapidly, doubling their weight approximately every two weeks up to six weeks of age.

At least ¼ square feet of floor space should be provided for every chick to that age. Twice this amount is needed during the following six weeks, particularly if the birds are being reared intensively (that is, without access to outside runs).

Overcrowding also seems to provide a stimulus for an outbreak of feather and toe picking leading to cannibalism.

Not only was the mortality less when 250 chickens or fewer were started per brooder as compared with units of larger size, but it was also found that fewer pounds of feed were required per pound of chicken produced.

FEED TROUGHS AND WATER VESSELS.

One of the secrets of success in brooding chickens, apart from having warm quarters, is to induce them to eat and drink soon after they are put under a "hover" brooder or in a battery brooder. Water and feed must therefore be easily accessible so that they will learn to drink and eat readily. A number of small trough feeders about an inch deep, two to three inches wide and up to 12 inches in length may be used during the first few days.

When the chicks have learnt to feed, larger trough feeders perhaps slightly deeper but wider and longer should replace the small training troughs. These troughs should be fitted with a "spinner" to prevent chicks getting into them, thus avoiding food wastage and contamination by droppings.

At least 10 linear feet of hopper space should be allowed for every 100 chicks to 3 weeks of age. From this

age on to six weeks this should be increased to 20 linear feet (or 10 feet of double-sized hopper length).

As with feed vessels, a number of small drinkers should be used during the first few days of life. The water intake of a batch of chickens increases with age, so these small drinkers have to be replaced by several larger vessels holding a reasonable quantity of water. The design of these vessels should be of a "fountain" type, which, whilst it allows chickens to drink readily, is neither too wide nor too deep to allow chicks to scramble into and drown.

FLOOR LITTER.

From experience it has been found that the best litter to use on the floor when starting with day-old chicks under a colony brooder is coarse sand. It need not be spread over the whole floor but may be confined to the area within the "surround." Outside the surround, dry coarse pine sawdust or chips can be used. Coarse sand is preferable to sawdust within the surround, as baby chicks are not selective feeders at first. If they do eat the sand it can do them no harm and would provide grinding material for proper gizzard functioning, whereas the eating of sawdust could and has been responsible for "crop-binding" in chickens.

Deep or "built-up" litter is used fairly widely nowadays on commercial farms. This is quite satisfactory with adult birds and its use has been extended to the brooder house. In the United States, where use is made of old litter in houses for all ages of stock, the results have been very variable with chicks reared from day-old onwards. One veterinary authority stated that the large amount of ammonia liberated when "built-up" litter became damp caused severe inflammation of chickens' eyes. Large roundworms in young chickens had become a problem in many young flocks. Coccidiosis had also appeared in chicks reared on old litter at a much earlier age than heretofore experienced and had occurred during the winter months.

In view of some of the adverse reports on the use of "built-up" litter with chickens, the Ohio Agricultural Experiment Station, which pioneered its use in America, has recently re-examined "built-up" litter as a harbour for coccidiosis and the eggs of internal parasites such as roundworm, caecal worm and various species of tapeworms. The results of the investigations showed that rearing chicks on litter which had been used previously by older birds was fraught with danger, for the oocysts of coccidiosis and the eggs of internal parasitic worms were not destroyed by the composting action which converts the mixture of fresh new litter and droppings into powdery, dry "built-up" litter.

A SPECIAL RADIO SERVICE FOR FARMERS

* * *

The COUNTRY HOUR, a special service for farmers, is broadcast DAILY through the National and Regional Stations from 12 to 1.

Selection of the Boar and Sow.

E. L. MELVILLE, Senior Adviser, Pig Branch.

The foundation of a successful piggery is quality stock, well fed and efficiently managed. This can only be attained in the first instance by careful selection of the breeding stock.

Too many farmers in the past have been content to use any sort of sows and very often a boar of doubtful ancestry. This must reflect on the quality of our pig meats. The future outlook for pig raising points clearly to the demand for a more uniform type of pig and this can only be achieved by careful selection of breeding stock.

The choice of breed or breeds to select from is for the individual to make, but it would be unwise to purchase pigs of any but the more popular breeds. The more breeders of any one particular breed, the wider the range of selection can be.

Once the breed or breeds have been decided, the next step is to note those particular breeders who have consistently good records as regards type and prolificacy, and if possible favour the breeder who is making an effort to improve his type of stock by carcase appraisal.

The show-ring is a useful guide to type, although one must not be guided by show awards entirely. Inquiries should be made as to the competition encountered when such prizes were gained. A long string of prizes and champion ribbons is of little use in assessing the value of a stud if there

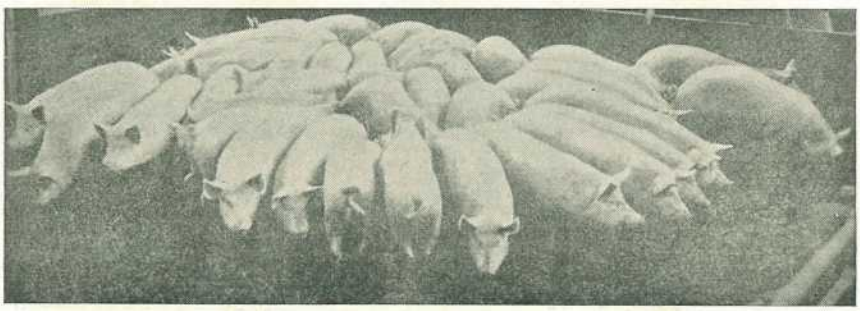


Plate 1.

Uniformity of Type is Required by the Trade and is an Indication of the Breeder's Skill and Management.

was little or no competition at the particular shows at which these awards were won.

Shows, and Royal Shows especially, in the opinion of the author, have been with the help of competent judges the means of raising type over the years to a level equal to that of any country in the world.

The statement is sometimes made that shows have done little to improve our standards, but how else has the improvement in our pigs been made? In the various carcase competitions held throughout Australia it will be found that the winners in every case claim ancestry to show stock. A competent show judge adjudicates with a definite type related to commercial requirements in mind.

While it is not necessary to purchase prize-winners, it will be found that certain families or strains within a breed have consistently good records of type and production and it is from these that selection should be made. A purchaser should always insist on seeing the parents of the animals it is proposed to buy, if at all possible, also any other progeny of the same breeding.

The age of the pig to buy depends upon the purchaser. Although the older the animal the more certain one can be of selecting the desired type, it is not good practice to select stock under the age of three months, and preferably six months.

The Boar.

The boar is a most important unit of the pig farm, as he will be the sire of all the pigs that are bred on the farm, which during his lifetime may number over 1,000. The wisdom of purchasing only the best strains is clearly demonstrated when the sire's capacity to reproduce is realized.

In conformation, the boar should have a good head typical of his breed, wide between eyes and ears with a bright intelligent eye, jaws well formed, not overshot or undershot when viewed from the side, with a well-formed neck of medium length and running smoothly into the shoulders, which should be wide between the front legs and well filled out behind the shoulder and elbow; avoid the pig that cuts in badly behind these points. The back should be straight or slightly arched, of good length without any dip over the loins,

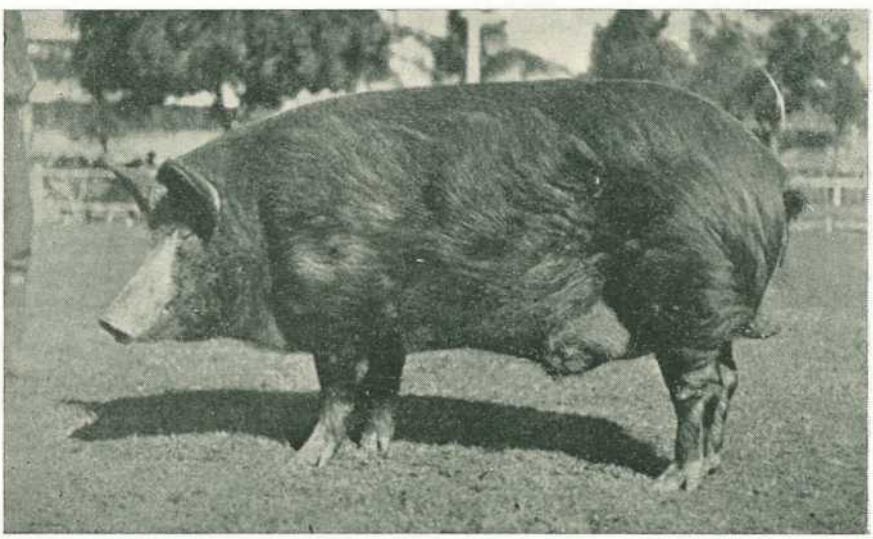


Plate 2.

Masculinity, Constitution and Type are Essential in a Sire.

ribs well sprung, hams well formed and fleshed down to the hocks and tail set reasonably high. The underline should be even and carry well through towards a flank which should be well let down and thick. The rudimentary teats should be well spaced and extending well forward towards the front legs and should be at least 12 in number. (Teat placing in the boar is important, as it will greatly influence the number and placing of his daughters' udders.) The legs should be straight, of medium length, and set evenly into the four "corners" of the body. The pasterns should be strong and short, slightly sloping to firm compact feet; avoid any splaying or crossing of the feet. The skin should be fine and free from wrinkles and covered with an abundance of fine straight hair. When viewed from the front or back the general conformation of the animal should be level along the sides and into the shoulders and giving that "trim" appearance so necessary for commercial requirements.

In general appearance the boar should carry himself with a proud and free action, having visual evidence of his masculinity, character, and constitutional vigour.

Careful handling of the boar when young will do much towards keeping him docile. Bad tempered strains should be avoided, as rarely are they "good doers."

