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C. W. WINDERS, B.Sc.Agr.

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Contents

ANNUAL RATES OF SUBSCRIPTION.—Farmers, Graziers, and all other persons in Queensland and Northern Territory whose main source of income is from the land; also Schools, Schools of Art, Agricultural Societies and Students in Queensland, **One Shilling.** All others, **Ten Shillings.**

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Event and Comment.

Prospects for Linseed.

WITH increasing amounts of the Asiatic production of linseed being utilised locally, and South American supplies largely unavailable to Australia because of the dollar position, a severe shortage of linseed oil for industrial purposes exists in Australia. This shortage is unlikely on present prospects to be relieved to any great extent for some considerable time.

Not only is the scarcity of linseed oil hampering Australian industry, but what oil is imported comes largely in the prepared form, which means that the by-products remain in the processing country. This deprives Australian stockraisers of what was once a substantial supply of a protein-rich concentrate—linseed meal.

A determined effort is being made to establish the linseed-growing industry in Australia on a scale which will enable the nation's demands to be met from local sources within a measurable period. Queensland has appeared to the commercial interests which are endeavouring to promote linseed-growing in Australia to offer excellent prospects as a producing State. As evidence of this, they allocated from the limited seed supplies available to them sufficient to plant nearly 6,000 acres in Queensland in the current season. A large proportion of the seed crop is expected to go back to contracting growers for the planting of a greatly expanded acreage in 1949.

During the past two seasons practically the whole of the plantings have been of the variety Walsh, but it is quite likely that among the commercial varieties of the flax plant which are grown for the production of linseed there are better varieties than Walsh for Queensland conditions. Both the State Department of Agriculture and Stock and the Commonwealth Council for Scientific and Industrial Research are engaged in one or more phases of the various steps of plant introduction from overseas, preliminary sorting out of varieties, larger scale field testing of promising varieties and assessment of the quality of the seed for processing purposes.

If present hopes are realised and the State is supplying substantial quantities of linseed to processors within the next few years, Queensland agriculturists will have gained a twofold benefit. Not only will they have attained a greater diversification of farming, but they may expect to share in the additional supply of protein concentrate made available.

Importation of Stud Stock.

THE Minister for Agriculture and Stock (Hon. H. H. Collins) has reminded Queensland livestock producers that the State Government, in conjunction with operators of certain overseas shipping services, offers assistance in the importation of approved stock from Great Britain and New Zealand.

For the most part, Australian studs are producing excellent animals, which as they are introduced to herds and flocks throughout the country are gradually raising the breeding quality of livestock. But even the best-served breeds would benefit from an infusion of the blood of first-class imported animals, and in addition those breeders who have a very limited number of studs from which to choose their breeding animals would appreciate a wider choice.

It is now becoming more generally recognised that the sire plays an outstanding part in the quality of the offspring, whether beef cattle, dairy cattle, sheep, pigs, poultry or horses. The assistance offered to primary producers in connection with the importation of stud animals is an indication of the Government's desire to increase the facilities for improvement not only of herd and flock sires but of all breeding stock.

Interested stockraisers should address their inquiries to the Under Secretary, Department of Agriculture and Stock, Brisbane.

Rural Training for Ex-Servicemen.

MANY ex-servicemen readers of the *Journal* may not yet be aware that they are offered opportunities in rural training which may be of immeasurable assistance to them if they are engaged in rural pursuits.

In brief, approved ex-servicemen are offered a course in both practical and theoretical farming. The course is provided at the Queensland Agricultural College at Gatton and embraces a wide range of crop and livestock farming. The training is entirely free and in addition the student is paid a generous allowance while attending the course. Further particulars may be obtained on application to the Deputy Director of Rural Training, Department of Post War Reconstruction, National House, Ann Street, Brisbane.

Soil Conservation.

TWENTY-ONE POINTS TO REMEMBER.

1. Don't try to treat the symptoms of erosion before remedying the cause. Measures for the reduction of run-off water from sloping land should receive first consideration.

2. Control of run-off commences at the crest of a watershed and extends to the creek bed.

3. Aim at the absorption of as much water as possible where it falls and provide a safe means of disposal for the surplus.

4. Use of vegetative cover, including crop residues and green cover crops, is an important factor in soil and rainfall conservation.

5. Rainwater allowed to escape from your farm as run-off represents loss of production and farm income. More serious still, it often involves the loss of soil as well.

6. The topsoil, which is the most valuable part of your land, is the first to be removed by erosion. Sheet erosion can proceed to an advanced stage if the land is not kept under close observation.

7. The effects of erosion are cumulative and the process accelerates as the condition of the land deteriorates.

8. Subsoil farming is usually starvation farming.

9. Carefully plan the layout and use of all parts of your farm and develop it in accordance with this plan. This means using each part of your farm for the purpose for which it is best suited.

10. The natural resources of forest, soil and water are intimately related. Proper treatment and use should be made of all three in the land use plan.

11. Don't burn stubble or other crop residues if you can possibly help it.

12. Don't bare fallow your land during the stormy summer months.

13. Be cautious with forest and grass fires, as they destroy close ground cover.

14. Don't attempt to determine levels with your eye or to design drainage systems haphazardly.

15. A well managed farm of moderate size will return more than a badly managed farm of large size.

16. The farmer who can plough a straight furrow is not necessarily a good farmer. Contour farming has many advantages over square or rectangular farming.

17. Learn to recognize the signs of erosion when you see them.

18. Erosion means much more than troublesome gullies, buried fences, or stunted crops. In the end it means the death of the land itself.

19. The health of human beings is largely governed by the health of the soil that grows their food.

20. Prevention of erosion is far easier than cure.

21. Conservation farming is natural commonsense farming. In comparison with many existing methods it ensures a more efficient use of rainfall, improved yields from crops and pastures, protection of the land against erosion, and a better and more stable farm income. It means maintaining our land and water resources in a productive and useful condition for this generation and all generations to follow.

A. F. SKINNER, Soil Conservationist.

THE QUEENSLAND YEAR BOOK, 1947.

The recently-issued official yearbook for Queensland contains a mass of information ranging from geography and climate of the State to public finance and provides a ready reference book to the resources and development of Queensland.

Maps showing rainfall incidence and variability are an interesting feature for the man on the land, as are also the informed comments on rural production and marketing of farm products and the statistical information.

This 400 page publication is available from booksellers at the low price of two shillings per copy.

EXHAUST GAS FOR MICE.

A Clifton reader of the *Journal* sends in a suggestion for dealing with infestations of mice and rats in grain stacks. He has had good results by connecting a ¾ or 1-inch garden hose to the exhaust pipe of a motor car or truck by means of a short length of bicycle tube, and running the engine to discharge carbon monoxide gas. If the grain stack is small enough to be covered by means of a tarpaulin, a complete kill can be effected. If the pile is not covered, by inserting the hose into the stack at various points the mice and rats are driven out in a dazed condition and can be easily killed.

Tomato Variety Investigations in the Stanthorpe District.

A. A. ROSS, Horticulturist, Horticulture Branch.

THE area planted annually to tomatoes in the Stanthorpe district is approximately 1,500 acres and returns in the vicinity of 250,000 half-bushel cases. The industry is important to Queensland largely because the whole of this production becomes available during the summer months, when tomatoes can be grown only with difficulty in other parts of the State. However, it will be observed that the per acre yield of marketable fruit is alarmingly low. There are numerous factors which can contribute towards this poor yield. Some of these are climatic and, therefore, beyond control, but others can be successfully overcome if given reasonable attention. A survey indicated that while inefficient systems of culture and improper attention to pest and disease control were helping to keep yields at a low level, the use of unsuitable varieties was largely responsible for this relatively poor return. This conclusion prompted the commencement of an investigation into the whole question of tomato varieties for the district.

The tomato is a plant which shows a marked varietal adaptation to local conditions, and varieties which thrive in coastal districts of Queensland may fail to do well inland. In addition, the crop in the Stanthorpe district is grown during the summer months and, therefore, it is reasonable to expect that varieties different from those which are found suitable for the autumn, winter, or spring crops on the coast will be required there. For example, Break o' Day, which is a very popular variety in coastal districts, usually fails to produce satisfactory yields in the Stanthorpe district.

LOCAL REQUIREMENTS.

In the majority of cases, tomatoes are produced in the Stanthorpe district without the aid of irrigation, and since they are grown during the summer transpiration of water from plants is relatively rapid. This demands that the plants should be grown on the ground in the bush form, as staking and pruning have the effect of increasing the rate of transpiration and inducing the onset of blossom-end rot.

Sunburning of fruit is an ever present danger during the growing period of the crop; therefore, types which show some resistance in this respect should be chosen.

The late summer months are usually wet and conditions are favourable for the spread of leaf diseases such as target spot and Septoria leaf spot; thus, varieties which either show some tolerance to these diseases or have such a habit of growth as to permit the effective application of fungicides are to be favoured. Fusarium wilt, which is a devastating disease in many tomato-growing areas, seldom causes serious losses in crops in the Stanthorpe district even when susceptible varieties are grown. Therefore, resistance to this disease becomes a factor of minor importance in assessing the suitability of a variety, at the present time, for these conditions.

The market at the time when Stanthorpe tomatoes arrive demands a smooth, round fruit of 2¾ in. to 3 in. diameter; and, since it usually has to travel considerable distances before being consumed, it must be firm and have a tough skin and solid walls. Absence of ribbing, roundness of shape, and uniformity of size of fruit speed up the operation of packing and give the finished case a much more attractive appearance. For this reason, corrugated Chinese types and small cluster varieties are not desirable. Fruit less than 2 in. in diameter usually does not find a ready market and varieties which normally produce a large proportion of these fruits are, therefore, unprofitable to grow. The production of many small fruits and lack of uniformity in fruit size were perhaps the most serious defects of the varieties grown prior to 1944.

CLASSIFICATION OF TOMATO VARIETIES.

There are certain classes of tomato varieties which cannot be expected to meet commercial requirements in the Stanthorpe district. Cluster varieties, while producing a very large number and weight of fruit, usually form fruit of a size too small for market requirements. Corrugated Chinese varieties do not find ready sale on the markets available to Stanthorpe growers; in addition, they require hand grading

Large, Smooth, Round Types.	Small, Cluster Types.	Corrugated, Flat, Chinese Types.	Ornamental Types.
Bonny Best	Ailsa Craig	Adelaide Dwarf Red	Cherry
Break o' Day	Best of All	Burwood Wonder	Currant
Burwood Prize	Britain's Best	Burwood 44	Farthest North
Chalk's Early Jewel	Essex Wonder	Mortgage Lifter	King Humbert
Denisonia (Bowen Buckeye Globe)	Kondine Red	Orange Prolific	Red Pear
Earliana	Heterosis	Rouge de Marmande	Red Plum
Grosse Lisse	Market King	South Australian Dwarf	San Marzano
Marglobe	Potentate		
Marhio	Prosperity		
Marvana	Radio		
Matchless	Recruit		
Norton	Salads Special		
Nystate	Sensation		
Pearson	Sterling Castle		
Penn State	Vetomold		
Penn Heart			
Pritchard			
Rutgers			
Sioux			
Stone			
Valiant			

and are difficult to pack. Small ornamental types are not intended for commercial production on the fresh fruit market and their uses are generally confined to home garden purposes or canning.

In the accompanying table the varieties are classified on the basis of shape and size of fruit. The class of large, smooth, round types can be further divided according to shape, breeding, and habit of growth, but such classification is difficult and serves little useful purpose. This table enables the potential value of many varieties to be determined at a glance.

EXPERIMENTAL DETAILS.

The investigations were conducted over four years on individual farms and followed trials which had been commenced in the Brisbane area two seasons previously. Seed of all available varieties was collected from many sources, including the United States Department of Agriculture, the Division of Plant Industry of the Council for Scientific and Industrial Research, and many seedsmen throughout Australia. In the first year all varieties on hand were grown and outstanding plants of the most successful varieties were selected as parents of the material used in trials of the following year. Single plant selection, on the basis of yielding capacity, size and shape of fruit and freedom from disease, was continued for several generations until a desirable type of plant was established which would reproduce itself with a high degree of uniformity. In addition, as a collateral project, several new varieties were introduced each season from various sources and compared with the best pedigreed strains. Selections were also made on any variety which showed promise, and these were included in the subsequent strain trials.

Cultural operations and pest and disease control methods followed Departmental recommendations throughout and were performed by the growers on whose properties the various plots were laid down.

In the collection of data, only fruits of 2-in. diameter and larger were harvested. This had the effect of debarring varieties which normally produce a large number of small fruit from being credited as heavy yielders. In other words, yield of marketable fruit was recorded rather than total yield. Observations on fruit quality, which includes uniformity of size and shape, desirability of size and shape, freedom from blemishes, flesh texture, absence of puffiness, flesh colour, carrying capacity, and resistance to fruit and leaf diseases were taken into account with yielding capacity in evaluating each variety.

DISCUSSION OF VARIETIES TESTED.

The varieties tested have been divided into four groups according to their suitability for the Stanthorpe district. These are:—

(1) High yielders of first quality fruit which may be relied upon to crop well consistently;

(2) High yielders of good quality fruits in certain seasons but which are somewhat exacting in their environmental requirements;

(3) Moderate yielders of fair quality fruit which require ideal growing conditions to produce payable yields;

(4) Varieties which possess some serious defect and cannot be recommended for growing in the Stanthorpe district.

Group 1.

In all Stanthorpe trials, varieties included in this group have yielded consistently well and have produced fruit of excellent quality under a wide range of climatic conditions. As described earlier, a rigid system of plant selection has been conducted on these four varieties and uniform strains of them have been developed. A scheme has been inaugurated whereby certified seed of these varieties will be available to growers in 1949. In trials which were conducted under conditions normal to the district in all respects, yields of these four varieties have been consistently in the vicinity of 800 half-bushel cases per acre, and specially selected plants have yielded up to 30 lb. of marketable fruit, which is equivalent to 1,500 cases per acre. It can be reasonably anticipated, therefore, that given proper attention these varieties will produce yields far in excess of those commonly grown in the past.

Grosse Lisse.

Introduced from Northern Africa into Australia in 1939 by the New South Wales Department of Agriculture, this variety has proved very suitable for local conditions. It is a mid-season variety, which commences to harvest in approximately eleven weeks after transplanting and will continue for about seven weeks. The bush is of medium size, semi-erect, non-determinate, and with foliage of medium density (Plate 40). Leaves are long and broad and of the normal tomato type. The main stem is fairly heavy, branches freely, and is capable of carrying a heavy crop. The fruit is large, circular in transverse section, and slightly pointed in longitudinal section. The stem-end cavity is shallow with a relatively large corky ring. Mature green fruit is pale green in colour with darker shoulders, free from ribbing. There is an absence of streaks at the stylar end and the scar is very small and slightly depressed. The fruit ripens to a bright red colour and has a smooth, slightly tender skin. The internal flesh is red, of fine, soft texture with a large, fleshy central mass free from fibrous core. Cells are well supplied with juice and have no air-space. The inner walls are thick and the outer of medium thickness, which ensures good carrying. The placentae are large and carry a considerable number of comparatively large seeds. There are approximately 7,000 seeds (dry) per oz. and about 12 lb. of ripe fruit yield an ounce of seed. The flavour is somewhat sweet and mildly acid.

Grosse Lisse is a large tomato of which practically the whole crop will reach marketable size when given reasonable attention. It is of excellent quality, yields heavily even under relatively hard conditions, and the fruit very seldom cracks. The recommended planting distance in Stanthorpe soils is 6 ft. by 6 ft.

Rutgers.

Introduced into Australia in 1934 from the New Jersey Agricultural Experiment Station, where it was selected from the progeny of a cross between Marglobe and J.T.D.

It is a late variety with a large, dense, erect, non-determinate vine and is a consistent cropper. Leaves are long and broad and rather dark in colour. The main stem is thick and branches freely. The fruit is large, circular in both transverse and longitudinal sections, and can

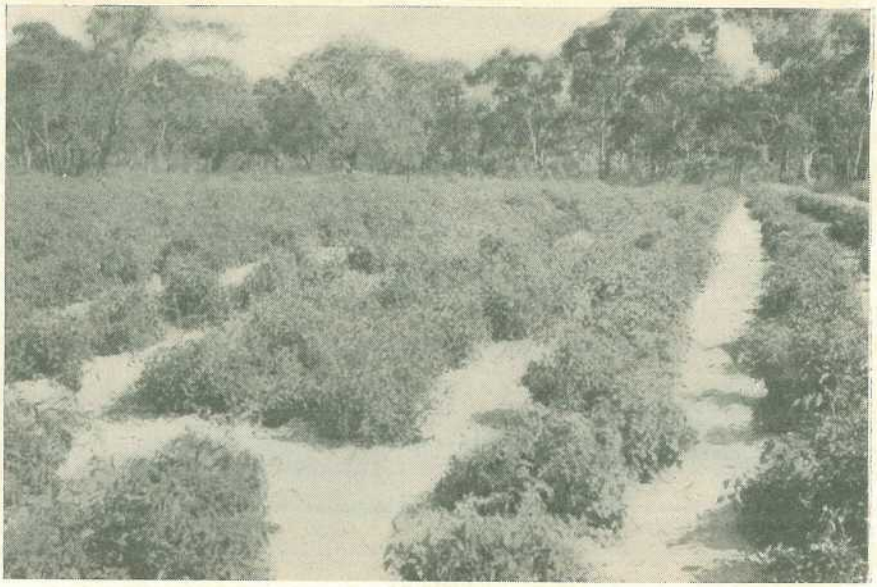

Plate 40.

A FIELD OF TOMATOES, VARIETY GROSSE LISSE, SHOWING SEMI-ERECT PLANTS OF MEDIUM SIZE.

best be described as deep globe-shaped. Shoulders are smooth and the stem-end cavity shallow with a medium-sized corky ring. The stylar scar is very small and smooth. Cracking is rare, the radial type being the more common. The mature green fruit is bright green in colour with darker shoulders and ripens to a bright red. The skin is smooth, tough, and yellow. The internal flesh is red, firm, and of fine texture. The cells are juicy and free from air-space, with outer and inner walls of medium thickness. Placentae are of medium size and carry small seeds, approximately 10,000 weighing 1 oz. (dry). About 23 lb. of fruit are required to yield an ounce of seed. The flavour is somewhat acid.

Rutgers is a tomato of reasonably good carrying capacity and will produce a reasonable crop even under unfavourable conditions. Size is good, and this, combined with its deep globe shape, facilitates grading and packing. It is, therefore, popular with growers and will be an important variety in this district for a long time. Recommended planting distance is 6 ft. by 6 ft.

Sioux.

An introduction from Nebraska, U.S.A., which has proved very satisfactory under Stanthorpe conditions. It is of recent origin and resulted from a cross between All Red and Stokesdale.

It is a first-early variety which yields heavily up till the final packing. It has a medium-sized, very open, sprawling type of non-determinate bush with long, narrow, normal tomato type leaves (Plate 41). The main stem is of medium thickness and branches fairly

Plate 41.

A SINGLE PLANT OF THE VARIETY SIOUX, AT THE TIME OF SETTING OF THE FIRST FRUIT, SHOWING ITS SPREADING HABIT OF GROWTH.

Plate 42.