The Sow.

In the selection of foundation stock for the brood sow herd, whether they be purebred or grade, uniformity of type and conformation is of paramount importance. Their ancestry, like that of the boar, should be the best available within the breed. They should come from a prolific family and show good body capacity, sound constitution and maternal characteristics. Docility and a mild temperament are good indications of mothering ability. There should be at least 12 sound and evenly placed teats extending well forward towards the front legs.

The sow's conformation is on similar lines to the boar's, but whereas the boar may be built on more compact and robust lines, the sow needs to be the feminine version of this type. This may be described as being constructed on a more refined framework without

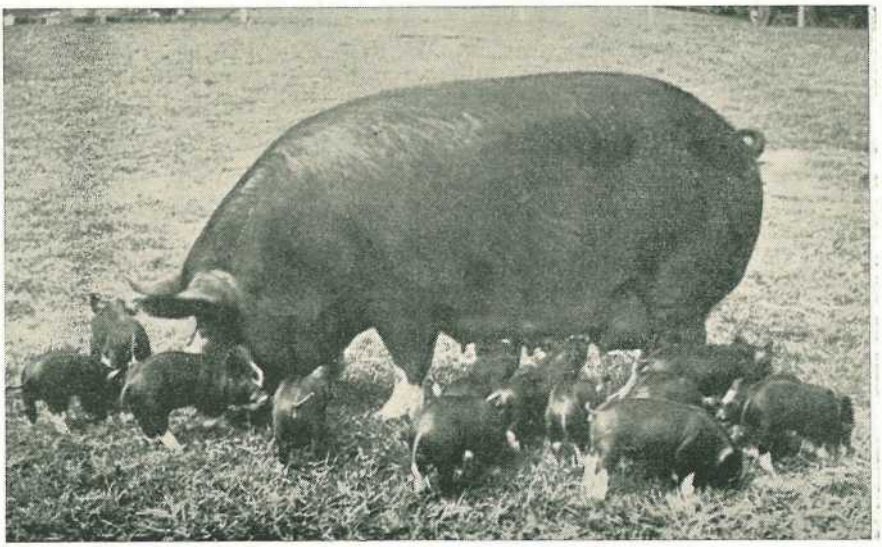


Plate 3.
Prolificacy and the Maternal Instinct are Necessary in the Brood Sow.

any loss of constitution or vigour; ample length and depth of body are essential for the accommodation of her unborn litter, and eventually to rear a large litter of healthy pigs.

Young sows should be well fed and kept growing until mature. They should not be mated until at least eight months of age.

Points to Remember.

Select only from the popular breeds and strains of proven blood.

Masculine vigour in the boar.

Maternal characteristics in the sow.

Constitution, character and commercial suitability.

Prolificacy and docility.

Well fed and housed, success should then be the reward.

INOCULATION OF LEGUME SEEDS.

★ ★

The Department of Agriculture and Stock supplies cultures of bacteria for the inoculation of seeds of legumes such as Poona pea, blue lupins, lucerne and clovers.

Seed inoculation is often necessary where the legume intended for planting has not previously been grown successfully, as it provides the plants with bacteria which are necessary for their full development.

Cultures are supplied free and post free. They are in bottles and have to be mixed with skim milk for sprinkling on the seed.

Order from the Under Secretary, Department of Agriculture and Stock, Brisbane, at least 10 days before sowing. State amount and type of seed to be treated.

Bone Flour as a Phosphate Supplement for Dairy Cows.

G. I. ALEXANDER, G. C. KENNY and GILLIAN DAVEY (Division of Animal Industry).

SUMMARY.

The addition of sterilized bone flour to the diet of a dairy herd affected by phosphorus deficiency gave a marked improvement in production even though the cattle had been receiving concentrates for some time previously.

The effect of feeding sterilized bone flour on the phosphate content of the blood (an indication of phosphate deficiency or sufficiency), and on the milk production of the herd, is reported and discussed in this article.

On many dairy farms in the coastal districts of Queensland the cattle suffer from a real or incipient phosphorus deficiency. Good milking cattle on winter pastures in these districts cannot obtain sufficient phosphate to replace that lost during the period of high summer production.

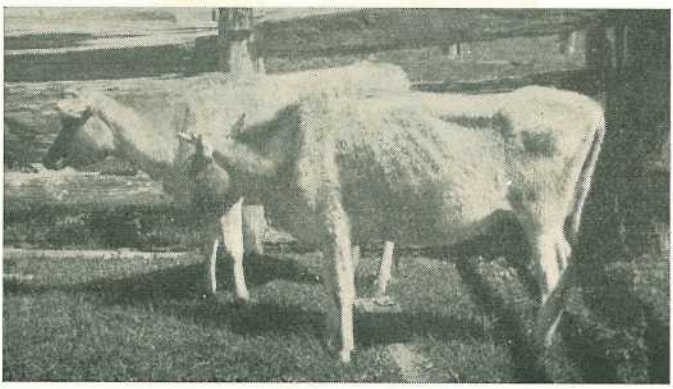


Plate 1.

Cows Showing Severe Symptoms of Phosphate Deficiency. Note poor condition and the retention of old hair.

The first sign of phosphorus deficiency is a decline in the inorganic phosphorus level of the blood plasma associated with a lowered and shortened milk production. This may be the only sign in the marginal or incipient type of phosphorus deficiency.

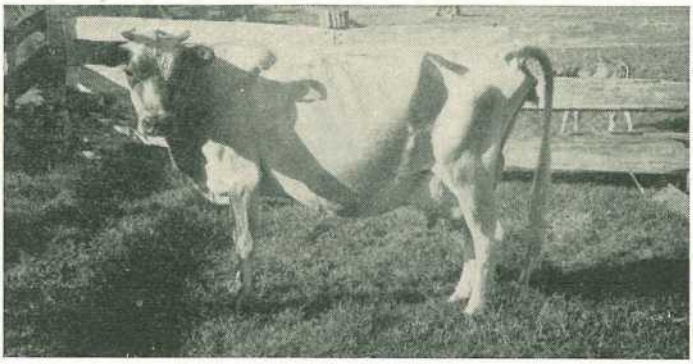


Plate 2.

A High Producing Cow Showing Early Symptoms of Phosphate Deficiency.

As the deficiency progresses, a roughened coat and lack of appetite become evident. Depraved appetite as shown by chewing of bones, rags or wood may be observed, usually in seriously affected animals. On the other hand, cows may suffer from severe phosphorus deficiency without having any depravity of appetite.

Plate 3.

Malformation and Late Eruption of Teeth, a Sign of Phosphate Deficiency.

In the long-standing deficiency, the animals may become stiff in the joints, and the bones become fragile. At this late stage, there is usually no evidence of bone-chewing.

History of Herd.

A pure-bred Jersey herd running on phosphorus-deficient country in the Gympie district has been kept under observation since 1950.

During 1949, this herd was not fed any supplement and was milked off pasture alone. Concentrate feeding was commenced in 1950. Although there was a considerable response to the concentrate feeding it was not as great as anticipated. Heifers on their first calf would cease lactating after a few months.

A number of heifers examined in June 1950 all showed some abnormalities. One aged 2½ years had only temporary teeth; one aged 3 years had no incisor teeth at all.

Several cows were bled and tests for blood inorganic phosphate carried out (Table 1). These showed that phosphorus deficiency was present in the herd.

TABLE 1.

INORGANIC PHOSPHATE IN THE BLOOD.*

Date of Sampling.	Cow No.†							
	1 3 Years.	2 Mature.	3 Mature.	4 Mature.	5 Mature.	6 4 Years.	7 4 Years.	8 Mature.
June, 1950	2·0	2·0	3·8	3·4	..	..	..	..
13–6–51	6·7	5·2	3·8	5·8	..	..	..	..
4–3–52	4·6	2·3	2·3	1·8	2·8	..	..	..
1–4–52	5·8	3·5	3·3	4·2	2·4	4·7	..	..
17–4–52	5·9	3·9	4·0	4·4	3·9	4·7	5·3	3·8
13–5–52	4·6	5·5	2·8	4·4	6·7	4·9	4·6	4·5
8–7–52	3·7	4·2	4·2	4·3	4·7	5·0	4·1	3·7
4–2–53	4·2	4·2	4·5	..	4·3	4·5	4·7	..

* 4.0 mg. per cent. is about the normal level.

† The age given is when first bled for analysis.

All milking cows were then fed a supplement of 3 oz. of sterilized bone flour daily in the concentrate mixture. The feeding of this phosphate supplement produced an increase in production in all cows. The increase varied in degree, possibly depending on the individual cow's reserves of phosphate.

Four cows were bled 12 months later and blood inorganic phosphate levels found to be normal. However, in March 1952, when these and a fifth animal were bled, a clear indication was obtained that the cattle were still not receiving sufficient phosphate in their diet to maintain a proper balance between their intake and their requirement. It was thereupon decided to use a sliding scale for feeding bone flour so that the highest producers, which have the greatest need for phosphate, received the greatest amount of phosphate supplement. The rationing was as follows:—

—	Daily Allowance of Sterilized Bone Flour.
Maintenance only	2 oz.
Maintenance + 5 lb. milk ..	3 oz.
,, + 10 lb. milk ..	4 oz.
,, + 15 lb. milk ..	5 oz.
,, + 20 lb. milk ..	6 oz.
,, + 25 lb. milk ..	7 oz.
,, + 30 lb. milk ..	8 oz.
,, + 40 lb. milk ..	10 oz.

A number of cows was bled at intervals while this sliding scale of feeding was in operation, to check on the phosphate status in the herd. The indications were that the scale effectively maintained the blood inorganic phosphate level of the herd in the normal range for the next 12 months (Table 1.)

Results.

Fig. 1, depicting rainfall, shows that 1949 was a reasonably good year, 1950 an excellent year, 1951 a drought, 1952 a fair year and the early part of 1953 quite reasonable. These factors must be taken into account when considering the results of the feeding.

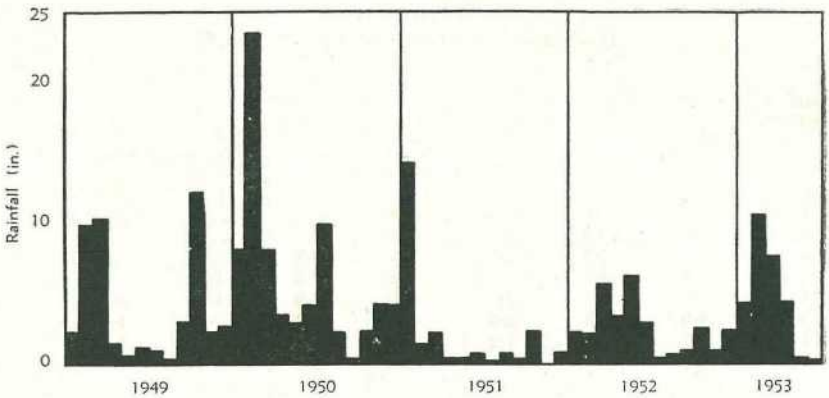


Fig. 1.

Rainfall for Gympie, 1949-1953.

Tables 2 and 3 show the rise in production in the years 1950, 1951, 1952 and 1953 over that in 1949, when no supplements of any type were fed. During 1950, which was an exceptionally good year, the production of commercial butter rose by 50%. During the drought year of 1951, however, the level of production was maintained at almost the same level as in 1950. This, in the opinion of the authors, can be attributed mainly to the inclusion of bone flour in the diet.

TABLE 2.

COMMERCIAL BUTTER PRODUCTION BY THE TRIAL HERD.

Month.	1949.	1950.	1951.	1952.	1953.
	Lb.	Lb.	Lb.	Lb.	Lb.
January	1,213	1,323	1,464	1,105	1,327
February	924	1,277	1,471	1,095	1,535
March	860	1,563	1,717	1,292	1,707
April	804	1,436	1,387	1,327	1,443
May	713	1,316	1,267	1,363	1,254
June	604	965	896	1,041	928
July	387	683	712	1,119	..
August	255	720	552	998	..
September	295	551	436	1,059	..
October	287	688	489	1,041	..
November	885	826	602	1,136	..
December	1,188	1,185	578	1,120	..
Total	8,415	12,533	11,571	13,696	8,194

The satisfactory production level in 1952 and in the first half of 1953 are likewise largely attributed to feeding bone flour.

In order to give due regard to seasonal effects, the production on the trial farm is compared with the average for the district herd recording group (Fig. 2). This allows a within-season comparison. During 1949, when no concentrates or mineral supplement were fed, the level of production in the trial herd was only 88% of the herd recording group average. For January to June, the period in 1950 when concentrates alone were fed, it was 103%, a rise of 15%. For the

TABLE 3.

SUPPLEMENTS FED AND BUTTER PRODUCED, 1949–1953.

1949.		1950.		1951.		1952.		1953.
Jan.-June.	July-Dec.	Jan.-June.	July-Dec.	Jan.-June.	July-Dec.	Jan.-June.	July-Dec.	Jan.-June.
Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.
Concentrates Fed.								
..	..	22,688	16,818	31,126	16,157	31,335	25,835	29,413
Bone Flour Fed.								
..	..	..	833	1,446	1,046	1,305	2,235	2,974
Commercial Butter Produced.								
5,118	3,297	7,880	4,653	8,202	3,369	7,223	6,473	8,194

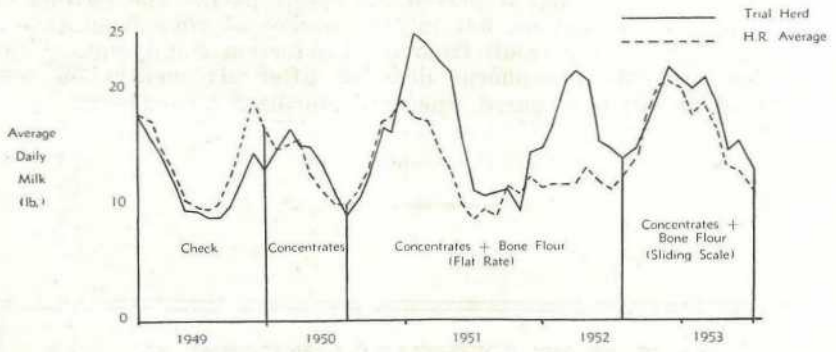


Fig. 2.

Average Daily Milk Production on Trial Farm compared with Herd Recording Average for the Area.

2-year period July 1950 to June 1952, during which bone flour was fed in addition to concentrates, the average production of the trial herd rose a further 24% above that of the herd recording group. To a large extent this appears to have been due to a rapid response on the part of the trial herd to improved conditions at the beginning of 1952 following the breaking of the drought. Other herds in the district did not recover from the effects of the drought until six months later.

This big margin of production in favour of the trial herd was not maintained during the period July 1952 to June 1953, when normal seasonal conditions prevailed. Herds in the district had by that time

fully recovered from the effects of the drought and were perhaps exhibiting a natural tendency to produce well after a year of enforced rest from full production.

TABLE 4.

COSTS AND RETURNS FROM FEEDING SUPPLEMENTS.*

1949.		1950.		1951.		1952.		1953.
Jan.-June.	July-Dec.	Jan.-June.	July-Dec.	Jan.-June.	July-Dec.	Jan.-June.	July-Dec.	Jan.-June.
£	£	£	£	£	£	£	£	£
Cost of Concentrates Fed at 3d. per Lb.								
..	..	284	210	389	202	392	323	368
Cost of Bone Flour Fed at 2d. per Lb.								
..	..	..	7	12	9	11	19	25
Return from Commercial Butter at 4s. per Lb.								
1,024	660	1,576	931	1,640	674	1,445	1,295	1,639
Profit.								
1,024	660	1,292	714	1,239	463	1,042	953	1,246

* Costs and returns are calculated at flat rates and do not represent actual totals.

Conclusions.

Although it is not possible to say to what extent the feeding of bone flour was responsible for improved production obtained from the trial herd, it is considered that it played the major part. The feeding of concentrates was important, but in the absence of bone flour gave a somewhat disappointing result from the production standpoint. Cows were also markedly phosphorus deficient after six months on concentrates alone but were cured when fed sterilized bone flour.

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MARKETING

Banana Price Movements on the Brisbane Wholesale Markets, 1948-1953.

PREPARED BY OFFICERS OF THE DIVISION OF MARKETING.

(*Continued from page* 268 *of the May issue.*)

Description of Seasonal Pattern.

The main features of the seasonal movement of banana prices are (i.) a short period of low prices from mid-December to mid-March; (ii.) a period of steadily rising prices from mid-March to mid-May; (iii.) a 5-month period of relatively high prices from late-May to October; and (iv.) two months when prices tend to fall sharply (November and December).

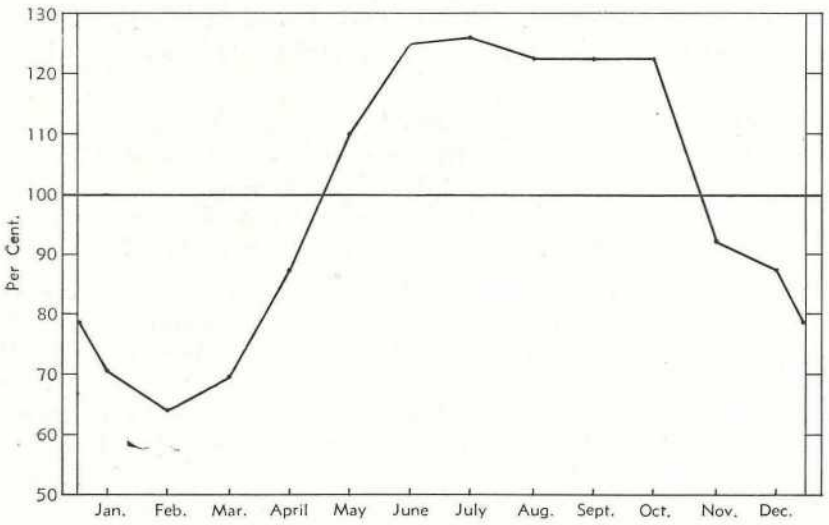


Fig. 2.

Seasonal Movement of Banana Prices. Computed from average monthly prices of Cavendish bananas (ripe sevens) from January 1948 to December 1951. (Average for 12 months=100%).

Diagrammatic representation of these features is given in Fig. 2.

(i.) The low price period from mid-December to mid-March is quite regular in occurrence and is characterised by good supplies of a wide variety of other fruits.

The most popular items in consumer demand at this time appear to be plums, peaches, grapes and dessert apples, but further competition is provided by the increasing deliveries of pineapples. Bananas are usually fairly well represented but are inclined to lack quality. Their appearance is often marred by the quick development of blemishes from even slight bruising. This is caused by the higher summer temperature, which also causes rapid deterioration in holding quality. These factors keep banana prices at their lowest level for the year.

(ii.) The period of rising prices from mid-March to mid-May can be attributed to a weakening of low price influences.