A SINGLE PLANT OF THE VARIETY VALIANT, AT THE TIME OF SETTING OF THE FIRST FRUIT, SHOWING ITS COMPACT HABIT OF GROWTH.

freely. The fruit is of large size, circular in transverse section, and slightly flattened in longitudinal section. The stem-end cavity is shallow with a comparatively large corky ring and smooth shoulders. The stylar scar is small and smooth. Cracking is very rare. The mature green fruit is pale green in colour with no darkening of the shoulders, and it ripens to a bright red. The skin is smooth and tough. The internal flesh is pinkish red, of fine texture, and free from core. The central mass is of medium size, fleshy, and firm. The cells have no air-space, are juicy, and have thick inner and outer walls. Placentae are of medium size and carry seeds of medium size—approximately 8,000 per oz. (dry). Approximately 22 lb. of ripe fruit yield an ounce of seed. It has a sweet acid flavour.

Sioux is a heavy yielder of excellent quality fruit and is the best early variety encountered for Stanthorpe conditions. Recommended planting distance is 6 ft. by 6 ft.

Valiant.

Introduced from U.S.A. in 1936, but otherwise its origin is somewhat obscure. It has proved very successful in all trials in the Stanthorpe district.

The vine is vigorous, erect, compact, determinate, and densely covered with long, broad leaves of the normal tomato type (Plate 42). It has a thick main stem and branches freely. The mature green fruit are deep green in colour with a dark green shoulder. They are deep-globe shaped, very smooth, with a very shallow stem-end cavity. The stylar scar is smooth and very small. No evidence of cracking appeared in any of the trials with this variety. The fruit ripens to a bright red colour and has a smooth, tough skin. The internal flesh is red, of fine texture, and has no fibrous core. The cells are juicy, free from air-space, and both inner and outer walls are thick. The placentae are small and carry

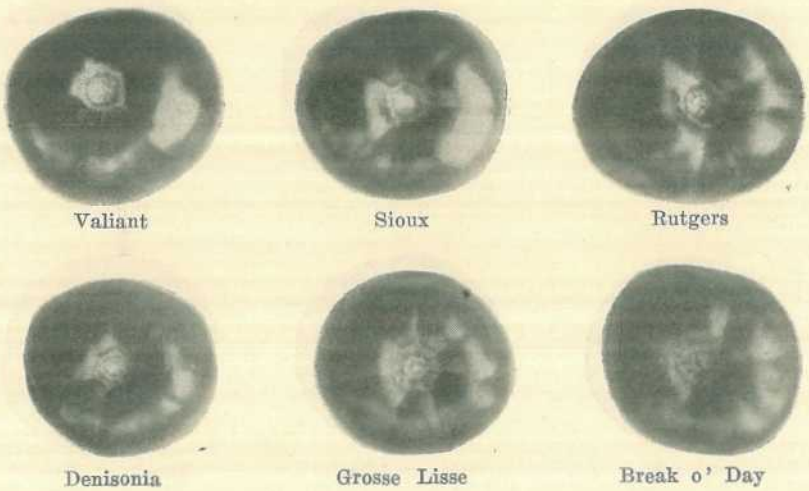

Plate 43.

Fruit of Six Tomato Varieties Showing the Desirable Globe Shape and Smooth Outline.

medium-sized seeds—approximately 8,000 per oz. (dry). About 17 lb. of fruit yield an ounce of seed. The flavour is slightly acid. This variety appears to possess a high resistance to target spot, as in all trials foliage was remarkably free from this disease and remained green much longer than that of other varieties.

Valiant produces a fruit of exceptionally high quality and yields very well. Its compact bush would permit of its being spaced more closely in the row and it is recommended that it be planted at 4 ft. 6 in. by 6 ft. spacing.

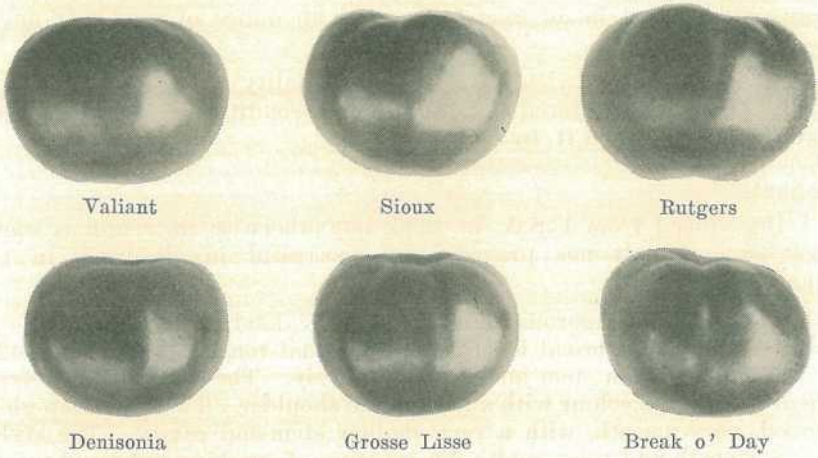

Plate 44.

FRUIT OF SIX TOMATO VARIETIES SHOWING THE DESIRABLE GLOBE SHAPE AND SMOOTH OUTLINE.

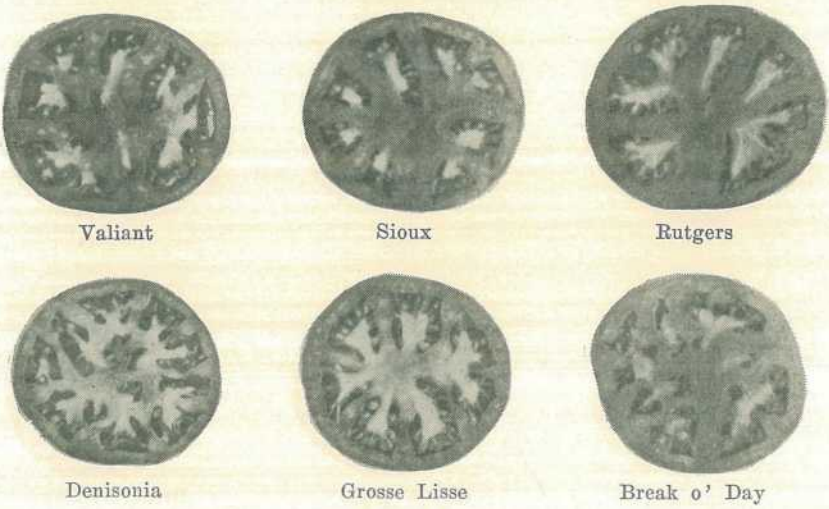

Plate 45.

CROSS SECTIONS OF FRUIT OF SIX TOMATO VARIETIES SHOWING DIFFERENCES IN INTERNAL STRUCTURE.

(To be Continued.)

PLANT PROTECTION

Codling Moth Control Experiments, 1947-48.

A. W. S. MAY, Entomologist, Science Branch, and K. FISHER-WEBSTER, Experimentalist, Horticulture Branch.

THOUGH the results obtained at Stanthorpe for the season 1946-47 had confirmed the value of a 0.1 per cent. DDT spray for codling moth control, many problems still remained to be solved before orchardists could use this insecticide efficiently. Accordingly, further experiments were carried out in the 1947-48 season to clear up some of the difficulties that face apple growers adopting a DDT cover spray schedule.

EXPERIMENTAL PROCEDURE.

Forty-five trees of the late-maturing Granny Smith variety, showing uniformity of vigour, were chosen for the experiment, chiefly because the fruit would be subject to codling moth attack for the greater part of the season. These were divided into five blocks of nine trees each. Eight different spray schedules were devised, and for the purpose of gauging codling moth activity within the experimental area, unsprayed plots were included in the series. Each of these nine treatments was applied, in turn, to single tree plots within each of the five blocks.

The treatments were designed among other things to shed light on the following points:—

(*a*) The merits of DDT in emulsion and dispersible powder type sprays;

(*b*) The efficiency of semi-dormant oil-lime sulphur sprays and summer sprays containing wettable sulphur or hexaethyl tetraphosphate* in keeping red mite in check; and

(*c*) The necessity or otherwise for a calyx spray in the codling moth control programme when DDT is used in the cover sprays.

The treatment schedule and the amount of codling moth damaged fruit in each are indicated in Table 1.

Codling moth, though not as severe as in the previous season, caused appreciable loss of fruit on unsprayed trees, for only 26 per cent. of the harvested fruit was unblemished. The inclusion of unsprayed trees ensured an active moth population throughout the experimental area for the greater part of the season; thus, despite the use of DDT in most schedules, codling moth damage was more severe than that experienced on the majority of orchards in the Granite Belt where DDT was applied to all trees.

* Marketed in Queensland as "Hexone."

TABLE 1.

CODLING MOTH CONTROL SCHEDULES (1947-48).

Schedule.	Semi-dormant Spray.	Calyx Spray.	*Cover Sprays.	†Injured Fruit.
				Per cent.
1	..	Lead arsenate ..	Lead arsenate	20·1
2	Oil-sulphur	DDT	DDT	20·2
3	..	DDT	1, 3, 5—DDT + Hexone 2, 4, 6—DDT	18·1
4	..	DDT	1, 3, 5—DDT + Sulphur 2, 4, 6—DDT	17·6
5	..	..	DDT	17·6
6	..	Lead arsenate ..	DDT	18·6
7	..	Lead arsenate ..	DDT (emulsion)	7·6
8	..	Lead arsenate ..	..	68·5
9	..	..	..	73·3

* Unless otherwise stated, DDT sprays were prepared from a dispersible powder concentrate.

† Based on harvested fruit and including both stung and wormy apples. Many of the stung fruits would be marketable.

Altogether, six cover sprays were applied. The timing of the first and second coincided with definite periods of moth activity as determined from lure trap records. The subsequent cover sprays followed a three-weekly schedule as moth activity on the rest of the orchard was not sufficient to permit the efficient functioning of lures later in the season.

DISCUSSION.

Codling Moth.

The inclusion of a lead arsenate schedule in the trial enabled a comparison to be drawn between this and the various DDT schedules. Following the results of last season's experiments, zinc sulphate and hydrated lime were incorporated with the lead arsenate in treatment 1, the zinc sulphate to increase the insecticidal efficiency of the spray and the hydrated lime to lessen the likelihood of spray injury. On the whole, there was a strong suggestion that the DDT schedules were more efficient than the lead arsenate schedule, but conclusive evidence on this point was not obtained.

The addition of hydrated lime greatly reduced the amount of foliage injury from lead arsenate, but this spray hazard was not entirely eliminated. Varying degrees of foliage injury were noticeable on all trees receiving the lead arsenate-zinc sulphate-hydrated lime schedule, a condition not associated with DDT sprays. Also, the inclusion of zinc sulphate and hydrated lime greatly increased the spray residue problem and this makes the combination spray undesirable late in the season. Because of the excellent results obtained with DDT, it is doubtful whether lead arsenate will retain its place in the general orchard spraying programme, at least for cover spray usage.

All DDT schedules gave efficient codling moth control and evidence was obtained that, at the concentration used (0·1 per cent.), DDT emulsion was more efficient than the dispersible powder. Noticeable spray residues were absent on plots receiving DDT spray schedules, and clean attractive fruit was harvested from all trees sprayed with the insecticide.

Despite the inclusion of spray schedules designed primarily to elucidate the value of a calyx spray when DDT is used in cover sprays, definite conclusions cannot be drawn from the data. When lead arsenate is used in both calyx and cover sprays, the calyx spray is much more important than in schedules requiring the application of DDT in cover sprays. The greater efficiency of the latter insecticide during the period of fruit development tends to offset any losses which might be caused by the omission of a calyx spray. This is seen more clearly when it is remembered that considerable fruit shedding normally occurs early in the season and also that the first cover spray is invariably applied within three weeks of the calyx spray.

Woolly Aphid.

Many orchardists in the Granite Belt have recorded damage to their trees from severe woolly aphid attacks following the use of DDT for codling moth control. Though Granny Smith apples are not as subject to this pest as some of the earlier apple varieties, such as Delicious, only small aphid populations were present on the experimental trees. Throughout the season, the woolly aphid parasite* could be found on the trees, and though its incidence fluctuated to some extent, parasite activity was such that most of the aphids were destroyed by the end of the growing period.

Despite low populations of this pest, periodical observations throughout the summer and autumn revealed that hexaethyl tetraphosphate at the concentration used (1-1600) shows little promise of filling the role formerly occupied in the Granite Belt by nicotine sulphate. Higher concentrations of the insecticide with an efficient spreading material may prove more satisfactory.

Mite Control.

Following evidence of mite† injury on the experimental trees in early January, it was anticipated that damage would become extensive later in the season. However, the mild weather of late summer and autumn did not favour prolonged mite activity and only slight foliage injury developed.

The use of a pale oil-lime sulphur spray at bud burst had a marked influence on summer mite populations despite the subsequent use of DDT for both calyx and cover sprays. This semi-dormant spray proved far more effective in reducing mite populations in the trees than wettable sulphur or hexaethyl tetraphosphate applied at six-weekly intervals during summer. It is apparent that mite control should be undertaken prior to the onset of conditions favourable for mite development; the use of a dormant red oil or a semi-dormant pale oil against the overwintering stage of the mites is more likely to keep mite populations low in summer than is an acaricide applied when the trees are in full foliage and populations are dispersed over the leaves.

CONCLUSIONS.

Though the introduction of DDT into the spraying programme on deciduous orchards has greatly altered the outlook for codling moth control, further experimental work is necessary before the many problems that have arisen following its use can be solved.

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* *Aphelinus mali* Hald.

† *Bryobia praetiosa* Koch.

Further experimental work is planned for the 1948-49 season along lines suggested by the 1947-48 work. Pride of place must be given to two of the more outstanding problems at present facing growers, namely, the control of woolly aphid and a reduction in the number of DDT applications required for the control of codling moth.

RECOMMENDATIONS FOR THE 1948-49 SEASON.

Growers are advised to conform to the pest control schedule recommended by this Department early last season. The salient points of this schedule may be listed as follows:—

1. Orchard hygiene should always be an important part of the orchardist's pest control programme. Over-wintering larvae of the codling moth, both in the packing shed and in the orchard, should be systematically destroyed each year.

2. Either a red oil spray (1-20) as late as possible before bud movement, or a pale oil-lime sulphur (1-1-20) at bud burst, should be applied to destroy red mite and lessen the risk of injury from this pest when DDT is used later in the season.

3. Until further evidence is available concerning the merits of the calyx spray in DDT schedules, the standard lead arsenate calyx spray should be retained.

4. Either lead arsenate or an 0·1 per cent. DDT spray may be used, applications being timed in accordance with spray notices issued by the Department of Agriculture and Stock.

Woolly aphid and mite populations should be dealt with as they develop on the trees, the aphid with the standard white oil-nicotine sulphate spray (white oil 2½ pints, nicotine sulphate 1¼ pints, water 100 gallons) in place of one or more of the DDT cover spray applications, and the mites by substituting an oil spray (1-60) for one of the DDT cover sprays.

Control the Banana Weevil Borer!

J. A. WEDDELL, Entomologist, Science Branch.

BANANA planting operations take place in the spring and all growers, whether newcomers to the industry or those increasing their areas, should take all possible precautions against the banana weevil borer.* This insidious pest, if ignored, can easily become the factor limiting the success of the venture. For this reason it is essential that growers should familiarise themselves with the habits of the pest so that the control recommendations can be efficiently carried out.

Habits of the Insect.

The adult beetle is a hard, slender, black weevil about half an inch in length and it has a curved proboscis or snout. This is the free-moving stage of the insect, but it moves about only in dark places or at night. Normally it shelters by day in the soil, in rotting corms, or in cut stems and other debris lying on the ground.

* *Cosmopolites sordidus* Chev.

The eggs are usually laid into the corm, but occasionally they are laid into either the firm basal part of the stem of the growing plant or into any part of the spent stem after it has been cut away and is lying on the ground. When an egg has been inserted into the plant tissue, the small opening soon becomes sealed off; consequently it is impossible to detect the presence of an egg from a surface examination. The principal egg-laying periods in the year are spring and autumn, but some egg-laying takes place all the year round. Eggs hatch usually in about eight days but in the height of summer the period may be as short as four days.

The grub that emerges from the egg is small, soft and legless. It tunnels its way into the plant tissue, growing and feeding more voraciously as it gets older. In the spring it is usually full-grown in about six weeks, but in the summer the rate of growth is much faster and the grub becomes full-grown in about three-and-a-half weeks. The grub then transforms to a pupa and from the pupa the adult beetle emerges after seven days. The breeding of another generation then commences.

The Damage.

It will be seen that the freely moving adult beetle is responsible for new infestation from plant to plant. The egg stage is the one mainly responsible for the initial infestation of a new plantation if eggs are present in the suckers. It is the grub stage that causes the damage to the plants.

Damage to the plants can affect the plantation in three different stages. If the suckers for a new plantation are carelessly selected and not properly cleaned, then a poor stand will probably result. The grub from a single egg is sufficient to kill a sucker. If the growing plantation becomes infested when the plants are in bearing they will start to show the effects of damage. In dry weather, the plants may suffer from lack of vigour owing to a shortage of food reserves. In wet and windy weather, plants will collapse under the weight of the heavy bunches owing to the root failure and poor anchorage caused by corm destruction. If the attacks continue unchecked then the plants as a whole will become weakened, and first one stool and then another will deteriorate. Finally, the plantation that should have lasted several years more will have to be dug out altogether because it will not be profitable to work.

Keeping New Plantations Clean.

The first essential is to start off with clean planting material. To do this, the following points should be observed.

1. The transfer or purchase of banana-planting material is controlled by the Banana Industry Protection Board. The intending grower should make himself acquainted with the requirements of the Board by enquiry from the local horticultural officer of the Department of Agriculture and Stock.

2. The plantation from which suckers or other planting material are to be taken should be free, or nearly so, from banana weevil borer infestation.

3. Before the suckers are removed from the parent plantation they should be trimmed and pared. In paring the corm of the sucker a layer at least one-eighth of an inch thick should be cut away. By so doing any eggs that have recently been laid will be removed and destroyed in the parings. If grub tunnels are exposed then the sucker should be pared further. Of course, if mutilation is severe that particular sucker should be discarded.
4. The trimmed and pared suckers should be bagged immediately and removed from the parent plantation before nightfall, otherwise egg-laying adults may be attracted to the freshly cut surfaces and the work already done will be of no value.
5. All discarded suckers should be split and, with the parings and other debris, spread out to dry in the sun.

Once the new area is planted it may become infested by beetles wandering in from older adjacent or nearby plantations, for obviously the new plantation will usually be in a banana-growing district. It is therefore advisable to place out beetle-baits and these for convenience usually consist of lengths of cut stems. A piece of stem 18 inches long split lengthwise will provide two baits, which should be placed with the flat surface to the ground. As the suckers grow advantage should be taken of any shade so as to enable the baits to remain moist and attractive as long as possible. The baits should be examined frequently and any beetles found on them or on the soil beneath should be destroyed. Even a small number killed in this way can well repay the little extra time and trouble.

Control in a Bearing Plantation.

As soon as the plantation comes into bearing, advantage can be taken of the freshly cut surfaces of the corm which are exposed when cutting down the old spent stems and when desuckering. These freshly cut surfaces are most attractive to the beetles and they should be dusted with a poison mixture. The poison recommended is an arsenical compound known as Paris green and this is still strong enough to be effective when mixed at the rate of one part Paris green to six parts flour. This mixture should be dusted on to every freshly cut surface. In cutting down an old stem it is suggested that it be cut off at a convenient height, six inches or more above ground level. If the base is then chopped almost through near ground level the stump of the plant can be bent over so as to expose two cut surfaces. These should be dusted with the mixture and the stump of the plant then straightened. A small space will thus be left between two moist poisoned surfaces and this will form a very effective poison bait.

All old stems and excess suckers that have been removed should be chopped across, split lengthwise, and placed out in the open spaces between the rows so that they will dry out as soon as possible and cease to provide beetle harbourage.

Biological Control.

Considerable attention has been paid in Queensland to the possibility of biological control of the banana weevil borer. Over 20 years ago colonies of an Histerid beetle* were imported from Java and

* *Plaesius javanus* Er.

liberated. Again in 1928 further colonies of the same beetle and large numbers of a fly*, whose maggots are predaceous on the grubs, were imported and liberated. Unfortunately all of these attempts were unsuccessful. The beetles were found for a short period after liberation and then disappeared completely. The attempt to establish the fly was even less successful as the species was not seen again after liberation. Just before the war, another species of beetle, this time a Hydrophilid†, was imported from the Federated Malay States. This insect was successfully established in south coastal areas and from there it has been distributed to other banana-growing areas. There seems reason to believe that the insect is of some value but it has by no means solved the banana weevil borer problem.

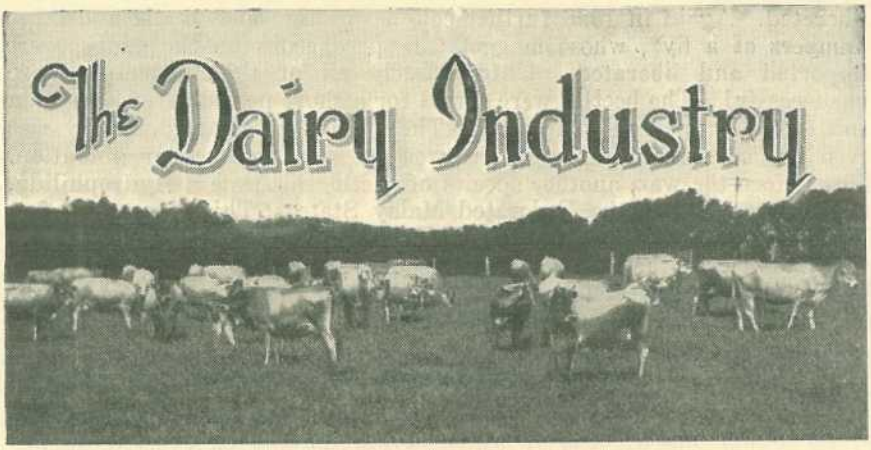
New Experimental Work.

A great deal of interest has recently been taken by banana growers in the newer insecticides, of which several have been evolved during and since the war. DDT is foremost among these. It has been shown by laboratory tests that the adult weevil will die shortly after a brief contact with DDT. Experimental work with this and other new insecticides in several banana plantations is planned for the present season and this work may have to continue into the following season owing to the difficulty that may be experienced in assessing results. The general form of the experiment is that groups of plants in the chosen infested areas will be marked. Some will then be sprayed with DDT at a strength of 0·4 per cent., that is, four times the strength that is normally used on cultivated plants. Two other new insecticides will also be included in the trials. The sprays are to be applied to the basal parts of the plants and to the surrounding soil. One application will be made in the spring and subsequent applications will be made as occasion seems to warrant, and they will probably be timed at least for summer and autumn. These details are given so that growers may know what experimental work is in progress, but it must be clearly understood that positive recommendations along these lines are not possible until the experiment is finalised.

Pending the results of the experimental work, growers are urged to carry out the baiting and other recommendations given in this article.

* *Chrysopila ferruginosa* Wied.

† *Dactylosternum hydrophiloides* McLeay.



Why Cream Tests Vary.

Prepared by DIVISION OF DAIRYING.

VARIATIONS in butterfat tests of cream supplied to butter factories are often a source of concern to dairymen. It is almost universally felt that, since the milk is drawn from the same herd, fed and milked in the same manner, and separated under identical conditions from day to day, there should be no variations in the factory butterfat tests of cream. Any variation is regarded with suspicion and the method of testing at the factory usually becomes the butt of criticism. Great care is certainly necessary in sampling and testing cream if the results are to be correct, but variations are bound to occur in tests, as so many factors affect the process of separation of cream from milk serum.

PHYSICS OF SEPARATION.

In the separator, force is used to bring about the separation of the cream from the milk serum. The simplest definition of "force" is that it is a push or pull—for example, the force of gravity tends to attract (or pull) all matter to the centre of the earth. The specialised force made use of in the common separator is known as centrifugal force. The term centrifugal force is used to describe that force which causes a body revolving round a central point to fly from the centre. When a car negotiates a curve at a considerable speed the passengers find themselves crowded up against the outside cushions due to the action of centrifugal force. The cushions, by pushing inwards, ensure that the passengers take the desired curve path through space. Roads are banked on curves to counteract the centrifugal tendency and thus ensure that the car takes the desired course.

Centrifugal force can be harnessed to act upon liquids as well as upon solids.

PRINCIPLES OF SEPARATION.

The separation of cream from milk serum in the centrifugal cream separator is thus based upon the principle *that when liquids of different specific gravities revolve around the same centre, at the same distance and with the same speed, a greater force is exerted upon the heavier liquid than upon the lighter.* Thus, in the case of milk, the milk serum will be subjected to a greater centrifugal force than the fat particles, with resultant separation of the two phases.

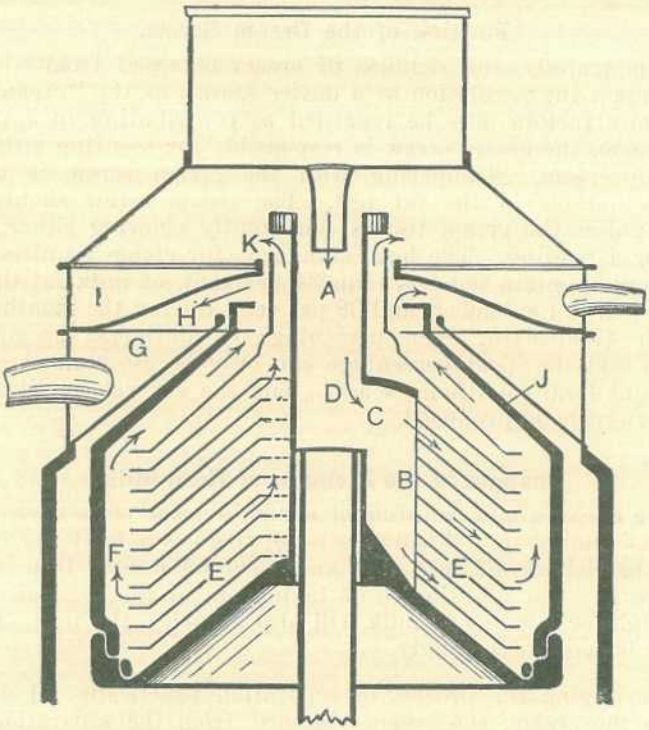


Plate 46.

SECTION OF THE UPPER PORTION OF A SEPARATOR.

(A) Milk inflow.
(B) Opening in projecting wing.
(C) Projecting wing.
(D) Hollow shaft.
(E) Skimming-discs.
(F) Circumference of bowl.
(G) Skim-milk pan.
(H) Inlet to skim-milk pan.
(I) Cream pan.
(J) Bowl hood.
(K) Inlet to cream pan.

The skimming discs aid in the separation of the two phases by braking the centrifugal tendency possessed by the rotating milk just long enough to permit thorough separation of milk serum from fat particles, which takes place about one-third of the way down the discs in a region known technically as the zone of separation. The skimming discs are thus designed to balance a certain centrifugal force; this is the reason for the conical shape and special angle of incline of the sides (see Plate 46). If the maker's instructions are ignored and the speed of the separator varied at will, then the machine cannot be expected to do its work efficiently. Low speeds will develop insufficient centrifugal force and thin cream results. High speeds develop excessive pressure on the sides of the separator bowl, which is normally of the order of tons per square inch, and so may threaten injury to the machine.

FACTORS AFFECTING VARIATIONS IN CREAM TESTS.

Position of the Cream Screw.

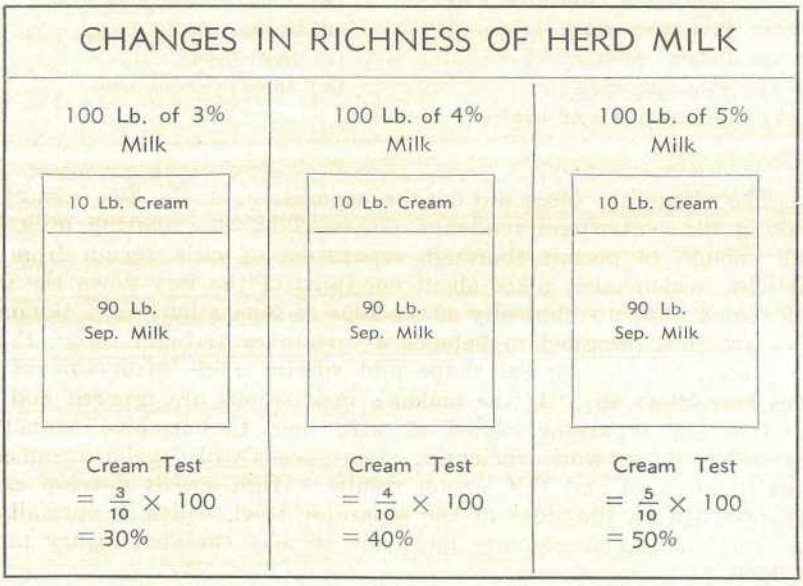
Fundamentally, the richness of cream obtained from a separator depends upon the regulation of a device known as the "cream screw." While many factors may be regarded as contributing to a particular test of cream, the cream screw is responsible for securing either a rich or a thin cream. Tampering with the cream screw is bound to cause fluctuations in the fat test. The cream screw should not be changed unless the cream test is consistently showing either too high or too low a reading. The legal standard for cream requires that the cream should contain not less than 34 per cent. of milk fat during the months April to September, and 38 per cent. during the months October to March (inclusive). The percentage of butterfat specified is a minimum and the ideal percentage can only be ascertained by taking into account local conditions, seasons, and the general conditions under which the cream is produced.

Changes in the Richness of Herd Milk.

These changes may be brought about by some cows drying off and fresh cows coming in. When this is so, there is a tendency towards a drop in the richness of herd milk and a corresponding drop in the test of the cream. The addition to or taking out of the herd of cows producing high- or low-testing milk will also influence the test. It will be raised or lowered accordingly.

Since during the process of separation practically all of the fat goes into the cream, the cream obtained from the separation of rich milk will contain more fat than that obtained from the separation of poor milk.

DIAGRAM 1.



Once the cream screw of the separator has been set, the separator will always deliver a definite ratio of separated milk to cream so long as all other conditions remain normal. Suppose the ratio be 90 to 10. Then, for every 100 lb. of milk separated, 90 lb. of separated milk and 10 lb. of cream will be discharged. Thus, irrespective of the richness of the milk put through the separator, this ratio will be maintained.

The relationship of the cream test to the richness of the milk separated may be represented as in Diagram 1.

Speed of the Separator Bowl.

The efficient operation of a separator of any make depends upon the centrifugal force generated by the speed of the bowl. As mentioned previously, the manufacturer's instructions relative to the speed of operation must be rigidly adhered to, otherwise the fixed skimming discs which are specifically designed to balance a certain speed of rotation will not perform their function properly. A higher speed than that indicated tends to increase the capacity of the separator for milk and causes the flow of a comparatively richer cream. As increased revolutions per minute may seriously injure the machine, no beneficial results can accrue from working at too high speeds. Operating at a lower speed than that indicated by the maker gives a proportionally larger volume of cream which will be lower in its butterfat content. In addition, low speeds are usually responsible for considerable losses of butterfat in the separated milk.

These factors can be represented graphically as in Diagram 2.

DIAGRAM 2.

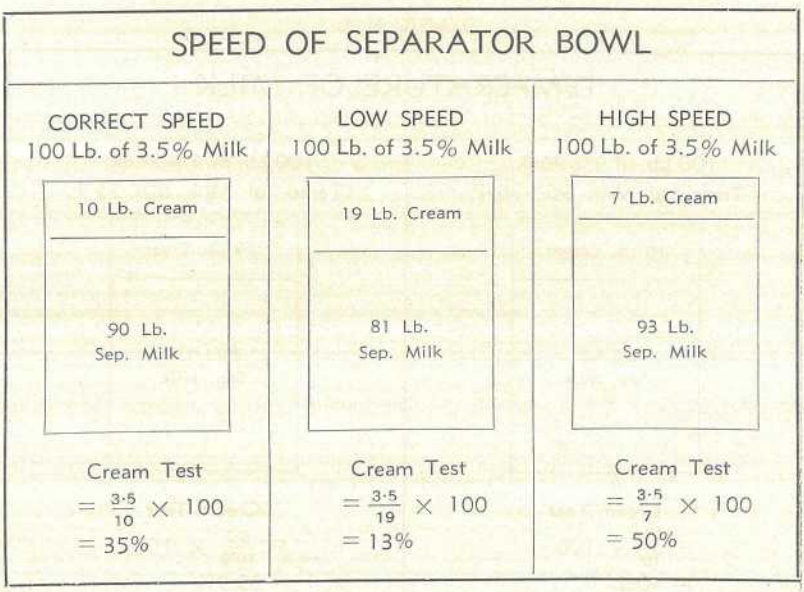
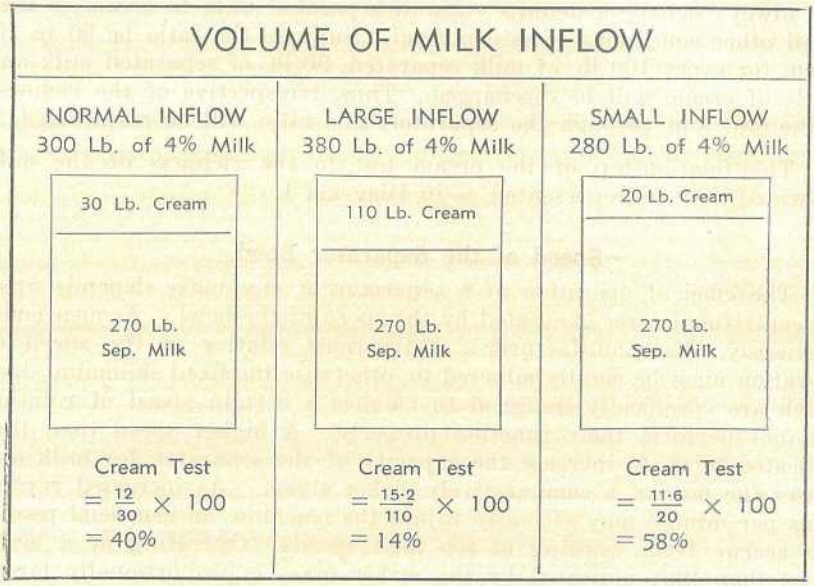


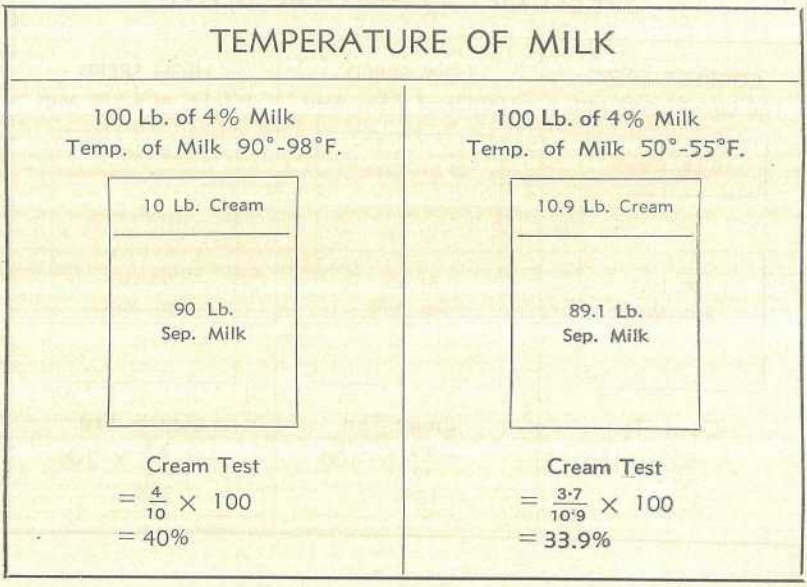
DIAGRAM 3.



Volume of Milk Inflow.

The richness of cream obtained from a separation varies inversely as the rate of milk inflow. Every separator has a rated capacity and any attempt to alter it may have serious consequences. Forcing the milk through in excess of capacity tends towards the production of a thinner cream than that of the normal inflow, while a reduced inflow of milk, other things being equal, gives a thicker cream. The effect of the rate of inflow on the cream test is illustrated in Diagram 3.

DIAGRAM 4.



Temperature of Milk.

Warm milk separates more completely than cold. A temperature between 90 degrees and 100 degrees Fahr. is regarded as more or less ideal. Hence the milk is in the best condition for separation in every respect immediately after each milking—that is, when it is "cow warm." Variations in cream tests due to separating milk at incorrect temperatures are quite common but not as significant as those due to operating the separator at incorrect speeds. The maximum variations observed are of the order of about 4 per cent. The influence of temperature upon the efficiency of separation is shown in Diagram 4.

Condition of Milk.

Milk, as it comes from the cow, after thorough straining is in the best condition for separation; it is then in a high state of fluidity, and at the right temperature. Sour or curdled milk separates with difficulty or not at all. Souring definitely does not increase pounds of butterfat. Slightly sour milk, or milk that has creamed, should be well stirred before it is allowed to enter the bowl. In practice, such milk should be slightly underfed to the separator.

Amount of Water or Separated Milk Used to Flush the Bowl.

Opinions vary considerably as to both the wisdom and the economic benefit of this practice. However, with many farmers, flushing the bowl and the inclusion of the results of flushing with the bulk cream are a firmly established part of separating routine. It is axiomatic that any variation from time to time in the quantity of water or separated milk used in flushing the bowl at the completion of the separating process will have a marked effect upon the test of the cream. A variation of one pint in the amount of flushing fluid may influence the test of the cream, the actual percentage depending upon the amount of cream obtained. In addition, the texture and keeping quality of the cream may be considerably affected by the method of flushing. If the flushing fluid is added at a greater rate than the separator can cope with, a deal of the non-fatty solids which are regarded as the poor keeping constitutents of cream may become mixed with the cream. Keeping quality will consequently be threatened.

Smooth Running.

The separator must run smoothly; otherwise, the layers of fluid in the separator, instead of arranging themselves in correct order—the cream at the centre and the separated milk at the outside of the bowl—are broken up and mixed by the vibration. As long as the separator is running smoothly, efficient separation takes place and the cream and separated milk make their way to their respective outlets without interference. Experiments have shown that five times as great a loss of butterfat in the separated milk have been experienced when a separator is operating under adverse conditions as when it is operating satisfactorily.

Cleaning of Separator.