Chief among these is an overall decline in the quantity of other fruit available and the reaction of the buying public to the high prices asked for the reduced supplies of stone fruit and oranges. While it is not suggested that bananas are a substitute for oranges or stone fruit, it is undoubtedly true that high prices for these articles induce the housewife to seek a more reasonably priced item of fruit. Another factor is the improvement in the quality of bananas which can generally be expected during March. The result is an improvement in demand for bananas which usually continues until mid-May and is reflected by the rising price level over that period.

(iii.) The third period, from May to October, is one of relatively high prices. For the most part prices also remain very stable but some fluctuations are experienced towards the end of September or early in October.

With the disappearance of stone fruit from the market, items such as apples and bananas enjoy a greater measure of popularity and prices improve accordingly. By the end of May banana prices are usually very close to their peak and as demand remains fairly constant over the ensuing winter months a satisfactory level of prices is maintained.

A sharp dip in banana prices usually occurs about late September. This is invariably caused by a temporary increase in supply. The first flush of hot weather is usually registered in South Queensland districts towards the end of September and this results in bananas reaching the cutting stage more quickly than usual, thereby increasing the quantity available for marketing. If these conditions occur at a time when prices are high—and this has generally been the case over the last few years—a fairly substantial reduction in prices is necessary to shift the increased stocks. On the other hand, if the price level is only moderately high, the increased stocks can usually be cleared with only a small reduction in wholesale rates, provided of course that the reduction is passed on to the consumer. Once the increased stocks have been absorbed, the market usually firms quickly because of the scarcity of other fruit during October.

(iv.) The fourth period takes in the months of November and December and is invariably ushered in by a sharp drop in prices about the end of October.

As the higher summer temperatures become general, the conditions which were experienced in late September, as referred to above, again become operative. However, this time the effects are more lasting and the presence of additional factors serves to further reduce prices. Firstly, bananas at this time of the year, although of good appearance, are usually of poor keeping quality and tend to deteriorate fairly quickly after removal from the ripening chambers under the influence of high temperatures. This initiates a good deal of buyer resistance, which is reflected in a pronounced weakening of the market. Secondly, the early varieties of stone fruit make their appearance about mid-November and by early December constitute the main item of fruit. Experience has shown that whilst the public spends freely on stone fruit at this time, budgets are also being stretched to meet Christmas expenditure and the demand for bananas wanes accordingly.

Variations from Seasonal Pattern.

There have been no major variations from the seasonal price pattern outlined above despite the lower production resulting from declining acreages and abnormal weather conditions. Reference to the graph of average weekly prices will show that even in 1952, when banana prices were forced to record levels by a severe drought, the established seasonal pattern was still present.

Minor variations occur from time to time, but in the majority of cases the disturbances are caused by episodic events, such as storm and wind damage and temporary setbacks to cutting by wet weather, which affect the flow of supplies to the market.

At this juncture it should be mentioned that there is at least one major difference between the seasonal movement of Cavendish and that of Lady Finger bananas. This occurs during the summer months and usually extends from December to March, when prices for Lady Fingers continue at a fairly high level and sometimes register an increase on prices ruling during the late winter months. The reasons for the increased prices for Lady Fingers at this time are twofold; in the first place, supplies are inclined to fall off and in the second place, they are of much better keeping quality than the Cavendish or related varieties. At other times of the year prices for Cavendish and Lady Fingers tend to move in sympathy.

TREND.

An analysis for trend in banana prices (ripe Cavendish) has been made covering the 6-year period from 1948 to 1953 inclusive, and a line of trend has been fitted mathematically to the prices recorded during the 4-year period February 1948 to December 1951, and extrapolated through the remaining two years. Prices for 1952 were specifically avoided when selecting the period of fit because of the pronounced episodic disturbance affecting them.

The analysis has revealed a steady upward trend in prices which has resulted in a basic increase of approximately 150 per cent. over the 6-year period. This represents a total increase of 30s. per case or an increment of 5s. per case per year.

This movement in prices is shown diagrammatically in Fig. 3.

The production and price data show that this basic upward movement in prices has been caused partly by the decline in production previously referred to and partly by the general inflationary tendency of the period.

Reference to Fig. 3 shows that prices in 1950 were somewhat below trend level. This was caused by a bountiful harvest in that year which resulted in increased production despite a reduction in acreage.

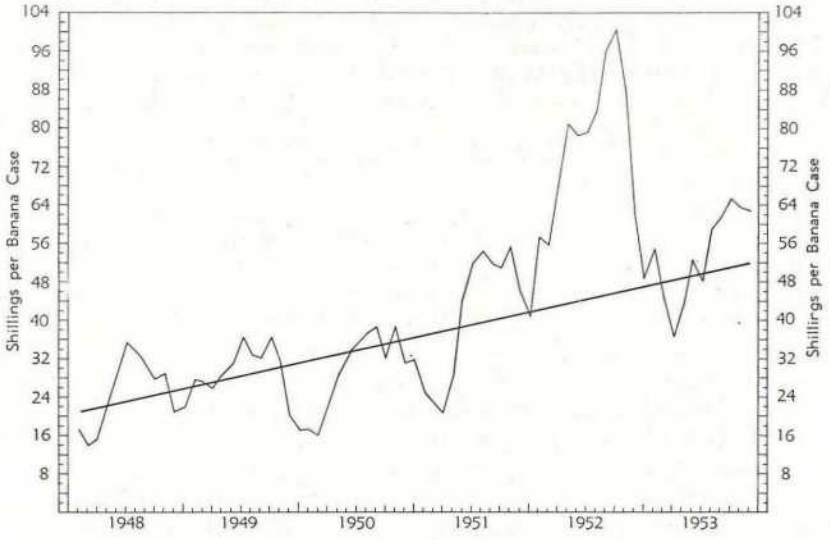


Fig. 3.

Average Monthly Prices and Trend for Cavendish Bananas (Ripe Sevens). 1948-1953.

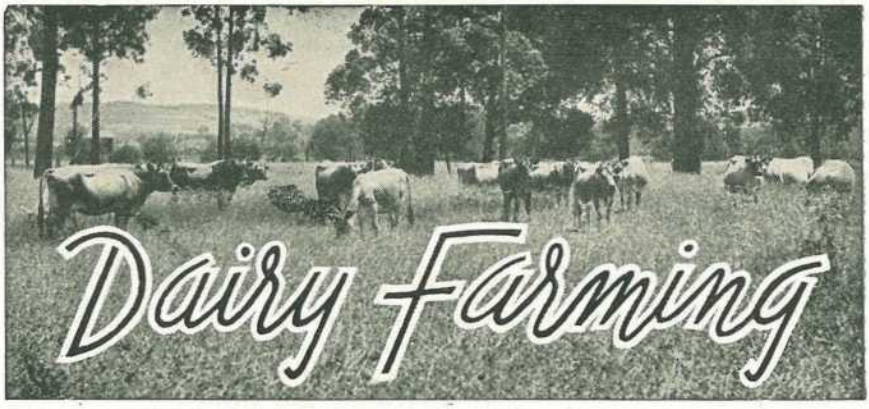
On the other hand, the episodic rise in prices during 1952 occurred when, owing to the effects of a severe drought, a shortage of bananas coincided with an acute shortage of other fruit.

If allowance is made for seasonal variation it will be seen that, although the trend line was extended through 1952 and 1953 without reference to the actual data of those years, prices for 1953 return fairly closely to the line of trend. It seems likely that the upward pressure on prices will continue until such time as an appreciable change occurs either in the trend of production or in general economic conditions.

DAIRY CHEMIST AT TOOWOOMBA.

The staff of the Department's Dairy Research Laboratory at Toowoomba has been strengthened by the appointment of a dairy research officer specialising in the chemistry of dairy products.

Particular attention will be given by this officer (Mr. N. B. Stanton) to the cheese-yielding capacity of milk supplies to Darling Downs cheese factories.



The Manufacture of Cheddar Cheese in Queensland.

E. B. RICE and T. A. MORRIS, Division of Dairying.

(*Continued from page 172 of the March issue.*)

CHEESE YIELD.

The Cheese Yielding Capacity of Milk.

A consideration of the cheese yielding capacity of milk must deal with two factors ; (*a*) the yield of cheese per given weight of milk, and (*b*) the yield of cheese per given weight of fat. The measurements normally employed are those of the yield of cheese per 100 lb. of milk and the yield of cheese per lb. of butterfat.

The following table shows the cheese yield per 100 lb. milk and per lb. butterfat from normal milks of different fat and casein contents.

Percentages.		Casein/Fat Ratio.	Cheese from 100 lb. Milk.	Cheese from each lb. Fat.
Fat in Milk.	Casein in Milk.			
			lb.	lb.
3·00	2·10	0·70	8·30	2·77
3·25	2·20	0·68	8·88	2·73
3·50	2·30	0·66	9·45	2·70
3·75	2·40	0·64	10·03	2·67
4·00	2·50	0·62	10·60	2·65
4·25	2·60	0·61	11·17	2·63
4·50	2·70	0·60	11·74	2·61
4·75	2·80	0·59	12·31	2·59
5·00	2·90	0·58	12·90	2·58

It will be seen from the above table that normal milks of low fat test have a larger ratio of casein to fat than normal milks of high fat percentage and thus yield more cheese per lb. of butterfat, but less cheese per 100 lb. of milk. Thus the efficiency of the operation of different factories cannot be compared on the basis of the yield of cheese obtained without due consideration being given to the composition of the milk being handled.

The composition of the milk, in so far as it affects the resultant cheese-yield, is dependent to a large extent on the breed of cow and to a lesser extent on such factors as type of feed, stage of lactation, locality and seasonal influences.

With milks of the same composition, variations in the yield of cheese may occur mainly according to the influence of the following factors :—

(1) The loss of butterfat and casein during manufacture.

(2) The amount of moisture incorporated in the cheese.

Loss of Butterfat and Casein During Manufacture.