Butterfat losses in the separated milk are greatly increased by operating a separator with an unwashed bowl. Therefore, not only from a hygienic point of view, but also from an economic viewpoint, regular washing of the separator is essential.

Conditions under which Cream is Stored.

If cream is held under conditions which permit the evaporation of moisture—for example, in an unsealed can at a high temperature—there will be a corresponding shrinkage in volume and an increase in the fat test. However, pounds of butterfat are unaltered.

Summary—Why Cream Tests Vary.

1. Cows: Changes in richness of herd milk.

2. Separator:—

   (i.) Tampering with cream screw will cause large variations in cream tests.

   (ii.) High speed, low rate of milk inflow, and low temperatures increase the test but produce less pounds of cream.

   (iii.) Low speed, high rate of milk inflow, and high temperature of milk decrease the test but produce more pounds of cream.

   (iv.) Lack of smooth running.

   (v.) Unclean separator bowl.

3. Storage of Cream: Test may be increased by evaporation of moisture. Pounds of butterfat are unaltered.

How to Prevent Variations in Cream Tests.

1. Set the cream screw to deliver the desired richness of cream. The desired richness is outlined in the *Dairy Produce Act* as follows:—"Cream intended for supply to a butter factory during the months of April to September, inclusive, shall contain not less than thirty-four parts per centum of mik fat, and during the months of October to March, inclusive, not less than thirty-eight parts per centum of milk fat."

2. Once the cream screw has been set, do not meddle with it.

3. Run the separator at each skimming uniformly at the proper speed.

4. Use the correct rate of milk inflow with the milk at the proper temperature—"cow warm."

5. If flushing the separator bowl is the general practice, use the same quantity of warm water or separated milk at each flushing.

6. Make sure the separator bowl is running smoothly.

7. Thoroughly clean the separator after each separation.

8. Cool the cream and store in a refrigerator or cooler.

Copper Deficiency of Sheep in Queensland.

G. R. MOULE, Officer-in-Charge, Sheep and Wool Branch.

IN August, 1945, an inspection was made of wool which was being shorn from some sheep depastured in north-western Queensland and it was considered that this clip showed a fault characteristic of copper deficiency. Subsequent research work carried out conjointly by C.S.I.R. and the Department of Agriculture and Stock confirmed this suspicion and revealed that there were some extensive but fairly well-defined areas where a copper deficiency of sheep occurs. These embrace a large portion of the sheep grazing lands east and south-east of Cloncurry, the northern part of the valley of the Flinders River, the Roma-Muckadilla area, the Warwick-Stanthorpe district and around the Gums and Tara.

The purpose of this article is to acquaint graziers with the symptoms and the correction of the trouble.

Utilisation of Copper by Plants and Animals.

Copper occurs in the soil and during their growth plants take up minute quantities. Various factors influence the amount of copper in the plants. Of these the amount of copper present in the soil, presence of other elements, the acidity or otherwise of soil, plant species and stage of growth are amongst the most important.

When the plants are eaten some of the copper is absorbed into the bloodstream during the normal process of digestion, and it is later stored in the liver. Though the amount of copper required is extremely small, it has a vital function in the formation of the protein molecules which make up the wool fibres. When there is insufficient copper in the plants to keep abreast of the rate at which the copper is utilised by the animals, supplies are drawn from the liver stores. When these are exhausted symptoms of copper deficiency may become obvious.

Symptoms of Copper Deficiency in Sheep.

The symptoms produced by copper deficiency depend upon the age of the animal. In adult sheep the most noticeable indication is in the wool and the changes which occur are quite definite.

The normal character, as indicated by the crimp of the wool, is lost and in cases where the deficiency is at borderline level large "secondary waves," which appear to be superimposed on the crimp, occur. Plates 47 and 48 show typical cases.

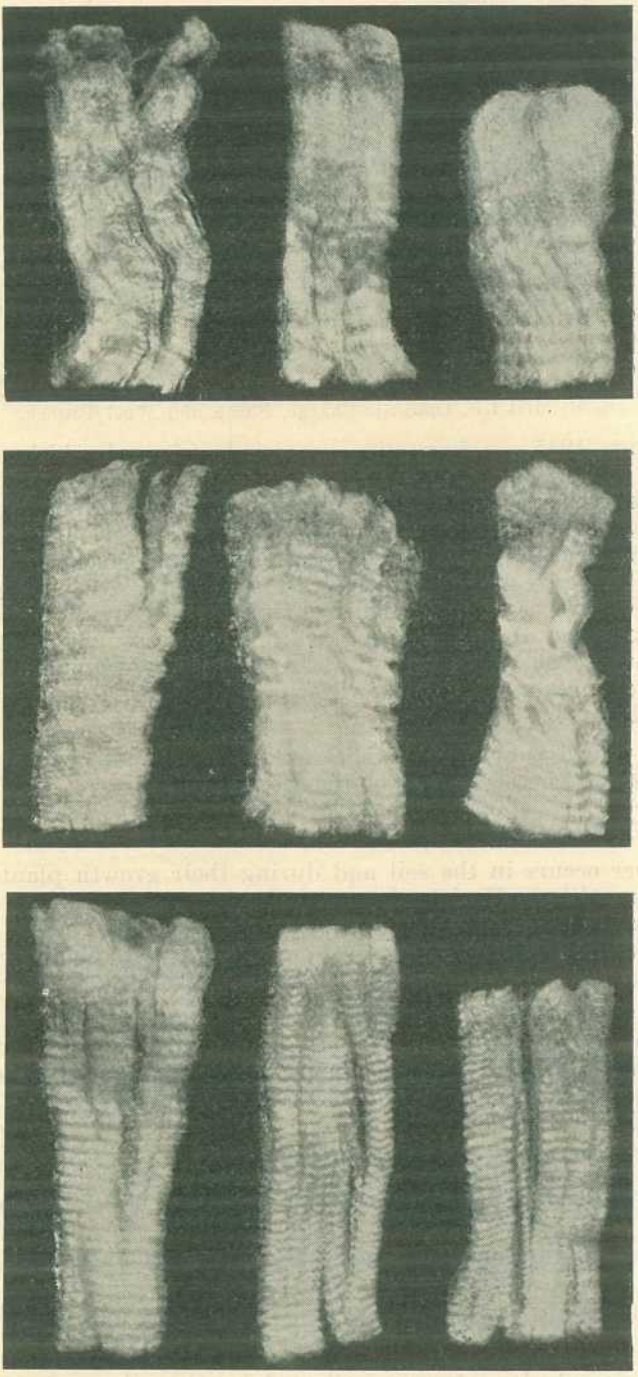


Plate 47.

EFFECT OF COPPER DEFICIENCY ON WOOL.—Lower tier is of normal fleeces, middle tier of slightly affected fleeces, and upper tier of badly affected fleeces.

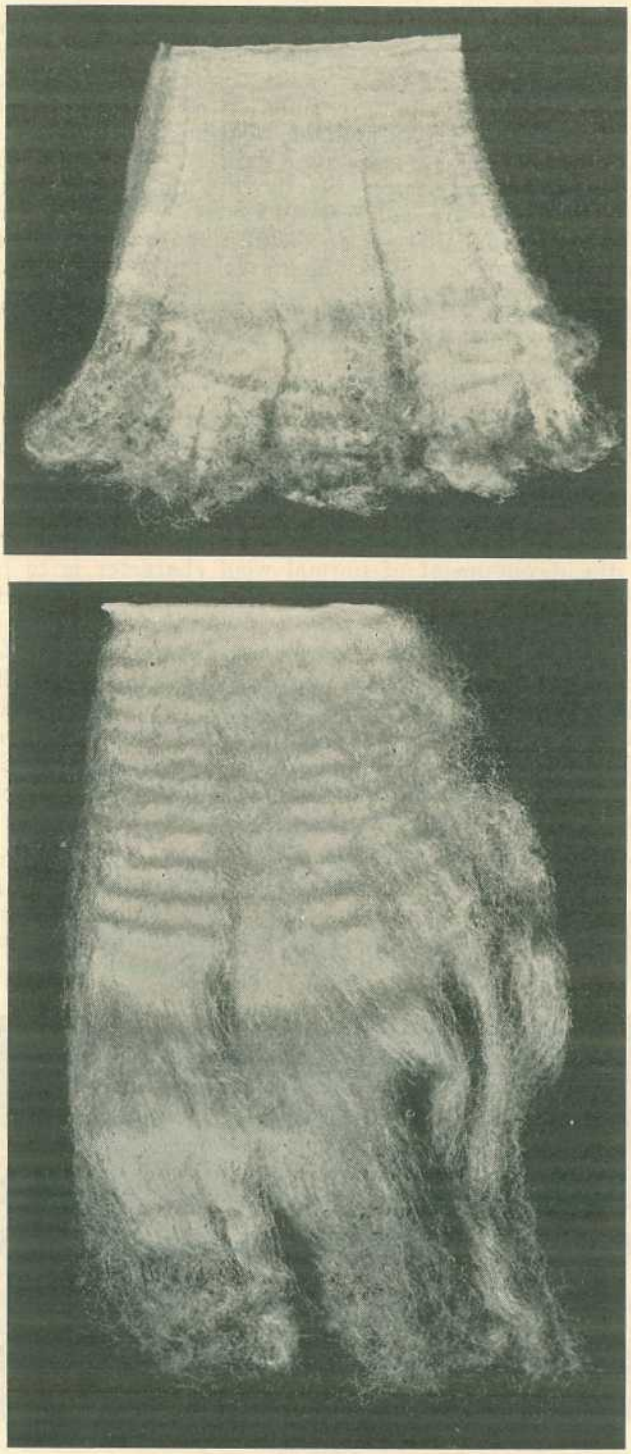


Plate 48.

Wools from Merino and Crossbred Sheep in which the Beneficial Effect of Copper Treatment is Apparent.

If the deficiency is accentuated the abnormality is more marked, and in extreme cases of deficiency the wool is referred to as "steely," "stringy" or "silky." Probably "silky" is the most descriptive single term, as the crimp has almost completely disappeared, though there may be some indefinite waves and the wool has a typical glassy sheen, sometimes referred to as a "galvanised shine." The handle is soft and slippery and the general impression is that the affected wool has no "guts." Such fleeces are not usually sound; when the whole length of the staple is affected there is no definite break but the wool is more inclined to be "rotten"; that is, the staple can be broken anywhere.

One interesting feature which must be borne in mind is that the abnormality in the wool will only occur in that part of the staple grown during the time in which there is insufficient copper to meet the demands of the sheep and after the liver stores have been exhausted. Typical "silky" wool has been seen on previously good-woolled stud rams some time after their introduction from sound country to copper-deficient areas. When these animals have been returned to sound country the wool has become normal again.

One of the most outstanding demonstrations of the importance of copper in the development of normal wool character is to be seen in Plate 48, which shows the wools from a Merino and a crossbred sheep. These animals were introduced into a copper-deficient area and after three months were shorn. The new wool showed typical "secondary waves" and these are clearly seen towards the tip end of the staples. Six months after shearing the animals were drenched at frequent and regular intervals with bluestone solution; the remarkable change in the wool is obvious from Plate 48. Adult sheep run on deficient areas are inclined to be a little unthrifty, though there are very few definite signs apart from the changes in the wool.

Some interesting observations have been made on black sheep running on country where white sheep show signs of copper deficiency. These animals showed intermittent white bands along the length of their black staples and there was a strong correlation between the occurrence of these white bands and the appearance of changes typical of copper

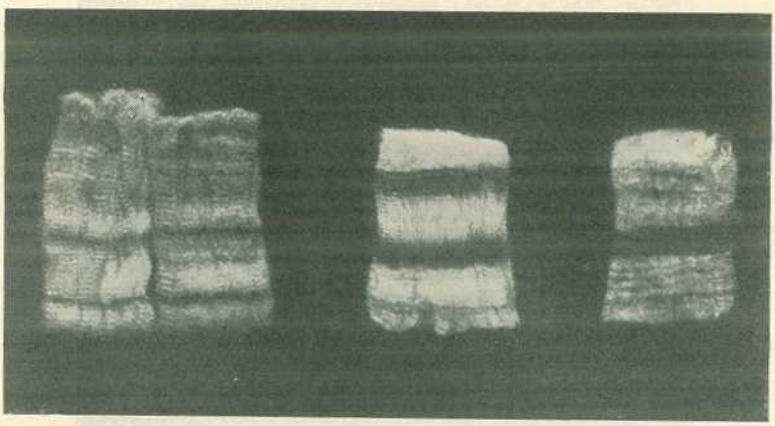


Plate 49.

WOOL FROM BLACK SHEEP WITH WHITE BANDS PROBABLY CAUSED BY COPPER DEFICIENCY.

deficiency in the wool of white sheep. In addition, when the animals were given copper drenches, the black pigment returned immediately to the wool of a black, banded staple which was growing white wool (see Plate 49).

If weaners are subjected to a copper deficiency they produce abnormal wool, their general growth and development are slow, and they give the impression of being stunted and poorly grown. Eventually they may grow into reasonably good sheep, though they are inclined to lack the substance and size of animals grown on sound country. If ewes are subjected to a serious copper deficiency during the latter stages of pregnancy, and if their copper status does not improve soon after lambing, a peculiar set of symptoms, followed by heavy mortalities of the lambs, may occur.

Lambs one to two months old are most commonly affected. The first signs are a check in growth rate and a tendency for the lambs to become unthrifty. If the lambs are driven for half a-mile or so they begin to stagger and lose control of their hind limbs. Further forced exercise will accentuate the condition and within a few days of first being noticed the affected animal is capable of travelling only short distances. If attempts are made to force these lambs along they show an exaggerated back leg action and knuckle over at the pasterns; their hindquarters sway, and finally they go down. If left alone the affected lambs will get up again after a short rest but will be incapable of travelling very far. The disease may progress rapidly and the forelegs may become affected. At this stage the lambs lie about in the paddock and are unable to rise. Their appetite is maintained, however, and they will crop all grass within reach and appear bright and alert. Death usually occurs as the result of the activity of predators—foxes, eagle hawks, &c.

If the lambs do not develop the disease until they are three or four months old the course is generally much less severe. There is a check in growth rate and the abnormal swaying gait only becomes apparent when the sheep are driven (Plate 50). Such lambs often survive.

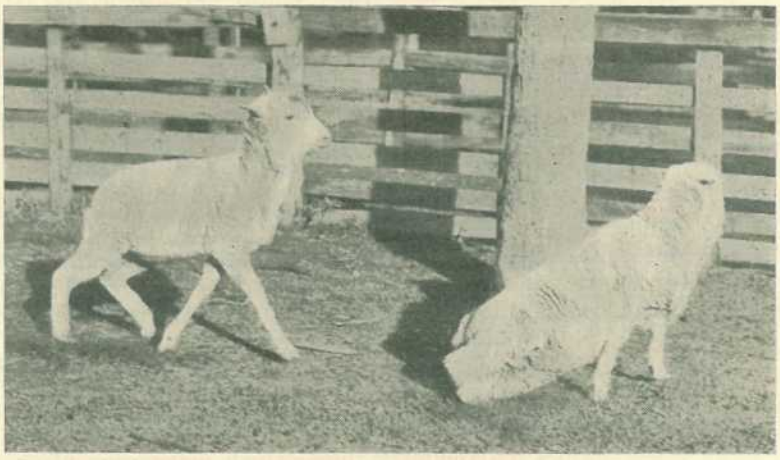


Plate 50.
LAMBS SHOWING SYMPTOMS OF COPPER DEFICIENCY.

Overcoming a Copper Deficiency.

Before attempting to treat any disease condition in livestock it is first necessary to obtain a correct diagnosis as to its nature.

The diagnosis of a copper deficiency in sheep is based upon—

1. The occurrence of abnormal wool;
2. The clinical appearance and history of the sheep;
3. Chemical analysis of the liver and/or blood.

Obviously the carrying out of this work calls for close co-operation between those who produce wool, prepare the wool for sale and handle the clips at sale time, and the technical services which are available on application to the State Department of Agriculture and Stock. Wool samples may be submitted to the Department's Sheep and Wool Branch and where necessary investigatory follow-up work will be undertaken.

Copper deficiency is easily overcome by arranging a small regular intake of copper. The exact method chosen will depend upon the circumstances. In areas where worms occur it is a simple matter to give sheep additional bluestone (copper sulphate) when drenching. A stronger drench administered four times a year will, in most cases, allow the sheep to lay down sufficient copper in their liver stores to meet daily requirements. Details of this treatment may be obtained on application.

In areas where salt licks are fed the bluestone (copper sulphate) can be incorporated in the lick at the rate of ½ *lb. per* 1,000 *sheep per week. This level of bluestone supplementation must not be exceeded because of danger from copper poisoning.* The easiest way of getting an even distribution of the bluestone (copper sulphate) is to dissolve it in a small quantity of water which can be sprayed over the salt lick during mixing.

The disadvantages of using a cuperised lick are—

(1) The expense and labour involved;

(2) The copper intake of a whole flock is erratic and some sheep, probably 25 per cent. of an average flock, will not take licks;

(3) The danger of chronic copper poisoning, which may result from salt-hungry animals eating too much.

In some districts where drenching is not undertaken and where salt licks are not fed it is possible to give the sheep copper through their drinking water, but this is only practicable where the water is distributed through troughs. To be successful, this method must allow for a fairly continuous supply of bluestone (copper sulphate) in the drinking water and this is often difficult to attain because—

(1) Bluestone (copper sulphate), even in the most dilute solutions, has a corrosive action on iron and for this reason cannot be added to the supply tank and can only be placed in concrete troughs, unless the supply tank is made of concrete. If the bluestone (copper sulphate) is added to the water in the trough it may dissolve readily and, if the first sheep in for water drink the trough empty, the remainder of the flock do not get their quota of copper;

(2) Some waters, particularly those which make very black tea, contain chemicals which deposit the copper in an insoluble sediment on the bottom of the trough.

The first difficulty can be overcome by the use of small copper or muntz metal cylinders about 18 inches long and 1½ inch diameter. One end of the cylinder is closed and a very small hole (about 3/64 inch in diameter) is drilled about 1 inch from the closed end of the cylinder. A small piece of brass or copper gauze is folded and placed in the bottom of the cylinder so that it extends to above the level of the small hole. The cylinder is supported in the trough near the float valve (see Plate 51) and the requisite amount of copper for a week's supply for the

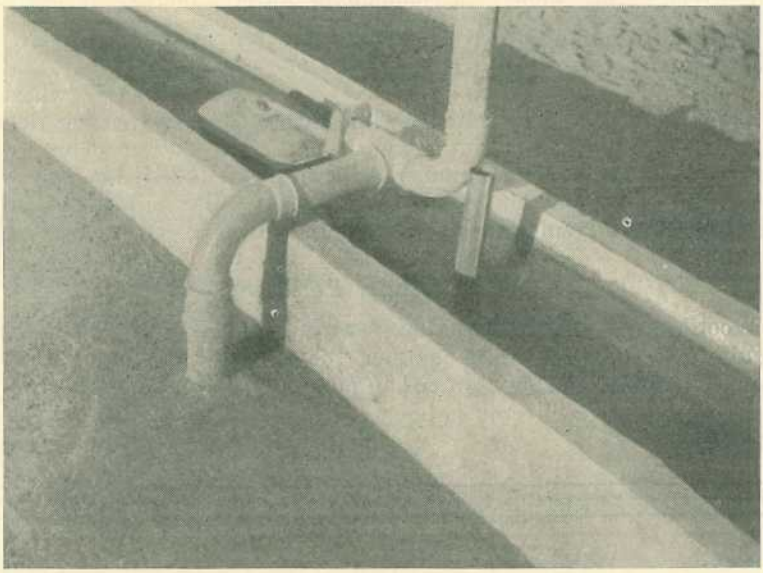


Plate 51.
SHOWING CYLINDER FOR FEEDING BLUESTONE INTO DRINKING WATER.

sheep in the paddock, calculated at the rate of 8 oz. per thousand per week, is added to the cylinder. The water which enters the cylinder through the small hole becomes saturated with bluestone (copper sulphate) and gradually finds its way out of the hole. Additional bluestone (copper sulphate) is added each week. The preferable method is to have duplicate cylinders for each trough. The weekly amount of bluestone (copper sulphate) to be given to the sheep in any one paddock is weighed out and placed in the spare funnel. When the troughs are visited as part of a routine inspection, the funnel containing the copper can be placed in the trough and the empty cylinder withdrawn and after recharging with bluestone (copper sulphate), can be replaced in the trough at the end of the next week. This regular interchanging of cylinders means that a constant check is kept on the amount of copper which is getting out to the sheep and on the small holes near the bottom of the cylinder, which can be inspected for blockages.