The main loss of butterfat and casein occurs in the whey. An average figure for these losses would be 6–8% of the fat and 4–5% of the casein in the milk. If a whey separator is used the loss of butterfat in the whey is not of great importance. However, casein losses, and where whey separation is not carried out, butterfat losses, should be kept to a minimum.

Factors which increase manufacturing losses are :—

(1) Anything which interferes with proper coagulation with rennet; for example,
   (*a*) Milk of abnormal composition.
   (*b*) Weak rennet.
   (*c*) The use of too little rennet.
   (*d*) Setting at a low temperature.
   (*e*) Pasteurising at too high a temperature.

(2) Failing to stir milk prior to setting.

(3) Stirring after the vat has caught.

(4) Cutting the curd too soon after setting.

(5) Poor cutting, such as results from the use of blunt or broken curd knives.

(6) Rough handling of the curd before it is firmed by cooking.

(7) Raising the temperature too quickly when cooking.

(8) Overstirring of the curd at drying.

(9) Milling, salting or pressing at too high a temperature.

Amount of Moisture Incorporated in the Cheese.

The amount of moisture which is allowed to remain in the cheese influences the yield of green cheese fairly considerably. However, excessive shrinkage of the cheese, particularly if it is not cool-cured, reduces any increase in yield obtained by overloading cheese with moisture. Quality should be the first consideration and should not be sacrificed for the sake of yield. A fair yield and good quality are more satisfying than a high yield and mediocre quality. With proper attention to detail, a cheesemaker can obtain both good quality and a satisfactory yield.

The amount of moisture that cheese can safely hold depends on the casein/fat ratio of the milk from which it is made, the temperature of the curing room and the age at which the cheese is to be consumed. When the

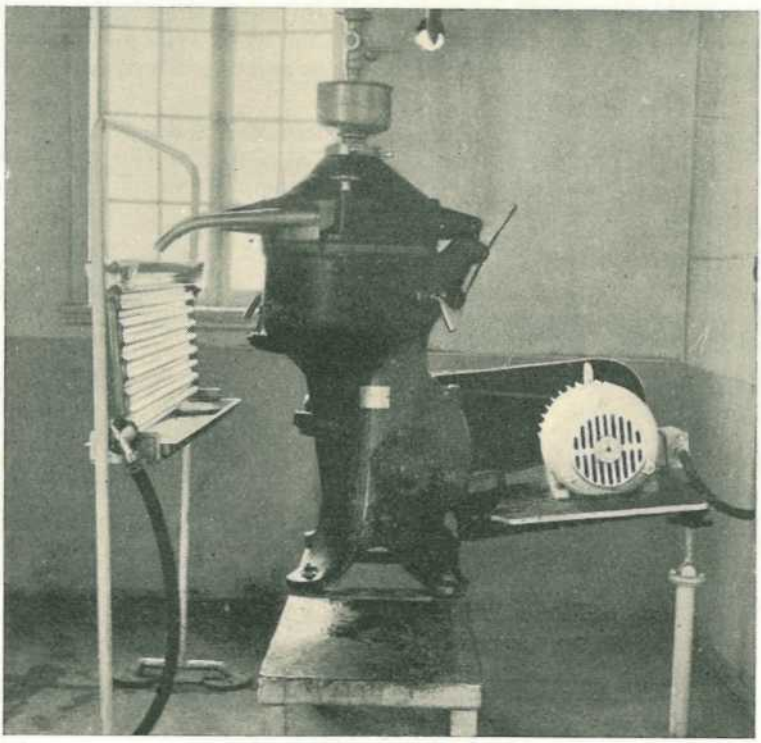


Plate 19.

Whey Separation. A whey separator and a cream cooler fitted with water connections are shown.

casein/fat ratio of the milk is low the moisture content of the cheese should also be low. If curing room temperatures are high, and particularly if the cheese is to be held for some time, a low-moisture, firm-bodied, cheese s hould be manufactured.

Adequate price differentiation according to the quality of the cheese would divert the attention from yield to quality.

DEFECTS IN CHEDDAR CHEESE AND THEIR CONTROL.

Defects in cheese may be found in flavour, body, texture, colour, and finish.

Defects in Flavour.

Most flavour defects in cheese are a result of the use of milk of low quality. However, some are a direct result of the conditions of manufacture and all may be accentuated by faulty methods during manufacturing.

In general, flavour defects may be of two types—feed, and bacterial and chemical.

Feed Flavours.

These are pronounced during certain periods of the year when cattle are fed on taint-producing feeds such as lucerne and clover, and eat taint-producing weeds such as cress weed, mustard weed, carrot weed, stinking roger and wild turnip.

When such tainted milk has been accepted for manufacture, the taint can be minimised by using plenty of active starter; heating the curd as high as practicable (102° F.) to help drive off the flavours; and aerating the curd well after milling.

Bacterial and Chemical Flavours.

Flavour defects due to undesirable bacterial action are of great economic importance because of their influence in reducing quality and depreciating the value of cheese.

(i.) *Sour or Acid Flavour.—This is due to the development of too much acid during some stage of manufacture, causing a sour, sharp, acid flavour.* The chief causes are over-ripe milk; holding the curd too long in the whey; *wheying off with too much acidity*; not firming the curd sufficiently before running off the whey; leaving too much moisture in the curd; too much starter; curing at too high a temperature.

In manufacturing cheddar cheese from over-acid milk (fast working milk) the following procedure is recommended:

Use an extra amount of rennet to hasten coagulation and firming and set at a higher temperature.

Cut the curd as soon as possible to allow the moisture to escape.

Cut the curd small to allow the moisture to escape and speed up the firming.

Use higher cooking temperatures and shorten the time taken in cooking. With very acid milk, the cooking time can be reduced to 15–20 minutes. The curd expresses whey faster than curd from a normal working milk.

As soon as possible after cooking, run the whey off to the level of the curd. This allows the removal of the final whey to be speedily carried out. Stirring of the curd during the final running-off of the whey helps to firm the curd.

Spread out the curd as much as possible in the vat and after matting cut into small blocks. Turn the blocks fairly rapidly and stand on their edge to hasten the removal of the whey.

If the curd is still showing too much acid after milling, stir 10–15 gallons of water at 80–85° F. through each vat and drain.

Use a higher percentage of salt to hasten the expulsion of the moisture and check bacterial action.

(ii.) *Fruity Flavours.*—Apart from an unpleasant fruity flavour, affected cheese may show "fisheye" slits. Gassiness is also often associated with fruity flavours. These defects are generally caused by—

(1) Contamination of milk by certain bacteria and yeasts prevalent in dirty cans, milking machines, and other dairy equipment.

(2) The unsatisfactory cleansing and sterilizing of milk cans used for the conveyance of unpasteurised whey or whey contaminated by unclean whey tanks and delivery pipe lines.

(3) Leaking vats or any insanitary conditions in the factory.

(4) Grossly contaminated starter culture.

(5) Moulds, press cloths, or bag ends which are not sterilized daily.

(6) *Insufficient acid development, as in the case of "slow vat" cheese.*

Here again prevention is better than cure. The control of these defects depends on rigid control of the milk supply; improved methods of factory hygiene and sanitation, particularly in regard to the cleansing and sterilizing of dairy equipment; proper cleansing of whey tanks and delivery lines; and *the use of a pure active starter culture.*

As soon as fruity and fermented flavours have been noted, the following measures should be taken pending the putting into effect of the above recommendations:—

Develop more acid during manufacture.

Use a slightly higher cooking temperature and work the curd fairly dry at wheying-off. If gasholes show, pile the curd as much as practicable, during cheddaring, to close them.

Aerate well after milling and salting.

Use slightly more salt than usual, and if the curd tends to become mushy add the salt over a longer period.

(iii.) *Rancid Flavour.*—The fat of the cheese is involved in complex chemical changes. The chief causes are contaminated milk supply (fat-splitting types of organisms); species of moulds (*Oidium lactis*); curing cheese at too high a temperature; and decomposition of the fat in old cheese.

As rancid flavour in cheese is due primarily to poor milk, farm sanitation is the key to control of this defect. Cheese should be kept at favourable temperatures during storage.

(iv.) *Unclean Flavour.*—This is generally associated with insanitary methods of milk production. It is exaggerated by after-contamination of the milk in the factory, due to such causes as unclean factory equipment, contaminated starter, rennet, salt or water supply.

If milk with off-flavours is accepted for cheese manufacture, the following steps are advised:—

Develop more acid, if practicable, before running off the whey.

Firm the curd more at cooking and do not pile the curd during cheddaring.

Aerate the curd well after milling.

Increase the amount of salt used.

(v.) *Hydrogen sulphide flavour ("stinker" cheese).*—The smell resembles the odour of rotten eggs and is generally associated with discolouration. This defect is due to certain bacteria found in milk

produced under poor sanitary conditions, which grow in the low oxygen environment in cheese. Unlike fruity flavours, this defect may occur in cheese of normal acid development and body. The sulphide flavour occurs in cheese manufactured from raw and pasteurised milk, although more frequently in the former.

(vi.) *Bitterness.*—Bitterness, which is more prone to develop in moist, soft cheese, may be caused by contamination by undesirable types of organisms, such as yeasts from whey tanks and unclean milking machines; the use of excessive amounts of hydrochloric acid or calcium chloride after pasteurisation; high temperatures during curing; inferior rennet; and wheying-off at too high an acidity. Excessive moisture in the cheese or a contaminated starter exaggerates the trouble.

The first step in attempting to overcome this defect is to endeavour to locate the cause and then the remedy is obvious. In the factory, the following control measures should be adopted:—

Use pure starter culture.

Increase the cooking temperature (2° to 3°F.) to reduce moisture.