The whole success of this method depends on the chemical content of the water being used, and it is advisable to consult the Department of Agriculture on this point.

The disadvantages of supplementation through water are—

(1) When alternative sources of surface water are available the sheep will often prefer them and not return to the troughs until forced to by dry weather;

(2) It is limited in its application to water distributed through troughs and these should preferably be concrete.

An indirect benefit derived from the addition of minute amounts of bluestone to the drinking water is that it prevents the development of the green slime (algae) so common in water troughs.

The fourth method of overcoming copper deficiency is topdressing of the country with finely ground bluestone (copper sulphate) at the rate of from 4 to 7 lb. per acre. This can be quite effective where the soil is deficient in copper, but the final success of topdressing depends upon the capacity of the indigenous plants to take up more copper and this is governed by a number of factors, included amongst which are the species of the plants, the presence of other minerals, and the acidity or alkalinity of the soil.

Chronic Copper Poisoning.

Woolgrowers are warned that it is dangerous to spread bluestone around in an indiscriminate manner. The daily intake of a greater amount of copper than is required to maintain the normal health of the sheep may produce chronic copper poisoning, with consequent heavy mortalities.

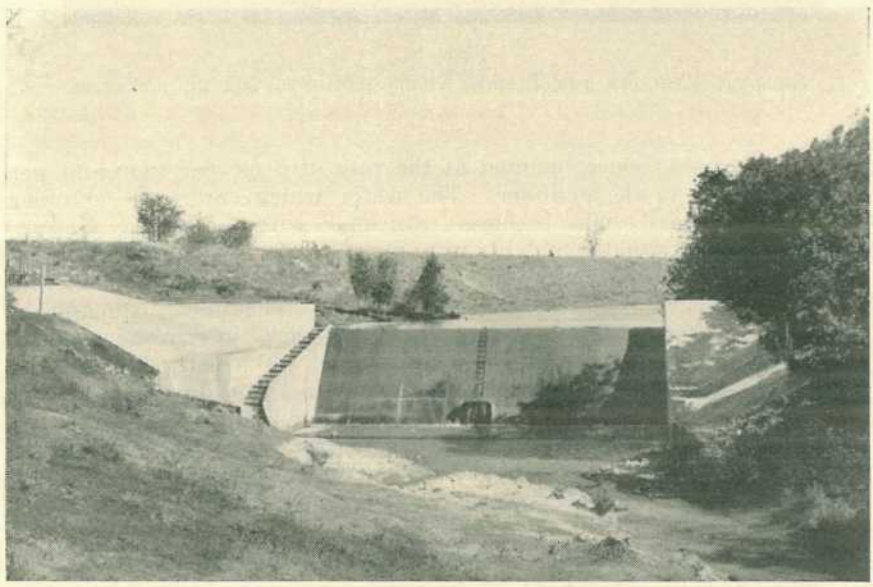


Plate 52.

AERO WEIR, NEAR AMBERLEY, MORETON DISTRICT.

The Beef Cattle Industry in the Far West.

J. C. J. MAUNDER, Chief Inspector of Stock.

(*Continued from page* 114, *August*, 1948.)

DISEASE PROBLEMS.

The entire area is remarkably free from all diseases of economic importance. This would be due partly to the fact that the country is very lightly stocked, and partly to the fact that most of the country is very open and exposed to blazing summers of dry and intense heat.

Cattle Diseases.

As the majority of the cattle in the area originate in the Territory, one would expect to find that contagious pleuro-pneumonia was not uncommon on the Georgina and Diamantina. Actually this is not so, and, though there must be numerous "carriers" introduced from time to time, it would appear that outbreaks of "pleuro" are rare. Certainly there is no evidence of preventive inoculation that would suggest that outbreaks do occur and it must be accepted that pleuro-pneumonia outbreaks in this country are not common.

Tuberculosis must also be practically non-existent as there is no evidence that any properties have been troubled by condemnations at the works for this disease.

Actinomycosis does exist, no doubt, but nevertheless not a single case was observed amongst the many thousands of cattle, in mobs and otherwise, that were seen.

Blight does not seem to worry the cattle as much in this country as elsewhere; one particularly misses the nasty eyes that are so common in some cattle in other districts.

Worm infestation must be negligible, judged by the flourishing, thrifty appearance of all calves.

Poisonous plants are conspicuous by their absence. There is probably no other similar wide expanse of country anywhere in this State that is so free from poison plants. There is a little native tobacco

and a little caustic vine, but apparently cases of mortalities in travelling cattle are extremely rare. On stock routes, there are no plants which have the reputation of being dangerous to cattle.

Bone-chewing, botulism and associated conditions are absent.

Disease of Horses.

Strange to say, the country does not seem to be so kind to horses as it is to cattle, and horses do not present the sleek appearance of the cattle. However, bone and hoof formation seem to be excellent.

Birdsville disease is responsible for considerable losses, though it appears to be spasmodic in incidence. The general opinion of people in the country indicates that the disease is more prevalent in the sandhill country than elsewhere. There is evidence to suggest that cases appear amongst horses when they are confined to horse paddocks in the sandhill country. Release from the horse paddocks (a horse paddock would be thousands of acres in extent), allowing freer range in flooded downs or channel country usually results in cessation of cases. No sick horses were seen, and no opportunity arose to examine viscera, but it is possible that infestation with red worms (*Strongylus* spp.) may have greater significance in the cause of this disease than is generally believed. It would appear to be quite definite, however, that typical advanced cases of the disease do respond in spectacular fashion to phenothiazine treatment. The manager of one property on which the incidence of the disease has always been high is quite satisfied that phenothiazine has solved his problem of Birdsville disease. His method is to bring in to the station any horse showing symptoms, teach it to feed with bran mashes, and administer ¾ oz. phenothiazine followed by ¾ oz. the next day. This man claims rapid recovery, even in cases where complete inco-ordination of movement has developed.

It is intended to take every opportunity to pursue investigations that may clarify the role played by helminth infestation in the occurrence of Birdsville disease.

Miscellaneous Diseases.

Although, with the exception of Birdsville disease, diseases of livestock are of small economic importance in the area, the stock around the station—namely, station poultry and dogs—are not so well off.

Tick fever in poultry is responsible for considerable mortalities and some extremely heavy infestations of *Argas persicus* were noted, despite the fact that due precautions in the way of suspended iron perches and galvanised-iron houses were taken.

Filariasis in dogs appears to be common, and, though no post-mortem examinations were performed, some typical cases of "heart worm" were observed amongst the station dogs. Incidentally, dogs are not used in this country as working units in handling cattle.

The brown dog tick (*Rhipicephalus sanguineus*) is fairly common and causes intense worry to the dogs on some stations. In these cases, people were advised how to control and eradicate infestations using DDT preparations.

PESTS AND THEIR CONTROL.

The depredations of pests such as brumbies, dingoes, and grasshoppers are at times considerable, and much expenditure is incurred in attempts to control the first two.

Brumbies.

These are present in fairly large numbers, do considerable damage to watering facilities and are always to be found on the best feed. When it is realised that they exist literally in thousands, the loss of potential fat cattle will be appreciated. Generally of poor quality, they are not worth running for stock horses, though occasionally this is done by an individual stockman if he happens to sight a brumby that appeals to him. To be of any use for work, it is preferable to remove the captured brumby from its home territory, otherwise it will eventually break away and go back to the mob.

Brumby shooters are employed on most properties at the rate of 5s. per head for each brumby shot, the shooter taking the hair from mane and tail and the station providing the ammunition. It is not uncommon for these shooters to account for 1,000 brumbies on a single holding in one year. By this method, brumbies can be kept under control, but unfortunately not all holdings deal with the menace with sufficient vigour and brumbies continue to breed and multiply. They are more numerous in the sandhill country than in the open downs.

Dingoes.

The dingo population seems to fluctuate considerably from season to season. In early 1947 they did not appear to be plentiful in the cattle country of the Georgina and Diamantina. Stations are not therefore obliged to take very active measures to destroy them. Doggers employed by local authorities work through the area, trapping and poisoning, relying more on the former for their dogs. Aerial baiting of the area has been commenced, but it may take some years before the value of this method of control can be assessed. From general observations, it would not appear that dingoes cause anything like the losses caused by either brumbies or grasshoppers.

Grasshoppers.

There is no doubt that these operate in plague proportions over a considerable area, precipitating drought conditions on some holdings. Along the Diamantina channels, grasshoppers reached plague proportions in February and completely wiped out in a month channel feed that would have carried on until at least June. This had the effect of creating acute shortage of feed, decreasing the number of fats that could be turned off and forcing a drastic reduction in stocking. Station gardens were completely wiped out. Efficient control measures would be extremely difficult; but the economic importance of the pest certainly warrants particular consideration.

Miscellaneous Pests.

Rabbits and wild camels have at times been prevalent in the lower reaches of the rivers, but appear to be practically non-existent at the present. One lone camel was observed, and no rabbits. There are various theories advanced to account for the decline of the rabbit; some people say that they were wiped out by a record flood about eight years ago, others believe that a series of dry years accounted for the decline.

Wild donkeys have also been fairly prevalent, but now neither rabbits, wild camels, nor donkeys are of any importance.

STOCK MOVEMENTS.

There are heavy, seasonal movements of cattle into, through, and out of the area.

Movement of Stores.

Stores come from the Territory on to properties for fattening, or through them en route to properties on the Cooper and in southern Queensland and New South Wales. There is also some movement of stores into South Australia.

Stores moving in for fattening mainly originate on Alexandria, Brunette, Austral Downs and Avon Downs, and cross at Lake Nash. All are inoculated against contagious pleuro-pneumonia, either before starting on the road or at Lake Nash, where they take the final clean dipping before crossing.

The Inspector at Lake Nash permits the cattle to the Inspector at Boulia and from there they are permitted to the property if within the Boulia police district, or on to the Inspector at Bedourie for permit to the property within that police district. These Inspectors do not inspect all mobs prior to issue of permits.

The route to be travelled is determined mainly by the feed and water position. Generally, the stores moving to properties on the Georgina follow the main Georgina stock route from Lake Nash through Urandangie and Boulia and thence down the Georgina. An alternative route is from Urandangie to the Wills at Dajarra and then down the Wills and the Burke into Boulia, thence down the Georgina. Stores for Coorabulka and Springvale use the same routes to Boulia, and thence direct by their respective routes.

Stores for the Diamantina follow the same routes to Boulia; they may then come through Springvale to the Diamantina, and then down the main Diamantina route. An alternative route from Boulia is on the Georgina to Bedourie, thence to Cluny and to Monkira on the Diamantina, then up or down the Diamantina, as the case may be.

Store cattle travel in mobs of from 1,200 to 1,800, the average being in the vicinity of 1,500, and aim at covering approximately 60 miles per week.

When dry conditions are threatening, there is considerable movement of stores, cows, and calves out of the area, these having been purchased for stocking elsewhere or are being moved to other properties controlled by the same interests. According to the state of the routes and destination, movement is mostly down the Georgina, to cross into South Australia at Birdsville, down the Georgina to Bedourie, thence to Monkira to Currawilla and on to New South Wales.

Reference to these store movements demonstrates that many thousands of stores are moving in this area, with main junctions at Boulia, Bedourie, Monkira, and Currawilla. Anything from 20,000 to 40,000 cattle would pass through each of these places annually.

Movement of Fats.

Fats from the upper reaches of the Georgina usually travel to Butru by the Wills route, for trucking to Townsville. Alternatively they may go to Boulia, thence by the main Boulia-Winton route for trucking at Winton for Townsville. The lower Georgina fats may travel down the Georgina, cross at Birdsville and truck at Maree for Adelaide, or may go via the Cluny-Monkira-Currawilla route for trucking at Quilpie for Cannon Hill, or New South Wales works.

Fats from the upper reaches of the Diamantina usually go via the Diamantina route for trucking at Winton. From the lower reaches they go usually to Quilpie for trucking, but occasionally down the Diamantina to Birdsville for trucking at Maree.

The average mob of fats would be in the vicinity of 500 and they travel at the average rate of approximately 7 to 8 miles per day.

Seasonal Incidence of Movement.

Stores from the Territory start to move in about the end of April and the movements continue until the end of July in normal seasons. The commencement depends to some extent on conditions in the Territory. Sufficient time must elapse after the finish of the wet season there to allow mustering to be completed, pleuro inoculations to be carried out and the mob started on the road.

Fats start to move out from the middle of June and would be practically finished by the end of August. The actual time of movement is governed to a certain extent by methods of station administration in relation to the financial year; some prefer to move fats off before July 1 and some after that date.

The movement of cows and calves and stores to relieve stocking rates usually takes place during June and July. By that time the signs of difficult times ahead would be manifested and movement must be completed before the state of stock routes renders it impossible.

Drovers and Droving Hands.

It would appear that there is no shortage of exeprienced drovers, but there does seem to be a difficulty in obtaining drovers' hands. Many drovers have to undertake long trips with a shortage of men, while in other cases the men they do get are inexperienced. Very few aboriginals were seen with droving plants. With the average mobs of stores seen, there were the drover, horse tailer, cook, and four droving hands.

STOCK ROUTES.

The following is a brief summary of the main stock routes in the Georgina-Diamantina country, and stock route junction numbers are given (reference Queensland Stock Route Map, Sheets 4 and 2) :—

(i.) Georgina Stock Route.

Cattle cross into Queensland at Lake Nash (6), thence by stock route junctions 1630; 5 (Headingly); 4 (Urandangie); 939 (Carandotta); 3:30 (Herbert Downs); 31 (Marion Downs); 1353 (Marion Downs South); 33 (Breadalbane); 35 (Bedourie); 1 (Glengyle); 42 (Birdsville). As far as junction 30 (Herbert Downs) carries the main store traffic from the Territory. The complete route carries stores for the Georgina. On this route, approximately 469 miles long, there are only five Government watering facilities. Beyond these, travelling stock are dependent upon surface water in creeks, channels, waterholes, &c., that are on the stock route.

(ii.) Georgina-Wills-Burke Route.

Commencing at Lake Nash (6) via stock route junctions defined in the Georgina route as far as 4 (Urandangie), thence diverting through 25 (Ardmore); 1560:949:26 (Dajarra); 13:950; then down the Wills

and the Burke into Boulia, through junctions 1562 (Buckingham Downs); 28:29 (Boulia), rejoining the main route at 31 (Marion Downs).

This is a much-used alternative route to the Georgina route, putting an additional 70 miles on to the trip, but availed of when feed and water on the Georgina route is unsatisfactory. This diversion of approximately 200 miles carries three Government watering facilities.

(iii.) Georgina-Boulia-Winton Route.

This route carries a heavy traffic of stores, most of which eventually find their way into central and southern Queensland and to New South Wales. From Lake Nash (6) it comes into Boulia (29) by either of the routes already described, thence follows the main Boulia-Winton road through junctions 50 (Warenda); 51 (Hamilton); 1575:106 (Mackunda); 105:104 (Middleton); 149 (Collingwood); 148 to 210 (Winton).

The length of the route is approximately 465 miles and it is provided with twenty Government watering facilities. Of these, fifteen are on the Boulia-Winton stage of 240 miles, where surface water is scarce even in normal seasons.

(iv.) Georgina-Boulia-Diamantina Route.

This route carries heavy store traffic from the Territory and, commencing from Lake Nash (6), by either the main Georgina route or the Wills-Bourke route into Boulia (29), thence through stock route junctions 49 (Hamilton River); 1355:48 (Springvale); 109 (Diamantina Lakes); thence down the Diamantina through 110 (Davenport Downs); 45 (Monkira); 38 (Durrie); 40 to Birdsville (42), where it links with the main Georgina route. The length of the route is approximately 545 miles, provided with ten watering facilities, but there is none over the last 200 miles and dependence is entirely on Diamantina waters.

(v.) Georgina-Butru Route.

This route is used for fats droved to Butru for trucking to Townsville, and has been referred to under (ii.), defined by stock route junctions 1353 (Marion Downs South); 31 (Marion Downs) through Boulia (29), up the Burke to 28, thence up the Wills to 1562 (Buckingham Downs), through 950 to 27 (Butru). The total distance is 175 miles, and there are no Government watering facilities. Water is usually available along the Wills.

(vi.) Georgina-Boulia-Winton Route.

Used for movement of fats for trucking at Winton when Butru route impassable. Defined by junction numbers 1353 (Marion Downs South); 31 (Marion Downs) through Boulia (29), thence to Winton (210) as described under (iii.). Total distance is 286 miles and there are fifteen watering facilities, all on the Boulia-Winton stage.

(vii.) Diamantina-Winton Route.

The priority route for fats out from the upper reaches of the Diamantina and "between rivers." Defined by junction numbers 110 (Davenport Downs); 109 (Diamantina Lakes) to the Mayne Junction (108), where the route from Coorabulka and Springvale joins it, thence up the Diamantina through 107 (Cork); 148 (Collingwood) and in to Winton (210). The total distance is approximately 200 miles and there are four watering facilities.

(viii.) Diamantina-Quilpie.

This route, fed also by (ix.) and (x.) is the main route out for fats going to Quilpie for trucking to Wallangarra, Tenterfield, or Cannon Hill. It also carries a heavy traffic of stores from the Territory or the Georgina-Diamantina country and north-western Queensland destined for fattening properties on the Cooper and in New South Wales. The route from the territory to the Diamantina to junction 109 (Diamantina Lakes) has been referred to under (iv.). From 109 the route is defined by 110 (Davenport Downs); 1362:111 (Palparara); 112 (Currawilla); 964 (Morney); 113 (Canterbury); 142 (Whitula); 41 (Windorah); 1782 (Hammond Downs), through 138:137 down Kyabra Creek through Tenham (225), 227:997 to 230 (Kyabra), thence through 232 (Eromanga); 231 (Borgie) to Quilpie (255), a total distance of 386 miles from the Diamantina, or approximately 740 miles from Lake Nash, with thirteen watering facilities from the Diamantina, a total of 23 from Lake Nash.

Stores may divert from this main route at the J.C. (113) and travel down the Cooper to fattening properties there or may go on to cross into New South Wales at Hawker (Warry Warry) gate or at Wompah Gate (approximately 900 miles from Lake Nash). They may also travel to New South Wales from Quilpie, going down the Bulloo to cross at Hungerford.