Run the whey at a lower acidity.

Stir the curd vigorously at removal of the whey.

Do not pile the curd during cheddaring.

Aerate the curd after milling.

Use a larger amount of salt.

While most cheese defects are readily detected by smell, bitterness can only be noted by tasting the cheese.

From what has previously been stated in connection with cheese composition and ripening, it will be realised that a high moisture content in the cheese and high curing room temperatures are factors which accentuate practically all flavour defects.

(vii.) *Metallic Flavour.*—A high copper content in cheese has been found to produce a metallic flavour. Where worn tinned-copper equipment is in use there may be sufficient copper exposed to allow the occurrence of this defect. The use of acid cleaners and hypochlorite on copper surfaces (for example, worn tinned-copper pasteuriser plates) is conducive to the production of the defect.

Defects in Body.

(i.) *Soft, Pasty or Weak Body.—Probably the most general cause of these defects is the retention of too much moisture in the cheese.* Thus any steps which reduce the amount of moisture in the fat-free-substance of the cheese may be expected to improve the body.

Excessive acidity and excessive rennet may cause these defects by producing very rapid breakdown of the protein.

Milk with a low casein/fat ratio (for example, high fat-testing milk or milk produced during drought) is liable to produce weak-bodied cheese.

Attention to the proper cooking of the curd, along with the attaining of the correct rate of acid development, is important in producing good-bodied cheese. *When the cooking process is not effective, more stirring of the curd and a higher rate of salting are required.*

(ii.) *Mealy, Crumbly or Corky Body.*—In most cases these defects are caused, and controlled, by factors exactly the reverse of the above. The cheese normally has too little moisture, or too little fat, in relation to the amount of solids-not-fat.

If the cheese is being made from whole milk, more moisture must be incorporated by avoiding over-cooking and excessive stirring of the curd and by decreasing the amount of salt used. If the milk is being standardised, it is probable that more fat should be left in it.

A mealy body may also result from the development of excessive acidity. The remedy then is to reduce the running acidity.

(iii.) *"Sweet Make".*—"Sweet make" cheese has a rather curdy and crumbly body. It will not press together into a smooth waxy mass when worked between the thumb and fingers. The remedy is, of course, to develop more acid in the cheese at some stage of the process, particularly before wheying-off.

(iv.) *Greasy Body.*—Cheese made from high-fat-testing milk may have a greasy body. Raw milk cheese is more inclined to have this defect than pasteurised milk cheese, owing to the better distribution of the fat in the case of the latter.

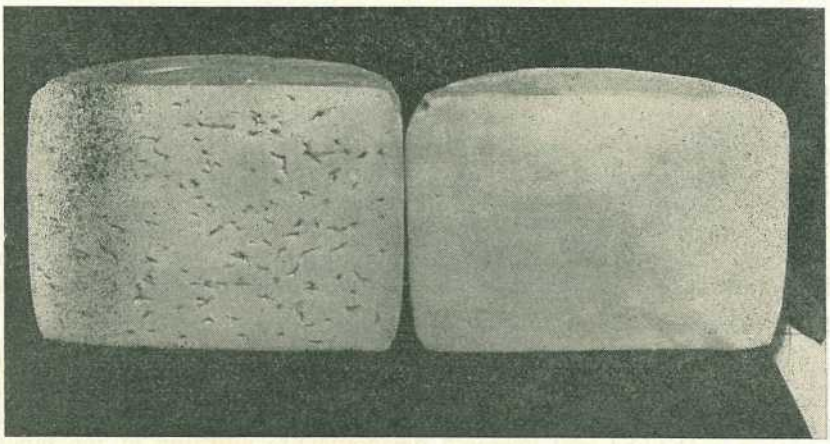


Plate 20.

Cheese Texture. On the left is an example of mechanical openness in texture; on the right is a well-made, close-textured cheese.

Defects in Texture.

Openness in the texture of cheese may be mechanical or bacterial in origin.

(i.) *Mechanical Openness.—This occurs as a result of improper matting of the curd.* The curd particles fail to adhere together properly and irregular holes or spaces are left in the cheese. Insufficient pressure

during pressing or not allowing the cheese to remain in the press for the required time may cause mechanical openness. Hooping curd held over from the previous day with the day's curd may cause openness in the cheese.

This defect seems to be related to the condition of the curd at hooping. A too acid or a too sweet curd may exhibit mechanical openness in the resultant cheese, thus indicating that there is an optimum condition of the curd for pressing and that a variation either way from this predisposes the cheese to openness. *Salting "under the mill" without allowing time for the curd to mellow is probably a major cause of the defect.*

(ii.) *Bacterial Openness.*—This is characterised by the regularity of the outline of the holes, which are usually round or oval. Bacterial or yeasty fermentation produces gas which causes the holes, or slits, to appear.

Mixed starter cultures commonly contain gas-producing organisms.

Yeasts and bacteria capable of producing openness in cheese may originate from a contaminated milk supply, especially if unclean milking machines are used; contaminated starter; dirty and unclean whey tanks; insufficient cleansing and sterilizing of milk cans used to take whey from the factory; and unclean factory equipment.

Attention to farm and factory hygiene is seen to be important here. The procedures mentioned in connection with fruity cheese are desirable during manufacture to minimise the defect.

Defects in Colour.

(i.) *Mottled Cheese.*—This defect is caused by adding colour after rennet; addition of the starter after the colour; lumpy starter; uneven cutting of curd resulting in uneven expulsion of moisture and uneven acid development; mixing the curd from different vats; adding the salt when the curd is lumpy and partly matted together, resulting in uneven distribution of the salt and uneven expulsion of the whey; inferior colour and uneven distribution of the colour through the milk. The control measures are obvious.

(ii.) *Dull or Bleached Colour.—The dull colour is due to excessive acid development partly bleaching the colour of the cheese.* Factors which tend to cause dull colour are high moisture in the cheese; wheying off with a soft curd and overacid development; addition of too much starter; inferior artificial colour. The lack of green feed for milking stock may produce a pale colour in the cheese.

(iii.) *Seamy.*—This is a condition in which the outline of the curd particles may be distinctly seen. Causes are greasy curd; insufficient pressing; the use of inferior salt; adding the salt when the curd is lumpy or partly matted; mixing the curd from different vats.

(iv.) *Rusty Spots.*—These are generally noticed where curd particles have not been thoroughly pressed together and mechanical holes are visible.

The causative organism is prevalent where unhygienic conditions prevail. Careful attention to farm and factory sanitation, plus the use of a pure starter culture, will reduce the risk of trouble from this source. Two-day pressing of the cheese will assist by reducing the number of mechanical holes.

Mastitis milk is reputed to cause rusty spots in cheese.

Plate 21.

Cheese Finish. On the left is a poorly finished, unwaxed cheese. Note the faulty bandaging, broken rind and illegible marking. On the right is a neatly-finished, waxed cheese.

Defects in Finish.

(i.) *Mouldy Cheese.*—This defect is caused by the growth of various moulds on the surface of the cheese. Factors which induce mould growth are insanitary and badly ventilated curing rooms; excessive moisture in the curd; and too high humidity in the curing room.

Mould growth can be retarded by ventilating the curing room so that the surface of the cheese can dry out; keeping the shelves clean and dry; turning cheese daily; and waxing the cheese.

Where mould infection is bad, the room (shelves, walls, floors, and so on) should be washed out and then disinfected with a 10% solution of formaldehyde or a strong solution of sodium hypochlorite.

(ii.) *Cracked Rind.*—This defect is encouraged by oversalting; wrinkled bandages; narrow or weak bandages; hooping cold curd; inadequate pressing; neglecting to scald the hoops of cheese; and rough handling of new cheese. Hot, dry curing rooms may promote cracked rinds. A draught on only one side of cheese causes uneven drying out and a danger of the rind cracking. *The use of an outer bandage is very helpful in preventing cracked rinds.*

(iii.) *Dirty Cheese.*—This is mainly caused by carelessness in the factory; dirty and rusty moulds; soiled bandages, mould growth and stains; dirty shelves in the curing room; and blotched and bad brand marks. It may also be caused by carelessness in the handling and transport of cheese by motor lorry and rail truck to cold stores.

(iv.) *Misshapen Cheese.*—This defect is fairly common and results from the manufacture of a weak-bodied curd; lack of regular turning; the cheese curing shelves not being level; and the use of weak and over-sized bandages. *High holding room temperatures aggravate the trouble.*

(vi) *Crown Rot.—If cheese are not turned regularly on the curing room shelves, crown rot is likely to develop.* Up to the age of two weeks the cheese should be turned every day, and thereafter every second day, to allow proper uniform drying out. The concentration of moisture around any particular portion of the cheese may cause that portion to rot. A high moisture content in the cheese and a high humidity in the curing room encourage crown rot.

[TO BE CONTINUED.]

HAVE YOUR SEEDS TESTED FREE

The Department of Agriculture and Stock examines FREE OF CHARGE samples representing seed purchased by farmers for their own sowing.

The sample submitted should be representative of the bulk and a covering letter should be sent advising despatch of the sample.

MARK YOUR SAMPLE

Sample of ..... seed
Drawn from ..... bags
Representing a total of .....
Purchased from .....
Name and Address of Sender
Date.....

SIZE OF SAMPLE

Barley	8 oz.	Oats	8 oz.
Beans	8 oz.	Peas	8 oz.
Grasses	2 oz.	Sorghum	4 oz
Lucerne	4 oz.	Sudan	4 oz.
Millets	4 oz.	Wheat	8 oz.

Vegetable Seeds - ½ oz.