(ix.) Diamantina-Quilpie, via Monkira.

Fats and stores often go through Monkira (45) instead of along the main route through Palparara (111), traversing junctions 110 (Davenport Downs); 45 (Monkira); 1358 (Mooraberrie); 112 (Currawilla); 964 (Morney), thence to Quilpie as described in (viii.). The total mileage is much the same and there are no watering facilities between Monkira (45) and Currawilla (112), where it rejoins the main route.

(x.) Georgina-Quilpie Route.

This route carries fats to Quilpie and stores destined for the Cooper and New South Wales, defined by junctions 1 (Glengyle); 35 (Bedourie); 36 (Cluny); 45 (Monkira); 1358 (Moorcherrie); 112 (Currawilla); 964 (Morney), thence to Quilpie as under (viii.). The total distance is approximately 500 miles, with 11 watering facilities, only one of which is in the first 250 miles of the route.

(xi.) Other Routes.

In addition to the above routes, fats and stores destined for the Adelaide market or fattening properties in South Australia move out along the Georgina and Diamantina and cross at Birdsville for trucking at Maree. This would be a slightly shorter route than to Quilpie from the lower Georgina, but about the same distance for Diamantina cattle.

Fats and stores from Durrie may go to South Australia through Birdsville or to Quilpie, the Cooper, or New South Wales through Betoota, Currawilla, Windorah.

WATERING FACILITIES.

It will be realised from the above that the routes are poorly supplied with watering facilities, the only one that can be considered satisfactory being on the Boulia-Winton stage, where facilities average 1 every 20

miles (approximately). This guarantees an average of one drink every day where cattle travel at the rate of 10 miles per day. Cattle travelling at a slower rate can do very well on 20-mile water stages, even though they may not get a drink every day.

It is obvious that stock routes in this country could be improved by—

(*a*) Establishment of additional watering facilities on all the routes mentioned to give a reasonable assurance of water every 20 miles.

(*b*) Better equipment of existing facilities. In many cases, water supply in the troughing depends upon the functioning of a mill. It has been noted that it is not unusual for a mob of cattle to arrive at the facility only to find the troughs empty, either because the mill has broken down or because several windless days have followed the previous watering of a big mob of cattle. The establishment of pumping equipment to take the place of mills and the employment of rangers, whose duty it would be to patrol stock routes and make sure that all pumping equipment is in order, would be worth while.

However, it must be realised that a perfect system of water facilities on these routes would not, in itself, be sufficient to guarantee them against seasonal vagaries. Actually, it is the absence of feed on the routes, probably more so than the absence of water, that renders them impassable in certain seasons.

Very little can be done about the feed position, beyond the gazettal of additional alternative routes and the provision and equipment of watering facilities on those routes to enable spelling of main routes. In addition, though water may not be the main limiting factor in availability of stock routes, improvement of present facilities, and establishment of additional ones must improve the routes.

It would appear that mobs of 1,500–1,800 are rather hard on stock routes, and better management of routes would be possible if mobs were limited to 1,000 head.

SOCIAL CONDITIONS.

Generally speaking, this is a hard country in which to live, but apparently very healthy. The people who have spent many years in this back country are well developed, active, and mentally alert.

Housing Conditions.

With the advent of household refrigerators and electric light and power equipment of modern design, the every-day life at the station homestead has been rendered not only bearable but comfortable. The majority of the homesteads are of old design of pisé construction. It is unlikely that any more pisé dwellings will be built as it would appear that pisé artisans are an extinct race. The homesteads generally are comfortably furnished, gauzed to render them insect-proof, and every effort is made to make them as cool as possible in the devastating summers.

One homestead, built just before the war of timber construction, provides a cool, comfortable insect-proof dwelling equipped with all the modern labour-saving devices, and would be hard to beat anywhere in the pastoral areas.

Station buildings are generally constructed in timber, though recently on some properties angle iron frameworks are being used and are apparently quite satisfactory.

All stations maintain a most comprehensive store for their own requirements.

Living Conditions.

The life of the manager's wife is bearable when domestic help can be obtained, but it is not unusual for her to have to do all the station cooking without any assistance whatever, maybe for months at a time.

Food supplies have to be freighted in over long distances, but augmented by station-grown vegetables (grasshoppers permitting) and based on the luscious, unrivalled beef "fattened on the channels," there is little likelihood and no evidence of any nutritional diseases of the permanent population. In good seasons, station milkers provide the milk ration, but most properties maintain a herd of milch goats.

Children are educated with the assistance of the correspondence course to a certain stage and then go away for the completion of their schooling to centres such as Charters Towers, Brisbane, and Toowoomba.

It is worthy of note that the total white population of the area, excluding Boulia but including Bedourie and Birdsville, would be less than 200 souls. The aboriginal population would be less.

Communications.

Mails on the Georgina are distributed from Boulia and on the Diamantina from Winton by mail contractors who also carry freight consigned to the holdings. On the Georgina, the mail service is a fortnightly one, while the Diamantina is more fortunate with a weekly service. In times of flood, it is quite common to be without mails or freight deliveries for 6-8 weeks.

There is no telephonic communication, but all stations are equipped with pedal wireless sets. Actually, only one pedal-operated set remains, all other sets being operated from the electric power plant. Each station has its own call sign and regular "sessions" are held each day, giving everybody a chance to have a social chat with their "neighbours" and discuss the events of the day, great and small. These "chatty" sessions do much to alleviate the lot of the womenfolk, and are also thoroughly enjoyed by the menfolk (when at home).

This system of wireless inter-communication has given a degree of safety to this country which it never enjoyed prior to the introduction of the pedal wireless. There are many instances in the past of persons becoming lost and perishing in this country from thirst, starvation, or drowning. Nowadays, this is most unlikely to happen, as all properties are kept well informed by each other of details of the movement of any travellers. Pedal wireless also provides a medium for the despatch of telegrams, which always go on urgent priority conditions.

Medical Services.

Concurrently with the pedal wireless services has been the establishment and development of the Flying Doctor service, operating from Cloncurry. All stations are equipped with a complete "flying doctor" kit, containing drugs, instruments, and dressings for emergency cases, together with complete instructions for their use.

Should a person become sick or injured, the flying doctor can be contacted by wireless and history and symptoms of the case described, enabling the doctor, in many cases, to prescribe treatment with satisfactory results. When necessary, the flying doctor will fly to the property (all are equipped with landing fields) to conduct examination and carry out treatment, or to arrange for a patient's removal by aerial ambulance to hospital.

This outback country owes a tremendous debt (and realises it) to the Rev. John Flynn, and the establishment of the pedal wireless and flying doctor service constitutes a lasting memorial to his untiring efforts on behalf of these people.

POSSIBILITIES OF DEVELOPMENT.

Water Conservation and Controlled Irrigation.

It is probably only natural that, in a land which is unique because of its natural irrigation systems, most discussions for improvements of the area are centred around the improvement and controlled use of this natural irrigation system. Suggested schemes differ in detail, but the principle of them all is to block the waters of the main channels of the Diamantina and Georgina by weir construction so that the channel de-tributaries, channel swamps, and flood plains could be submerged at regular intervals in place of the present haphazard seasonal flooding.

It must be remembered, however, that the waters of the Diamantina and Georgina do not flow eventually to the sea, but actually disperse over the country in the vicinity of Lake Eyre. Moreover, the channel system is so wide that weirs would have to be miles in extent to block effectively the waters of the rivers.

If it were possible to control the waters and flood at will, then it is likely that no greater area of country would be flooded than is already achieved. It would simply mean that the flood incidence could be made an annual occurrence, instead of haphazard. Even so, it is not certain that annual flooding would be an improvement on the natural balance now maintained by nature. It is believed by many cattle men that when two or more good flood years follow in succession the feed from the second and subsequent floods is not of such high quality as that produced by the first flood, or, in popular parlance, is a "little sour." Cattle fail to fatten as quickly or as "firmly" on this "sour" pasture as they do on the feed following a flood after a period of no flooding.

This state of equilibrium between flood incidence and period of idleness or natural fallow that is typical of the channel country may have much to do with its extreme fertility. Perhaps if the dry periods of "natural fallow," during which great cracks open up the surface, did not occur, then soil fertility would deteriorate. For this reason, it is believed that it would be possible to "push" this channel country too far if regular annual flooding were attempted. If anything in this direction were attempted, it might be preferable to aim at biennial floods.

This is mainly conjecture, rather than the result of scientific findings following fertility investigations. Actually, the opinion has been expressed by at least one scientific investigator that it is unlikely that loss of soil fertility would occur in the event of annual flooding.

Regional Killing Works.

There is some weight of opinion in favour of the establishment of local killing works that would enable cattle to be slaughtered on the holdings and the carcases air-freighted to the capital cities for the local trade. This would certainly overcome the problem of long treks to meatworks, but the relatively low value of the freight in proportion to the high rate of freight charges would make the proposition uneconomic. Moreover, the losses incurred through the inability to process the many by-products at such killing works would be very considerable.

Road Transport for Fats.

At least one company with large interests in the area has given consideration to the practicability of using motor trailer transport to convey fats to railhead. If successful, this would undoubtedly overcome two of the greatest handicaps under which fattening is conducted, namely, distances from railhead and dependence upon favourable stock route conditions.

It would appear, however, that the rough roads would have to be replaced by better surfaces to make the venture a success, otherwise losses by bruising would offset most of the advantage gained. The capital outlay, of course, would be enormous as it would be necessary to run sufficient units to move a trainload at a time.

Nevertheless, this venture would appear to have better prospects of success than the establishment of regional works with air freight for carcases to capital cities.

Development by Railroad Construction.

It is fairly obvious that transport is the big problem of this outback country, and the railways are still unsurpassed for the haulage of big loads of livestock over distances of hundreds of miles. It is to railroad construction, therefore, that we must look for greater utilisation of these cattle areas.

There are two main problems—(*a*) the provision of railways to enable stores to be brought in quickly for fattening when the maximum feed is available, and (*b*) the provision of railways for haulage of fats to meatworks.

There is no doubt that the provision of railways for both purposes would be of inestimable benefit to the entire cattle country of western, north-western, and south-western Queensland, and particularly to the country of the Georgina and Diamantina, Cooper and Bulloo.

Under average seasonal conditions in the Georgina and Diamantina country, stores are brought in for fattening following a seasonal flood. The following year may be a bad one and it may not be possible to move off any cattle, either stores or fats, owing to the state of the stock routes. Should another bad year follow, as it sometimes does, the property is caught with an excess of cattle in drought or near-drought conditions and losses may, and do, reach extreme proportions.

With the provision of suitable railroad extensions, these conditions could not arise, as it would always be possible to move cattle, there would be no fats carried over to the next season, and the stores and breeders could be moved out for sale to reduce stocking.

The lush pasture conditions following flooding are not of long duration, and only after "record" floods will they last till the next season. To obtain maximum return, it is claimed that if stores could be brought in by rail and go straight on to the rich fattening pastures, the majority could be turned off the same season. That is, they would come in about April and be turned off as fats in, say, August-September. This is in contrast to the present conditions where stores come in, say, April, 1947, and are turned off as fats in July-August, 1949.

Perhaps this could be done if stores came in at 2½–3 years old instead of 18 months–2 years as at present, but even so, it is probable that only the tops could be turned off in the same season. Many would still have to carry over to the following season, which may not be a good one.

It must be admitted that the possibility of bringing stores in to lush pastures and turning them off as fats in the same season is open to conjecture, and certainly it would require a revision of the present breeding practices on the holdings from which the stores originate. However, there is no doubt that adequate railroad extension to guarantee movement of cattle out, as desired, would render cattle-raising in this country a much more stable venture and allow a slight increase in stocking without the fear of calamitous losses.

Another important feature of railway movement out is the fact that it would make possible the marketing of the baby beef that is really the "cream" of all this area, and which is now never marketed owing to the inability of this class of beast to walk the hundreds of miles to railhead without deterioration to little better than store condition.

It is believed that provision for railway movement outwards would enable stocking to be increased safely, and get fats to market so much earlier that the productivity of this vast area of country could almost be doubled.

Several routes have been suggested during recent years for railroad construction in this area, to provide for the movement of store cattle in and fats out, also to make possible the movement of cattle to relieve stocking when drought conditions are prevailing or are threatening. It is not within the scope of this report to discuss the economics of any of the suggested routes, but there is no doubt that the provision of adequate rail transport would mean more to the cattle industry in this far-western cattle country than any other project.

The most important routes that have been suggested in a recent report of the Bureau of Investigation are:—

(1) Standard gauge line from Camooweal to Dajarra, through Boulia, Monkira, Windorah, to Quilpie, Cunnamulla, and terminating at Bourke.

(2) The same as No. 1, except that the route would go direct from Boulia to Diamantina Lakes to Windorah, thence to Quilpie, Cunnamulla, and Bourke.

(3) The same as No. 1, except that the route would go from Monkira to Jundah, thence to Quilpie, Cunnamulla, and Bourke.

(4) The same as No. 2, except that the route would go from Diamantina Lakes to Jundah, thence to Quilpie, Cunnamulla, and Bourke.

Of the suggested routes, it would appear that No. 1 would be of most benefit to the cattle country, followed by 2, 3, and 4 in that order.

With the main strategic line of standard gauge, extensions of State gauge would link up from Windorah to Yaraka, from Durham Downs to Quilpie, and from Boulia to Winton.

Even if the main strategic defence line of standard gauge were not constructed, a great service would be rendered if it were possible to extend the present Queensland systems further into the area. For instance, if the line could be extended from Yaraka to Windorah to Monkira, or alternatively, from Quilpie to Windorah to Monkira, the cattle properties of the Cooper, Diamantina and Georgina would be within reasonable distance of railhead. Fats could be moved out (including baby beef) despite the condition of stock routes, and similarly relief movements would be possible.

It is extremely difficult to calculate or even to guess what additional fats could be marketed if such facilities were available; but, taking into consideration the fact that 2-year-old beasts could be marketed as fats, and remembering that heavier stocking of properties would be safer, it is possible that an additional 50,000 fats per annum could be obtained from the Georgina, Diamantina, and Cooper Rivers.

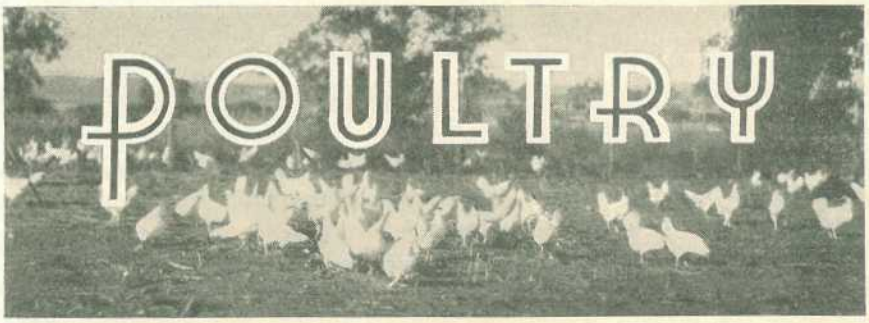
SUMMARY.

Summarising the possibilities of development of the Georgina and Diamantina cattle country, it would appear that the two main factors now restricting development are—(*a*) the lack of transport facilities, and (*b*) erratic seasonal conditions. Little can be done to stabilise seasonal conditions, beyond good management to alleviate the effects, but it is evident that, with adequate transport, the country would be capable of increased production, both in quantity and quality, and the industry in the area would be a much more stable undertaking than it is at present. Moreover, rail haulage is the most satisfactory and economical means of transport where large numbers of livestock have to be moved.

It must be realised, however, that there is a limit to the development that this country will stand, and it is essentially an area where cattle-raising is to be practised on large runs which are of light carrying capacity and which may owe their unique quality to a natural equilibrium of drought and flood, of fallow and plenty, and some cattle men believe that any vital disturbance of this natural equilibrium may result in a marked deterioration of that soil fertility and pasture cover that can, and do, produce such fine beef carcases as those "fattened on the channels."

ACKNOWLEDGMENTS.

It is desired to acknowledge with sincere thanks the hospitality and unbounded co-operation that was extended to us by all the fine people we met during the course of this investigation through the cattle country of the Georgina and Diamantina.



Poultry and Egg Production

P. RUMBALL, Officer in Charge, Poultry Branch*.

VISITORS to the Royal Show this year who are interested in the poultry section are again able to feast their eyes upon the best birds in the State. The exhibits reflect the care and attention that has been bestowed upon them. That this care and attention has been directed in the first place to keeping the birds fit and healthy is evidenced by their general healthy appearance, and the most casual inspection reveals the fact that every possible effort has been made to preserve the natural beauty of plumage, breed characteristics and outward appearance.

Shows serve a very useful purpose; among other things, they enable breeders to meet and compare notes. To select the best from your own yards is an easy matter, but it is not until they are benched with the best from other yards that many weaknesses in one's own birds are evident. Shows demonstrate very definitely that it is only the fit and healthy bird that has a chance to win, that a bird has to be true to type, and that with two birds of equal merit with respect to health and type the Judge's award will go to the bird that is the most attractive in appearance due to the preservation of its plumage.

The poultry industry of the State is not only concerned with showing. It is an industry that produces millions of dozens of eggs and millions of pounds of poultry flesh. These have to go before the judge, who in this instance is the consumer, whether he be in Australia or in Great Britain.

The producer of these commodities could well take a lesson from the show exhibitor. He has to see that his eggs are fit and healthy; in other words, fresh and wholesome. It is necessary to have eggs true to type; that is, eggs of reasonable size. They must also be in good plume; that is clean of shell and attractive in appearance. The same rules apply to poultry meat. This must be healthy; carcasses well fleshed and attractive in appearance.

It is estimated that during the past twelve months over 8,000,000 pounds of poultry meat were produced in Queensland, of which a little more than 1,250,000 pounds were exported to Great Britain, and during the same period the egg production was 14,000,000 dozen, the export of which exceeded 2,000,000 dozen.

Eggs are the most widely distributed commodity produced by poultry, and therefore naturally command our first consideration:

They must be fresh and wholesome;
They must be clean of shell and attractive; and
They should be of a good average size.

*In an Australian Broadcasting Commission talk from the Royal National Show.

Now at this stage little can be done in regard to the size of eggs being produced by existing flocks, but, as replacement of flocks is now taking place, attention should be directed towards future production by only using eggs for hatching purposes of a minimum weight of 2 ounces.

Production of Clean Eggs.

A hen normally lays a clean egg. It can be soiled by her feet, by dirty nest boxes and by broken eggs. The remedy is to give a bird an opportunity to clean her feet, to keep the nest-boxes clean, and to reduce breakages in the nest.

A fowl wanting to lay does not rush into the fowl-house and hop into the first vacant nest. She meanders up and down in front of the nests before making her selection and it is this habit that we should make use of to bring about a cleansing of the hen's feet. This is easily achieved if the area in front of the nests is kept covered with good dry clean litter, such as coarse pine sawdust, pine chips, broken straw or chaff. The use of the same class of material in the nests ensures clean nests provided it is renewed from time to time.

Fowls have a desire to crowd in nests. They frequently select one for this purpose which is well-filled with eggs, with the consequence that some eggs are broken and others soiled with egg material. Frequent gatherings will prevent many breakages and it is recommended that two gatherings should be the minimum daily practice, and during the flush season of production, three.

Certain types of nests referred to as community nests have been used by many farmers with considerable success. This type of nest is large and dark and capable of accommodating several birds. The darkness appears to subdue the quarrelsome nature of the layer, and supplies that privacy that a hen appears to look for. With community nests careful supervision should be exercised during hot weather, otherwise losses of birds may result from over-heating. This type of nest is not the answer to the production of clean eggs under dirty conditions, but more clean eggs would be produced with community nests under favourable conditions than with any other nest. Listeners who are interested could obtain a sketch by applying to the Department of Agriculture and Stock.

The answer to the question of how to produce clean eggs can be summed up in a few words: clean dry houses, floors well littered, clean nests and frequent gatherings.

The internal quality of the egg is equally as important as its external appearance. Many eggs have the internal quality destroyed by the farmer washing eggs in his effort to present to the buyer an attractive commodity.

The shell of the egg gives the impression that the internal content is protected from contamination. This is not entirely the case. Shells are porous. Most farmers, particularly those operating incubators, have noticed that during the process of incubation the air-cell increases in size. This could only occur by the passage of vapour through the pores of the shell. Rot producing organisms can enter the egg through these same channels.

Nature supplied some protection to the egg as she provided for a coating of mucilage-like material as the final coating of the shell. This is commonly known as the bloom. Washing eggs removes the bloom

and opens wide the door for bacterial invasion. Many experiments have been conducted with the object of determining a method of washing that would not subject the egg to germ attack, but none of them has provided an effective measure, and, consequently, all efforts have to be directed to produce an egg for market that does not require washing.

The wastage due to the export of washed eggs has been so extensive that the British Ministry of Food has made it a condition of its contract that all eggs exported in shell must be unwashed.

Soiled eggs may not be exported. Consequently, when it is found necessary to wash some eggs, they should be marketed in separate boxes and marked "Washed Eggs."

Egg quality can also be adversely affected by heat. Heat causes a rapid breaking down of the thick albumen content of the shell. When an egg with thin albumen is broken for frying or poaching, both it and the yolk spread. With a good fresh egg the yolk should stand well up with the albumen supporting it. If males are running with the layers, there is every possibility of the egg being fertile. Heat will bring about some germ development. Germ development is possible with a temperature in excess of 68 degrees Fahrenheit. In order to protect the loss of quality due to heat, egg producers are recommended to:

(i.) Place the nests in the coolest portion of the fowl-house;

(ii.) Gather the eggs frequently;

(iii.) Gather eggs in a wire basket. They will cool more rapidly in wire baskets than in buckets;

(iv.) Place baskets of eggs in a cool position;

(v.) Do not pack until cooled;

(vi.) Store eggs when packed in a cool position pending despatch to the market.

The use of large water-cooled safes is suggested as a means of keeping eggs cool. They have played their part upon many farms and in many countries.

Table Poultry.

The export of table poultry from Queensland is only in its infancy, but the quantity exported during the past twelve months was equivalent to about 400,000 birds. While Great Britain is meat hungry a ready market will exist for all exports of reasonable quality. In pre-war days, table poultry of the choicest quality poured into Great Britain from many countries. If Australia is to hold her markets in Great Britain for all time it is reasonable to assume that poultry meats from Australia will some day have to compete with poultry meats from other countries. There appears to be an opening for the development of a dual purpose breed that has a less objectionable leg colour than that of our Australorps, and one in which the pin feathers are not so prominent as in a black bird. It may be that the Leghorn-Australorp cross will be the answer to the trade. Cross breeding plays a prominent part in the poultry industry in America, both in egg production and for table poultry. Some breeders in the State enthuse over the Leghorn-Australorp cross, but as yet sufficient evidence is not available to suggest it as an answer to the production of both eggs and poultry meat.

MARKETING

Production Trends—August.

Dry conditions were general throughout the main central and southern farming districts, rain being limited to light falls which occurred at intervals, chiefly in the south coastal region. The Darling Downs received little more than half in inch for the month, but there is a good stand of herbage and an abundance of green fodder crops. Moderate rains received in the northern coastal area early in the month included several falls of over two inches in the Tully-Babinda district. At Innisfail up to four inches were recorded, resulting in some dislocation of sugar cane harvesting, but at the same time providing favourable conditions for ratooning and for young plant cane.

The Darling Downs, Maranoa, and Warrego pastoral districts are in good condition. In the greater part of the Central District and in the northern areas of the Central Highlands, drought conditions prevail, the pastures in the Longreach-Winton area being particularly bad.

Although winter cereal crops are still making progress due to the previous heavy May-June rains, dry conditions have prevailed for approximately six weeks, and further good rains would be of great value to pastures and all growing crops. Provided adequate rains are received before the end of September the prospects of harvesting a record wheat crop are bright.

Land is being prepared for the sowing of summer grain and fodder crops. In the northern tobacco districts, irrigated areas will be ready for planting during September. Rain is urgently needed so that final preparations for the planting of cotton may be completed.

Dairy production continued to be very satisfactory for this time of the year. Production of butter during July was the highest July production since 1942.

The Brisbane Wholesale Fruit and Vegetable Market.

Tomatoes continued in very light supply during August and realisations were maintained at very high levels. Choice local Salads were firm throughout the month at 31s. to 36s., and occasionally more, per half-bushel case.

With slightly increased quantities of peas and beans being received, top values declined gradually from 1s. 3d. and 1s. 6d. per lb. on opening to 9d. and 10d. per lb. respectively at the close of the month.

Returns for root vegetables represented excellent values to growers, with carrots reaching as high as 65s. and parsnips 47s. per cwt.

Citrus fruits were plentiful. Choice packs realised good prices but other grades were slow of sale at moderate figures.

The strawberry season was at its peak. Fruit generally was good and prevailing demand allowed clearances to be made at prices satisfactory to growers.

The Tobacco Leaf Marketing Board.

The inaugural meeting of the Tobacco Leaf Marketing Board was held on 13th August in the offices of the Department of Agriculture and Stock. Mr. G. H. Short of Dimbulah was appointed Chairman for the initial term of three years, and Mr. T. V. Gilmore was elected as the Board's representative on the Council of Agriculture. The Board proposes to set up its office in Mareeba, and has appointed Mr. J. L. Power of South Brisbane to act as liaison officer between the Board and southern Queensland growers. The Board will again meet early in September to discuss marketing policy and other matters.

Co-operative Milk Production in Sweden.

Sweden has recently applied the principle of co-operation to milk production. In 1944 a group of farmers formed an organisation to operate a co-operative dairy barn. The barn is jointly owned by 11 farmers who individually own and operate a combined tract of about 125 acres of arable land and 1,500 acres of other land.

This information comes from the May issue of *"Foreign Agriculture,"* which points out that the advantages of the co-operative operation of the dairy barn include (1) saving in capital investments in buildings and equipment; (2) increased efficiency in milk production, especially in regard to utilisation of labour; (3) reduction of the work load of the farm woman, who is given more time for the home and for such operations as poultry raising.

Total cost of construction amounted to 50,000 dollars, 17 per cent. of which was contributed by the Swedish Government which is encouraging such projects to serve as test cases, and 28 per cent. by the consumers' co-operatives as grants or gifts. The remainder was financed by a State loan, secured by mortgage, and by member contributions amounting to 15 per cent.

CURRENT FEEDING VALUES FOR MONTH OF AUGUST, 1948.

(Division of Animal Industry and Division of Marketing).

Feed.	Starch Equivalent Value per 100 lb.	Protein Value per 100 lb.	Average Wholesale Selling Price at Brisbane.	Cost per Starch Equivalent Unit.	Remarks.
STARCH CONCENTRATES.					
Wheat	72	8	7s. 7d. bushel	2·11	Wheat fairly plentiful; other grains light.
Wheat meal ..	72	8	£14 13s. 4d. ton	2·44	
Maize	78	8	7s. 9½d. bushel	2·14	
Maize meal ..	71	8	£16 10s. short ton	2·78	
Sorghum	71	7	£13 10s. ton	2·03	
Sorghum meal ..	71	7	£13 10s. short ton	2·28	
Barley	71	7	Not quoted		Imported bran and pollard available.
Barley meal ..	71	7			
Oats	62	8	5s. 9d. bushel	2·78	
Crushed oats ..	62	8	5s. 11d. bushel	2·87	
Pollard	66	10	£12 10s. short ton	2·27	
Bran	56	10		2·69	
Molasses ..	50	1	47s. 6d. 44-gal. drum	2·59	
PROTEIN CONCENTRATES.					
Meat meal ..	80	55	Not available		
Linseed meal ..	72	25			
Peanut meal ..	78	43			
Blood meal ..	63	68			
Cottonseed meal	67	33			
ROUGHAGES.					
Lucerne hay and chaff	40	10	Hay £8 ton	2·14	Wheaten chaff scarce and of varying quality. Values erratic.
Oaten hay ..	33	3	Chaff £11 ton	3·01	
Wheaten hay ..	33	3	Not available		
Oaten chaff ..	40	3	£11 5s. ton	3·01	
Wheaten chaff ..	40	3	..	..	
MINERAL SUPPLEMENTS.					
Ground calcium carbonate (limestone)			Not quoted		
Bone meal			£11 ton		
Bone flour			Not quoted		
Shell grit (dicalcic phosphate) ..			4s. bag		

The Royal National Show.

Plate 53.

WHEAT IMPROVEMENT.—This display by the Agriculture Branch was designed as a tribute to Mr. R. E. Soutter, breeder of wheats which make up most of the Queensland crop.

Plate 54.

SOIL CONSERVATION.—Proper and improper methods of land utilisation were strikingly displayed by the Soil Conservation Section.

Plate 55.

FODDER CONSERVATION.—This exhibit served as a reminder of the facilities provided by the Department for landholders undertaking construction of silos.

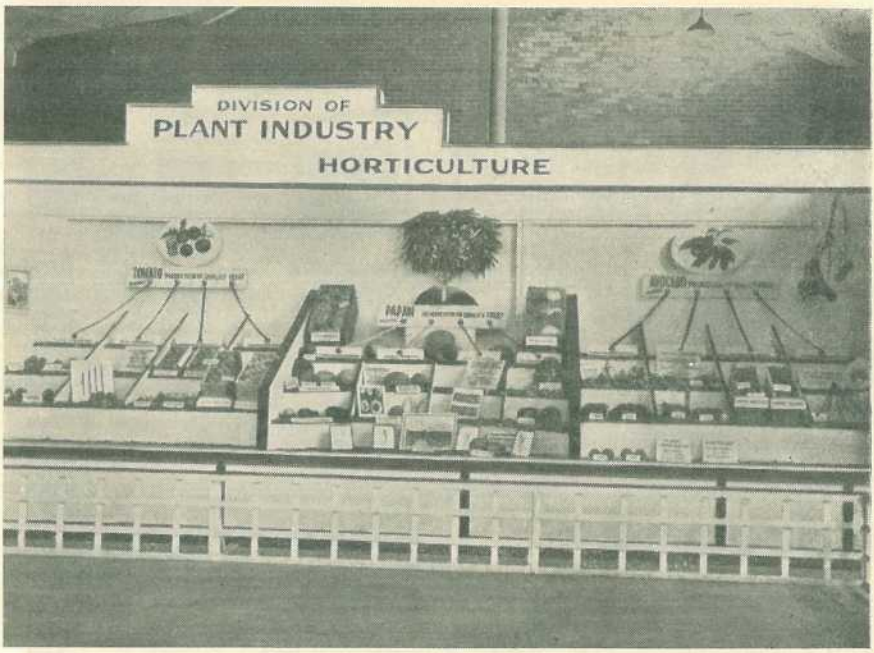


Plate 56.

HORTICULTURAL PRODUCTS.—The essentials in producing quality tomatoes, papaws, and avocadoes were represented by the Horticulture Branch display.

Plate 57.

Plant Protection.—The revolution in insecticides was the theme of the Entomology Section's display. The Plant Pathology exhibit demonstrated the several methods of combating plant diseases. Weeds, poisonous plants and native fodders made up the display of the Botany Section.

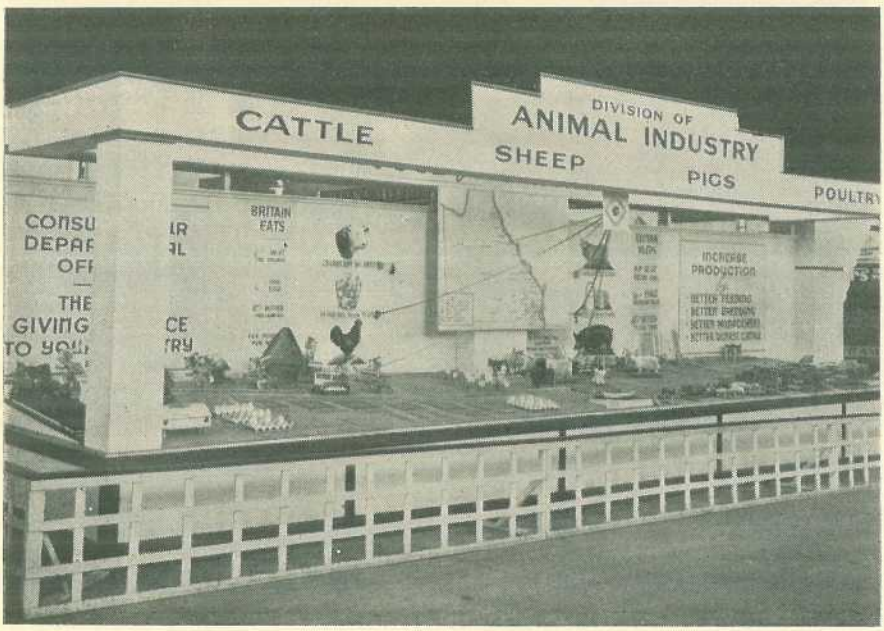


Plate 58.

Livestock Products.—In a comprehensive display, the Division of Animal Industry pinpointed the various ways in which production of livestock products can be increased.

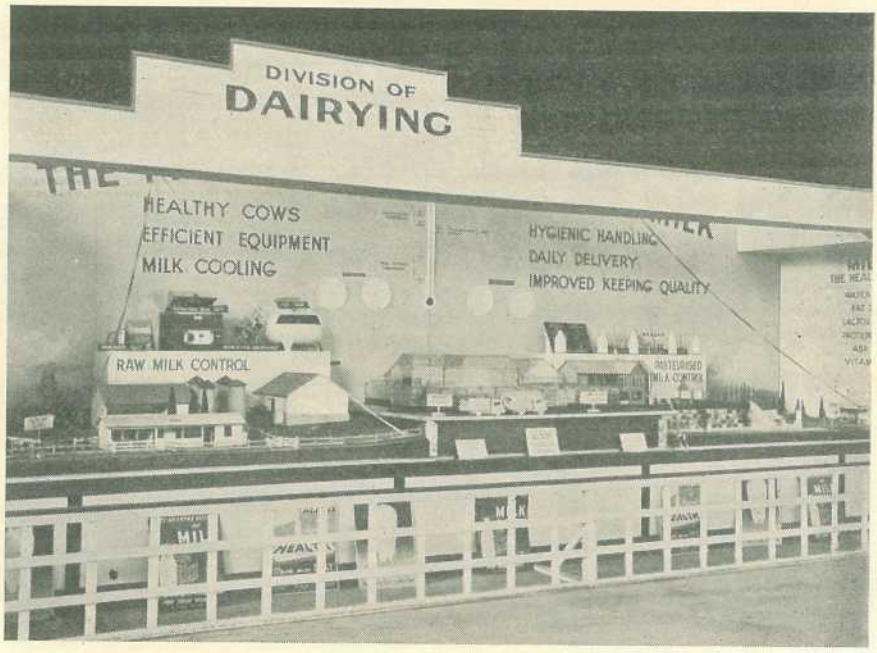
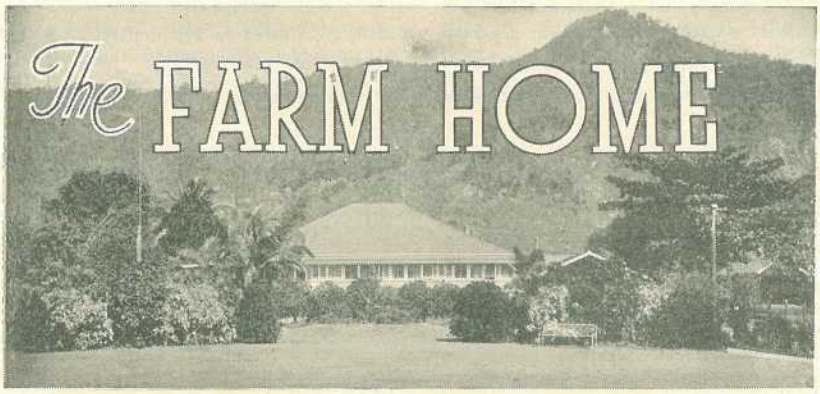


Plate 59.

CLEAN MILK.—The Division of Dairying illustrated the steps taken from farm to delivery to ensure a clean, healthy milk supply.

Plate 60

MARKETING PRIMARY PRODUCTS.—The progress of producer-controlled marketing through commodity Boards was graphically shown by the Division of Marketing. The crop forecasting service was also explained.



Care of Mother and Child.

Under this heading an article supplied by the Maternal and Child Welfare Service of the Department of Health and Home Affairs, dealing with the welfare and care of mother and child, is published each month.

CARE OF THE NURSING MOTHER.

The importance of breast feeding to the baby cannot be over-emphasised.

Now that the summer is approaching with its risks to the artificially fed baby of diarrhoeas caused by either food or infection we must make every effort to ensure that babies who have their own mothers shall be fed on their own mothers' milk. Statistics taken in every country show that the death and sickness rates in breast-fed babies are much lower than for those who are bottle-fed.

The first and most important step towards successful breast feeding should really be taken long before baby is born, and that is the mother's decision that she is going to feed her baby. If she is convinced, as she should be, that this is best for both the baby and herself she will do whatever makes it possible for her to have enough milk.

Most of the rules for successful breast feeding are simple and easily followed. these are—

1. *Fresh Air.*

For a healthy blood supply fresh air is essential. In a Queensland summer there is usually no lack of this in the daytime, but some people do not have enough fresh air at night. Thorough ventilation—that is, a moving current of fresh air—is essential both day and night.

2. *Water.*

Extra water during the nursing period is very necessary. Baby is taking between one-and-a-half to two pints of fluid daily from the mother, and it follows that extra fluid to this amount is required by her. Milk, fresh fruit drinks, and plain cool water will supply necessary fluids and the mother should take a glass of water each time before babe commences his feed.

3. *Clothing.*

Clothing should be light and loose and hang from the shoulders. Tight garments should not be worn.

4. *Cleanliness.*

Personal cleanliness is essential; the daily bath is necessary for the health of the skin.

Dental hygiene is most important. The mother who has decaying teeth or inflamed or suppurating gums will absorb poisons from them into her bloodstream, and her own health and that of the child will suffer as a result.

5. *Exercise.*

Daily exercise in the open air is a necessity. A plea is frequently made that domestic duties give enough exercise, but it must be remembered that open air and sunshine act as a tonic for both mind and body. As a daily walk outdoors is necessary for baby also it should be made a regular routine.