SEND YOUR SAMPLE TO—**STANDARDS OFFICER, DEPARTMENT OF AGRICULTURE AND STOCK, BRISBANE.**

Register of Merit for Dairy Cattle (Second Supplementary List).

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

Since the publication of the First Supplementary List of Cows eligible for entry in various sections of the Register, a further 14 animals have qualified or have additional records. This small number is very disappointing, and shows that too much emphasis is placed on the value of a single lactation record. Lifetime production records have been proved in many countries to give the most reliable information as to an animal's productive ability.

During the 12 months under review a total of 62 cows completed a sufficient number of tests to allow them to qualify for entry into various sections of the Register of Merit, had the production been sufficient to reach the required standard.

The fact that of these 62 cows only 14 (22.6%) qualified shows that the standards set for the various sections of the Register are sufficient to exclude all but the most consistent producers, thus emphasising the merit of the animals which have qualified.

The additional entries in the various sections are:—

Elite section	1
Lifetime section	4
Intermediate section	9

The total number of cows which have qualified for entry into the Register up to December 31st, 1953, is shown in Table 1.

TABLE 1.

COMPOSITION OF REGISTER OF MERIT (FEMALES).

Section.	Breed.					Tota
	A.I.S.	Ayrshire.	Friesian.	Guernsey.	Jersey.	
Intermediate	23	1	..	3	66	93
Lifetime ..	8	..	1	1	13	23
Elite	2	..	..	..	1	3

All the additional animals included in the Register are shown in Tables 2–5, which are compiled in alphabetical order according to breed and owner. Animals which have had further lactations since the last list was published are also shown.

"Navillus Charm 17th" (A.I.S.) qualified for entry into the Elite section with a production of 94,073 lb. milk and 3,685 lb. butterfat in eight lactations.

She commenced her first lactation record at the age of 3 years and her last period at 9 years 10 months. The cow was bred by Mr. C. O'Sullivan, Navillus A.I.S. Stud, Greenmount. She was sired by "Greyleigh Eros" and her dam was "Navillus Charm 4th."

"Greyleigh Eros" has 27 recorded daughters with 49 lactations and an average butterfat production of 334 lb. butterfat. The maturity equivalent average is 407 lb. butterfat.

Sires Register of Merit.

No additional animals have qualified for entry into this section. The only alteration is to the details of daughters of "Bellgarth Stylish." In the First Supplementary List this Bull had four daughters in the Intermediate section and one in the Lifetime. One of the Intermediate register cows has now qualified for entry into the lifetime section of the Register. Thus there are three daughters in the Intermediate section and two in the Lifetime section.

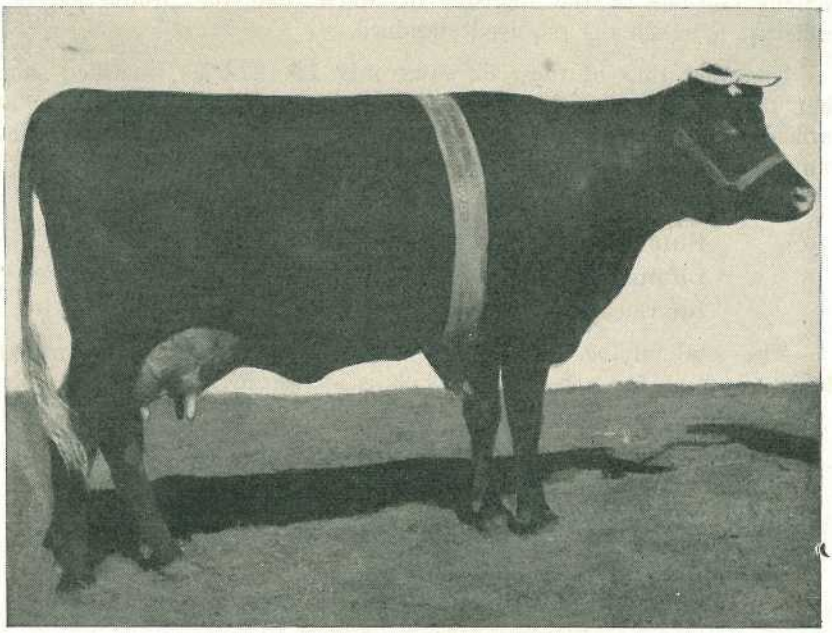


Plate 1.

Elite Register Cow "Navillus Charm 17th", Owned by Mr. C. O'Sullivan, "Navillus", Greenmount. This animal has qualified for entry into the Elite Section of the Register of Merit with a production of 94,073 lb. milk and 3,685 lb. butterfat in eight lactations.

TABLE 2.

INTERMEDIATE REGISTER OF MERIT (SECOND SUPPLEMENTARY LIST).

Name of Cow. (*Name of Sire.*)	Herd Book No.	Date of Beginning of Record.	Age.	Production Records.		
				Milk.	Average Test.	Total Butterfat.
			Yrs. Mths.	Lb.	%	Lb.
AUSTRALIAN ILLAWARRA SHORTHORN.						
M. C. LESTER, "ST. ANDREWS," WARWICK.						
St. Andrews Honeycombe 3rd	71,880	8–6–50	1 11	8,417	4·0	335
(*Tabbagong Victory*)	8,729	26–9–51	3 3	10,695	4·1	442
	..	25–10–52	4 4	17,128	4·2	721
C. O'SULLIVAN, "NAVILLUS," GREENMOUNT.						
Swanlea Diana 14th	53,914	28–8–50	6 11	12,642	4·0	500
(*Alfa Vale Loyal*)	4,512	2–8–51	7 11	14,366	3·8	549
	..	10–7–52	8 10	14,297	3·8	548
GUERNSEY.						
A. RUGE AND SONS, "WOOWOONGA," BIGGENDEN.						
Springvale Jessie	19,822	23–6–50	3 4	8,659	4·5	391
(*Moongi Lloyd George*)	7,657	5–6–51	4 4	9,068	4·1	368
	..	16–8–52	5 6	9,855	4·2	414
JERSEY.						
R. J. BROWNE, "HILL 60." YANGAN.						
Hill 60 Likeness	53,156	10–12–49	2 4	5,961	4·9	295
(*Kelvinside Dream Boy*)	16,277	5–11–50	3 3	7,974	4·7	379
	..	12–1–52	4 5	7,656	5·4	416
Nairfale Noble's Rosemary	2,975 (JSBA)	29–1–50	7 0	9,290	5·3	489
(*Nairfale Pride's Noble*)	17,828 (JSBA)	10–2–51	8 0	7,629	5·0	380
		6–7–52	9 5	8,465	5·1	430

TABLE 2—*continued.*

INTERMEDIATE REGISTER OF MERIT (SECOND SUPPLEMENTARY LIST)—*continued.*

Name of Cow. (*Name of Sire.*)	Herd Book No.	Date of Beginning of Record.	Age.	Production Records.		
				Milk.	Average Test.	Total Butterfat.
			Yrs. Mths.	Lb.	%	Lb.
S. A. CRAMB, "AMAROO," CABOOLTURE.						
Caergwyrle Tulip	53,630	8–3–50	2 2	5,963	5·2	313
(*Imerlaw Bandmaster*)	15,022	28–3–51	3 3	6,141	5·0	308
	..	10–5–52	4 4	7,279	5·5	440
"TRECARNE JERSEY STUD," LOCKYER.						
Trecarne Dairy Queen 5th	54,374	13–8–50	2 1	5,218	6·0	311
(*Trecarne Golden Lad 2nd*)	14,944	14–8–51	3 1	5,745	5·5	318
	..	16–8–52	4 1	7,477	5·7	429
P. AND M. E. KERLIN, "GLENRANDLE," KILLARNEY.						
Glenrandle Gleam Girl	54,329	29–10–50	2 0	6,551	5·7	375
(*Trinity Gleaming Effort*)	15,002	20–9–51	2 10	7,280	5·9	426
	..	29–9–52	3 11	8,971	5·5	497
Glenrandle Goldenette 2nd	53,126	28–4–50	2 0	5,785	5·5	320
(*Trinity Gleaming Effort*)	15,002	8–5–51	3 0	6,739	5·7	382
	..	14–5–52	4 0	7,146	5·6	398

TABLE 3.

LIFETIME REGISTER OF MERIT (SECOND SUPPLEMENTARY LIST).

(2,240 lb. Butterfat Minimum.)

Name of Cow.	Herd Book No.	Age at Start of Recording.	Age at Commencement of Last Test.	No. of Records.	Total Milk.	Average Test.	Total Butterfat.	Name of Sire.	Herd Book No. of Sire.
		Yrs. Mths	Yrs. Mths.		Lb.	%	Lb.		
AUSTRALIAN ILLAWARRA SHORTHORN.									
W. HENSCHELL, "YARRANVALE," YARRANLEA.									
Fairvale Laurel 2nd ..	43,594	3 1	8 6	4	64,673	4·0	2,581	Bingleigh Monach Jean's	6,579
JERSEY.									
R. J. BROWNE, "HILL 60," YANGAN.									
Nairfale Idol's Delight ..	42,733	2 1	6 11	6	42,360	5·5	2,345	Nairfale Recorder Golden	19,872
C. HUEY, "ASHVIEW," SABINE.									
Ashview Lady 3rd ..	39,377	1 3	8 11	6	40,997	5·7	2,351	Trecarne Victor 4th ..	11,492
P. KERLIN, "GLENRANDLE," KILLARNEY.									
Glenrandle Golden Girl ..	36,169	3 0	10 11	7	48,700	5·4	2,651	Bellgarth Stylish ..	10,878

TABLE 4.

ELITE REGISTER OF MERIT (SECOND SUPPLEMENTARY LIST).

(3,600 lb. Butterfat Minimum).

Name of Cow.	Herd Book No.	Age at Start of Recording.	Age at Commencement of Last Test.	No. of Records.	Total Milk.	Average Test.	Total Butterfat.	Name of Sire.	Herd Book No. of Sire.
*Navillus Charm 17th ..	45,661	Yrs. Mths 3 0	Yrs. Mths 9 10	8	Lb. 94,073	% 3·9	Lb. 3,685	Greyleigh Eros ..	2,193

* Additional records included.

TABLE 5.

SIRES REGISTER OF MERIT.

Name of Sire. (Breed).	Herd Book No.	Intermediate Register of Merit.		Elite and Lifetime Registers of Merit.		Total Daughters in Register of Merit.			Total Daughters Recorded.		
		No. of Daughters.	Average Butterfat.	No. of Daughters.	Average Butterfat.	No. of Daughters	Lactations.	Average Butterfat.	No. of Daughters.	Daughters Total Lactations.	Recorded Average Butterfat.
*Bellgarth Stylish (Jersey)	10,878	3	Lb. 392	2	Lb. 351	5	28	Lb. 372	18	57	Lb. 347

* Additional records included.

Still More Wool!

Part 5. How Can You Measure Progress?

G. R. MOULE and R. E. CHAPMAN, Sheep and Wool Branch.

It may seem fantastic, but you could double or even treble your rate of progress in sheep breeding. Naturally, most of you are impatient to do so, but first of all let's define what we mean by rate of progress.

For the purpose of this article, the rate of progress means the rate of increase in the average cut per head of our flocks. It does not refer to the few outstanding show animals any stud or flock might produce.

Most of the increase in the average cut per head of sheep in Queensland during the last 50 years has come from the permanent improvements which have been put on properties. That additional fencing and the extra water have allowed the sheep to use the available pasture more efficiently.

The increase in the cut per head which has come from improved use of the land does not mean we have better sheep. They can only be obtained through better breeding. The surest way to do this is to measure the characters you wish to improve in your sheep. This also has the advantage of letting you calculate your rate of progress.

When you class your maiden ewes you endeavour to take out those which are low cutters. You also cull any with bad conformation, such as undershot jaws, turkey hocks, devil's grip. You will also take out some ewes which cut heavy fleeces, as some may have coarse wool, or they could be a bit hairy around the breech or be frosty faced. However, the net effect of your culling should be to increase the cut per head of your maiden flock.

You can get an improvement in the cut per head from both the ram side and the ewe side. A stud would measure the improvement in the cut per head from the ram side by comparing the average fleece weight of the rams chosen to be sires with that of the remainder of the rams in the same age group. Because only a few of the rams are kept as sires, the stud master should get a fairly big improvement from the ram side.

Of course, if you are a flock man, it is not quite so easy to determine the advantage you get from buying rams from a stud. A really accurate assessment of the benefit obtained could only be made by comparing the fleece weights of the imported rams with your rams of the same age bred in your flock and which grew under the same conditions as in the stud.

In addition, you would need to compare the average cut per head of the rams you can afford to buy with that of the best rams you breed in your flock. Once again, to make the comparison accurate the conditions under which both lots of rams grew would need to be the same.

However, in practice, it would be unlikely that your rams would enjoy the same level of feeding as the stud rams. This would tend to make the stud rams show to advantage in any direct comparison of fleece weights. Hence you would need to substitute an indirect means of comparing the performance of both groups of rams.

You could keep your best rams and mate them with a random run of ewes in such a way that you could identify each lamb with the ram which sired it. You could do this also with the imported rams. By comparing the offspring you could see which rams showed to advantage. This would also indicate whether it was worth your while breeding your own sires or continuing to buy them at your usual price.

But whether you breed your own rams or buy them from a stud they should still contribute to the improvement of your flock. In other words, the rams you use should cut more wool than the average of the male sheep bred in your flock—if you kept them as rams. Suppose the rams you choose as sires cut 2 lb. more wool than the average of those bred in your flock when given the same opportunities. The advantage from your choice of rams would be 2 lb. of greasy wool.

Similarly there would be a contribution from the ewe classing. The results obtained from different methods of classing were outlined in a previous article in this series. When the cut per head was the only factor considered in classing ewes an improvement of 0.42 lb. was achieved in the average cut per head.

If these ewes were mated after classing with the chosen rams the advantages contributed by the ram and the ewe side would be:—

From the ram side .. .. .. = 2.00 lb. greasy wool

From the ewe side (6.32 lb. — 5.90 lb.) = 0.42 lb. greasy wool

This equals a total advantage from the two sides of (2.00 lb. + 0.42 lb.) = 2.42 lb. greasy wool. However, when all things, such as wool weight, staple length, etc., were considered the final gain from the ewe side was reduced to 0.22 lb. greasy wool.

Therefore, the total advantages from classing and mating the rams which have been taken for this example with the ewes discussed in the previous example would be (2.0 + 0.22) lb. = 2.22 lb. greasy wool.

However, both the ewe and the ram sides have contributed to this advantage, so it is necessary to divide by 2 to find the increase in the breed average. This would equal $\frac{2.22}{2}$ lb. = 1.11 lb. greasy wool. But not all of this advantage would be passed on to the lambs

bred from these ewes and rams. The proportion that is passed on can be measured and expressed as a percentage of the total increase in the breed average due to selection.

For some characters over 30% of the gain is passed on to the lambs. These are known as characters which are highly heritable, and include greasy wool weight, clean wool weight, staple length, fibre diameter, fibres per square inch of skin and wrinkling.

A smaller proportion of the advantages gained by classing for some other characters is passed on to the lambs. These include such things as birth weight, weaning weight and wool quality number.

Only a small proportion of the advantages resulting from classing for breed type and fleshing is passed on to the lambs. These characters are said to be of low heritability.

Actually about 30% of the increase in the greasy wool cut per head resulting from classing is passed on to the lambs. Therefore, in the flock we have been considering $\frac{30}{100}$ of 1.11 lb. greasy wool would be passed on to the lambs. This equals $\frac{1}{3}$ of a pound. This figure refers to the average improvement in the cut per head of the offspring, including both ewes and rams, when they reach maturity. Some sheep will receive more than this $\frac{1}{3}$ lb. and some less, just as in the unclassed flock, from which their parents were selected, some were above average and others below.

However, this gain would not be effected in one year. A whole sheep generation would have to go by before it became apparent. This usually takes between 4 and 5 years. Therefore, considering the sheep generation as 5 years the rate of gain per annum would be $\frac{1}{3}$ lb. of greasy wool divided by 5. This equals $\frac{16}{3 \times 5}$ oz. (that is, $1\frac{1}{15}$ oz.) of greasy wool per year. This may seem rather small at first glance, but it serves to emphasise that you need to obtain the greatest possible gains from your selection by using accurate records.

In the next article of this series, ways and means will be discussed by which the various aspects dealt with so far could be incorporated in your breeding programme.

COUNTRY BREAKFAST SESSIONS.

The Rural Broadcasts Section of the A.B.C. is now providing regular breakfast sessions of interest to rural people from 4QY, 4AT and 4QS, Monday to Friday from 7 to 7.15.

Harry Greaves, stationed at Cairns, handles the northern programme, and Trevor Stockley conducts the southern programme from Toowoomba.

Preserving Vegetables by Salting.

R. E. LEVERINGTON, Horticulture Branch.

Vegetables to be salted should be thoroughly washed and the edible portions prepared as for normal cooking. A pre-cooking or blanching process in boiling water or steam is required to prevent subsequent deterioration in quality and appearance. To prevent over-blanching, the product must be cooled immediately in running cold water.

The vegetable is placed in a glass jar with a lacquered or plastic screw-top lid. A layer of about one inch thick of vegetables is placed on the bottom of the jar and sprinkled with fine cooking salt. The jar is filled to within one inch of the top with alternate layers of vegetable and salt, one pound of salt being required for 3 lb. of vegetables. The contents are then covered with a piece of clean muslin or cheesecloth, which is pushed down inside the jar. To press the vegetables down, two pieces of clean wood are wedged crosswise under the shoulder of the jar. In about 24 hours the pressure and salt will withdraw sufficient moisture from the vegetables to cover it with a strong brine. If insufficient brine is formed a solution containing 5 oz. of salt to one pint of water should be poured through the cheesecloth or muslin cover until the vegetable is covered and the jars completely filled. When bubbles cease rising, the tops should be screwed on tightly. If flat tops are not available, a layer of paraffin wax is a satisfactory substitute. If mould growth develops on the surface it should be removed and the vegetable used. If mould develops throughout the layers the vegetable should not be eaten. Prior to use, the vegetable should be soaked for about two hours in several changes of water and cooked without salt.

INSTRUCTIONS FOR INDIVIDUAL VEGETABLES.

Vegetables.	Instruction.	Blanching times in boiling water. Minutes. (Add extra 1–2 minutes for steam blanching).
Beans	Wash, string and slice, then blanch in boiling water, cool immediately in cold water, drain and pack	4
Carrots and Parsnips ..	Wash, scrape and cut into cubes or ¼-inch discs, blanching in boiling water; cool immediately in cold water, drain and pack	4
Cauliflower and Onions	Prepare as for normal cooking but leaving onions whole. Blanch cauliflower in boiling water and cool immediately in cold water For every 10 lb. of vegetables, use a brine solution containing a pound of salt in one gallon of water. Place the vegetables in this brine and allow to stand for 12 hours. After this period has elapsed, run off the brine and dissolve 1 lb. of salt in it and return to the vegetables. Allow to stand again for 12 hours. Repeat this operation at 12 hour intervals until in all 6½ lb. of salt has been added. Now pack in glass or stone jars and keep in a cool, dark place	4 (Cauliflower)