6. *Bowels.*

Every effort should be made to regulate these with the right food, exercise, and regular habits. Aperients should not be necessary.

7. *Diet.*

The diet of the nursing mother is *most important* both to herself and baby. In these days of high prices it is usually mother who goes without milk or fruit or meat so that father or the rest of the family may have a good share. This should not be, and husbands should learn what foods are necessary for mother to protect her own and baby's health and see that she has them. Advice or a book with instructions re diet may be obtained from the Sister at your local Welfare Centre.

8. *Rest.*

A nursing mother needs at least 8 hours sleep every night and an hour's rest in the daytime with her feet up. A very busy mother may find this difficult, and here again her husband and family must help her. A high stool should be provided in the kitchen on which she can sit to do many tasks such as preparing vegetables, ironing baby's clothes, and so on. Sewing or darning can be done just as easily in the open air, resting on a lounge or comfortable chair with the feet up.

9. *Worry and Excitement.*

Nursing mothers should try to avoid worry and emotional upsets, and here again must be assisted by their families.

10. *Smoking and Alcohol.*

Nursing mothers would be well advised to cease smoking. It has been demonstrated that after a mother has smoked seven cigarettes nicotine is present in the breast milk. This definitely affects both the quality of milk and the baby's progress. Alcohol also has no advantages and may be harmful.

Any further advice on this and other matters connected with children may be obtained by communicating personally with the Maternal and Child Welfare Information Bureau, 184 St. Paul's Terrace, Brisbane, or by addressing letters "Baby Clinic, Brisbane." These letters need not be stamped.

IN THE FARM KITCHEN.

Carrot Soup.

Ingredients: 1 lb. carrots, 1 large onion, 1 quart stock, 1 oz. flour or other thickening, little milk, nutmeg.

Scrape the carrots and shred on a grater. Peel and shred the onion. Put the vegetables with the stock and simmer until tender. Adjust seasoning to taste and thicken as required. Serve with a dash of grated nutmeg.

Scotch Broth.

Ingredients: 1½ to 2 lb. lean mutton, 2 leeks, 3 pints cold water, 1 teacup each finely-chopped carrots, onions, cabbage, celery and turnip, 1 teacup barley, 1 dessertspoon chopped parsley, seasoning, 1½ oz. bacon fat (if available), pork or mutton dripping.

Cut up the mutton into convenient pieces, put into a pan with the cold water and bring to boiling point. Skim and stir in barley, cover, and simmer for about 1½ hours. Meanwhile prepare the vegetables and fry in the melted fat for 5 to 6 minutes without colouring. Add these to the cooked meat and season to taste. Replace lid and continue simmering until the vegetables are tender. Stir in the chopped parsley last of all before serving.

QUEENSLAND WEATHER IN AUGUST.

During August there was no rain over the Tropical and Central interior districts and in the sub-tropical interior only very isolated light showers were received in parts of the Warrego and Maranoa. Apart from isolated showers on the Central Coast that district as well as the Central Highlands was also rainless as well as most of the Port Curtis subdivision. In the first part of the month showers in the far North Coast (Barron) gave over average results in the narrow coastal belt. To the north and south of Brisbane the restricted coastal fringe of the Moreton Division received 1 to 2 inch falls on the 28th, otherwise showers in that Division were mostly light. Some places on the East Downs received moderate showers 11/12th and 20/21st but other Downs stations reported from nil to light totals. The East Downs district aggregate of 66 points was 50 per cent. below normal and the West Downs 19 points was 78 per cent. below. Although parts of the North West, Central Highlands and Central Coast received moderately useful rains in July, most pastoral areas in the Central and Tropical Divisions of the State will welcome early spring storms. Most sub-tropical pastoral districts still maintain the benefits of favourable summer and autumn rains, but in the South-Eastern Districts the dry spell of the last two months is beginning to affect dairying pastures. A record wheat area of 550,000 acres is in general holding out well, as all subsoils were soaked by the heavy May and June rains and frost periods during July and August have checked any early tendency to rank growth.

Pressure.—During most of the month the predominating continental high pressure belt was the main control for Queensland. Central areas of these systems as they crossed New South Wales and South-East Queensland brought moderate south-easterly weather along the Queensland coast from the 4th to 14th. After the middle of the month activity in the southern low pressure became more pronounced and trough and cold south-west to southerly frontal circulation brought rough weather off the South Coast on the 19th and scattered showers in the south-east border districts 21/22nd. On the 23rd and 24th another vigorous cold front brought snow and sleet in southern States with the usual moderate to strong westerly to south-west wind circulation in southern Queensland, where strong westerlies again set in at the end of the month with another vigorous closed centre crossing Tasmania.

Temperatures.—Maximum temperatures were mostly about normal ranging from 1.3 degrees below at Cairns to 1.1 degrees above at Mitchell. Minimum temperatures were mostly slightly below normal from 0.2 degrees at Mitchell and Richmond to 2.4 degrees at Palmerville; Boulia and Longreach were 0.30 and 0.10 above. Frosts were fairly prevalent in the south-east quarter with cold periods in the tropical interior. Stanthorpe reported 23 frosty nights.

Rain position is summarised below:—

Division.	Normal Mean.	Mean August, 1948.	Departure from Normal.
	Points.	Points.	Per cent.
Peninsula North	20	6	70 below
Peninsula South	7	1	86 ,,
Lower Carpentaria	10	0	100 ,,
Upper Carpentaria	25	0	100 ,,
North Coast, Barron	114	136	19 above
North Coast, Herbert	167	120	28 below
Central Coast, East	77	5	94 ,,
Central Coast, West	50	1	98 ,,
Central Highlands	84	0	100 ,,
Central Lowlands	48	0	100 ,,
Upper Western	16	0	100 ,,
Lower Western	32	0	100 ,,
South Coast, Port Curtis	118	14	88 ,,
South Coast, Moreton	169	133	21 ,,
Darling Downs, East	131	66	50 ,,
Darling Downs, West	88	19	78 ,,
Maranoa	91	1	99 ,,
Warrego	75	12	84 ,,
Far South-West	49	9	82 ,,

Commonwealth of Australia, Meteorological Bureau, Brisbane

ASTRONOMICAL DATA FOR QUEENSLAND.

NOVEMBER.

Supplied by W. J. NEWELL, Hon. Secretary of the Astronomical Society of Queensland.

TIMES OF SUNRISE AND SUNSET.

At Brisbane.			MINUTES LATER THAN BRISBANE AT OTHER PLACES.					
Date.	Rise.	Set.	Place.	Rise.	Set.	Place.	Rise.	Set.
	a.m.	p.m.						
1	4.59	6.5	Cairns	45	12	Longreach	42	28
6	4.55	6.9	Charleville	29	25	Quilpie	33	37
11	4.52	6.12	Cloncurry	61	38	Rockhampton ..	17	3
16	4.50	6.16	Cunnamulla ..	28	31	Roma	18	15
21	4.48	6.20	Dirranbandi ..	17	21	Townsville.. ..	37	12
26	4.47	6.24	Emerald	26	13	Winton	49	31
30	4.46	6.27	Hughenden ..	46	24	Warwick	3	6

TIMES OF MOONRISE AND MOONSET.

At Brisbane.		
Date.	Rise.	Set.
	a.m.	p.m.
1	4.43	6.08
2	5.22	7.15
3	6.04	8.21
4	6.52	9.25
5	7.44	10.23
6	8.40	11.16
7	9.38	..
		a.m.
8	10.36	12.01
9	11.32	12.40
	p.m.	
10	12.26	1.14
11	1.19	1.45
12	2.11	2.13
13	3.03	2.41
14	3.57	3.08
15	4.53	3.38
16	5.51	4.10
17	6.52	4.46
18	7.55	5.28
19	8.58	6.17
20	9.57	7.14
21	10.51	8.16
22	11.38	9.23
23	..	10.29
	a.m.	
24	12.20	11.35
		p.m.
25	12.57	12.40
26	1.32	1.43
27	2.05	2.46
28	2.39	3.50
29	3.16	4.55
30	3.57	6.01

MINUTES LATER THAN BRISBANE (SOUTHERN DISTRICTS).

Charleville 27; Cunnamulla 29; Dirranbandi 19;
Quilpie 35; Roma 17; Warwick 4.

MINUTES LATER THAN BRISBANE (CENTRAL DISTRICTS).

Date.	Emerald.		Longreach.		Rockhampton.		Winton.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	24	14	40	29	15	4	46	33
6	30	9	46	24	21	1	54	26
11	23	14	39	30	14	5	45	34
16	13	25	28	41	2	16	31	48
21	10	30	25	45	0	21	27	53
26	18	19	33	35	9	10	38	41
30	27	11	43	26	18	0	50	29

MINUTES LATER THAN BRISBANE (NORTHERN DISTRICTS).

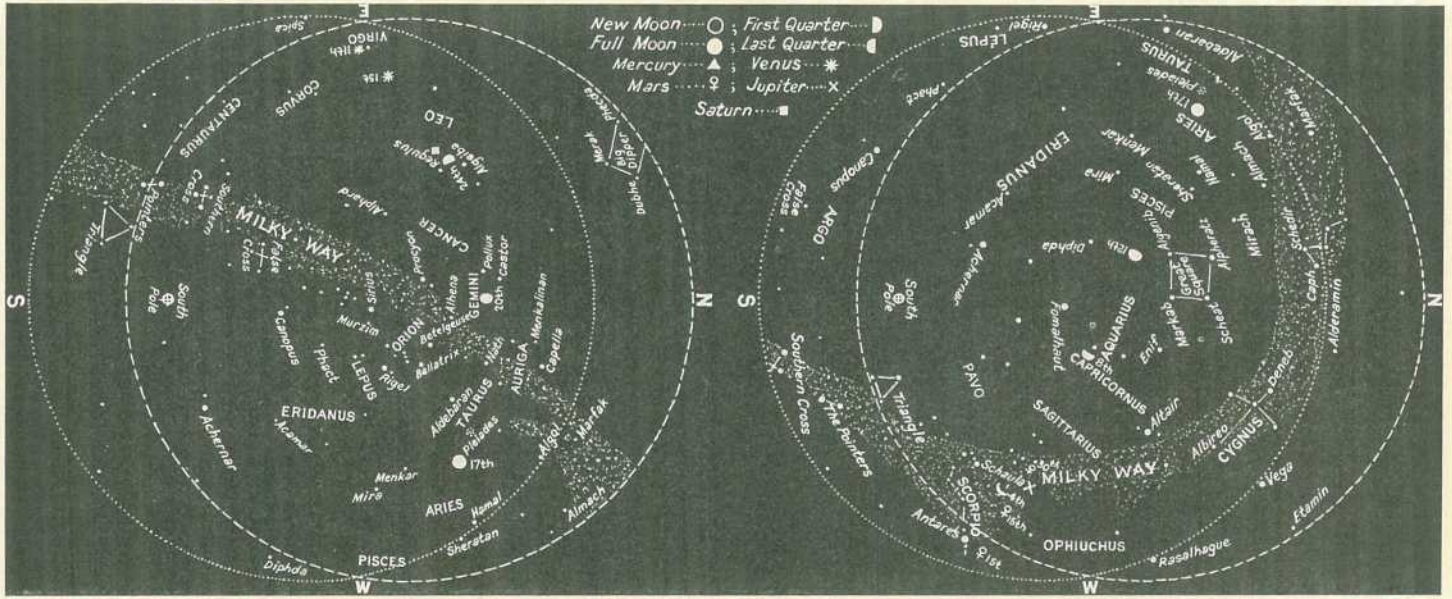
Date.	Cairns.		Cloncurry.		Hughenden.		Townsville.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	40	15	57	41	42	26	33	14
3	51	5	65	34	49	20	42	6
5	56	2	68	32	52	17	46	3
7	54	5	67	34	51	20	44	6
9	46	9	62	36	47	22	38	9
11	38	18	56	43	41	27	32	17
13	27	28	49	49	33	34	23	24
15	18	38	42	57	27	42	16	33
17	8	48	36	62	21	48	8	40
19	2	55	33	67	17	52	3	45
21	5	55	35	67	19	52	5	45
23	9	47	37	62	21	47	8	39
25	20	36	43	55	28	40	17	31
27	27	24	49	46	33	31	23	21
29	43	12	59	38	44	24	36	12
30	47	7	63	35	47	21	39	8

Phases of the Moon.—New Moon, November 1st, 4.02 p.m.; First Quarter, November 9th, 2.46 a.m.; Full Moon, November 17th, 4.31 a.m.; Last Quarter, November 24th, 7.22 a.m.

On November 15th the Sun will rise and set 20 degrees south of true east and true west respectively and on the 13th and 28th the moon will rise and set approximately at true east and true west respectively.

Eclipse of the Sun.—On November 1st a total eclipse of the Sun will be visible from a path about 40 miles wide stretching from the centre of Africa, across the Indian Ocean just north of the island of Madagascar, and continuing to the south of Australia; terminating to the east of the South Island of New Zealand. For about 2,000 miles on either side of this path the eclipse will be seen as a partial one and from the southern portion of Queensland at the maximum phase the disc of the moon will extend a little less than half-way across the Sun. The amount of "darkening" of the Sun's disc decreases as we go north until at Cape York no eclipse is seen. The times of beginning &c. are not the same for all places as in an eclipse of the moon and at Brisbane the disc of the moon will meet the Sun to the left of the point nearest the horizon at 4.57 p.m. In the eastern part of the State the time of commencement will be later as we go north and may be as much as 15 minutes later than at Brisbane while in the south-western districts the time of commencement will be up to 10 minutes earlier than at Brisbane and merging to no difference in time with Brisbane in the north-western part of the State. The time of maximum phase at Brisbane is 5.49 p.m. and again the time of maximum phase at other places varies as stated above. East of a line joining Innisfail, Blackall and Cunnamulla, the Sun will have set before the eclipse ends but west of this line the moon will have completely passed over the Sun's disc before sunset.

Mercury.—A morning object all this month. On the 1st, in the constellation of Virgo, will rise 50 minutes before the Sun and on the 4th will reach greatest angle west of the Sun. On the 30th, in the constellation of Scorpio it will rise about 25 minutes before the Sun.



Venus.—Throughout this month will rise between 3 a.m. and 4 a.m. and will remain in the constellation of Virgo.

Mars.—At the beginning of the month, in the constellation of Orphiuchus, will set between 8.30 p.m. and 9.30 p.m. and at the end of the month, in the constellation of Sagittarius will set between 8.20 p.m. and 9.20 p.m.

Jupiter.—In the constellation of Sagittarius will set between 9.45 p.m. and 11 p.m. on the 1st and between 8.20 p.m. and 9.20 p.m. on the 30th when Mars and Jupiter will be about one degree apart, Jupiter being the brighter and more northerly planet.

Saturn.—In the constellation of Leo will rise near midnight during the month.

Star Charts.—The chart on the right is for 7.15 p.m. in the south-east corner of Queensland to 8.15 p.m. along the Northern Territory border on the 15th November. (For every degree of longitude we go west the time increases by 4 minutes.) The chart on the left is for 8 hours later. On each chart the dashed circle is the horizon as viewed from Cape York and the dotted circle is the horizon for places along the New South Wales border. When facing north hold "N" at the bottom; when facing south hold "S" at the bottom and similarly for the other directions. Only the brightest stars are included and the more conspicuous constellations named. The stars, which do not change their relation to one another, moving east to west, arrive at any selected position about 4 minutes earlier each night. Thus, at the beginning of the month the stars will be in the positions shown about 1 hour later than the time stated for the 15th and at the end of the month about 1 hour earlier than that time. The positions of the moon and planets, which are continually changing in relation to the stars, are shown for certain marked days. When no date is marked the position is for the middle of the month.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

AUGUST.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Aug.	No. of years' records.	Aug., 1947.	Aug., 1948.		Aug.	No. of years' records.	Aug., 1947.	Aug., 1948.
North Coast.	In.		In.	In.	*South Coast—contd.*	In.		In.	In.
Atherton	0·84	42	4·99	0·66	Caboolture	1·62	67	0·72	2·14
Cairns	1·65	61	4·94	1·99	Childers	1·21	48	2·11	0·26
Cardwell	1·22	71	3·11	0·69	Crohamhurst	2·17	50	1·11	0·00
Cooktown	1·17	67	4·65	1·04	Esk	1·39	56	0·58	0·78
Herberton	0·61	57	3·71	1·04	Gatton College	1·08	44	0·64	0.00
Ingham	1·44	51	1·41	0·33	Gayndah	1·12	72	0·88	0·22
Innisfail	4·85	62	9·39	4·98	Gympie	1·65	73	2·12	0·36
Mossman	1·34	19	5·28	0·91	Kilkivan	1·35	62	1·58	0·14
Townsville	0·50	72	3·25	0·00	Maryborough	1·61	72	1·30	0·66
					Nambour	1·88	47	1·43	1·48
Central Coast.					Nanango	1·29	61	1·27	0·38
Ayr	0·58	56	0·93	0·00	Rockhampton	0·82	72	2·26	0·01
Bowen	0·72	72	0·22	0·07	Woodford	1·61	55	0·61	0·83
Charters Towers	0·50	61	1·12	0·02					
Mackay	1·09	72	1·58	0·08	*Darling Downs.*				
Proserpine	1·45	40	2·10	2·46	Dalby	1·16	73	0·66	0·07
St. Lawrence	0·79	72	3·43	0·14	Emu Vale	1·06	47	0·48	0·32
					Jimbour	1·10	64	0·53	0·00
Central Highlands.					Miles	1·08	58	1·29	0·00
Clermont	0·70	72	1·17	0·00	Stanthorpe	1·73	70	0·90	1·35
Springsure	0·99	74	2·29	0·00	Toowoomba	1·58	71	1·43	0·61
					Warwick	1·40	78	0·64	0·84
South Coast.									
Biggenden	1·04	44	0·94	0·24	*Maranoa.*				
Bundaberg	1·27	60	1·47	0·07	Roma	0·86	69	2·40	0·00
Brisbane Bureau	1·90	91	0·50	1·35	St. George	0·91	62	3·52	0·05

CLIMATOLOGICAL DATA FOR AUGUST.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Atmospheric Pressure Mean at 9 a.m.	Shade Temperature.		Extremes of Shade Temperature.				Rainfall.	
		Mean Max.	Mean Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Pts.	
Cairns	..	78	60	81	21	50	29	199	6
Herberton	..	71	48	81	21	30	26	104	10
Townsville	..	78	57	84	23	47	22	Nil	..
Rockhampton	30·11	77	51	87	20	39	22	1	1
Brisbane	30·12	72	51	80	15	44	18	135	8
Darling Downs.									
Dalby	..	71	42	80	31	30	17	7	1
Stanthorpe	..	63	36	72	31	25	17	135	8
Toowoomba	..	65	42	74	31	32	14, 18	61	6
Mid-Interior.									
Georgetown	..	84	54	88	31	37	26	Nil	..
Longreach	30·13	79	47	89	31	37	1	Nil	..
Mitchell	30·15	72	39	84	31	29	17	Nil	..
Western.									
Burketown	..	79	57	90	6, 7, 9	47	25	Nil	..
Boulia	30·06	79	49	89	30	40	17,21,24	Nil	..
Thargomindah	30·12	72	44	83	30	39	2, 5, 14, 16,17,18	18	2

A. S. RICHARDS,
Deputy Director, Meteorological Services.

Commonwealth of Australia,
Meteorological Bureau, Brisbane.