Volume 65 Part 4

# QUEENSLAND AGRICULTURAL JOURNAL

Edited by
J. F. F. REID
Associate Editor
C. W. WINDERS, B.Sc.Agr.

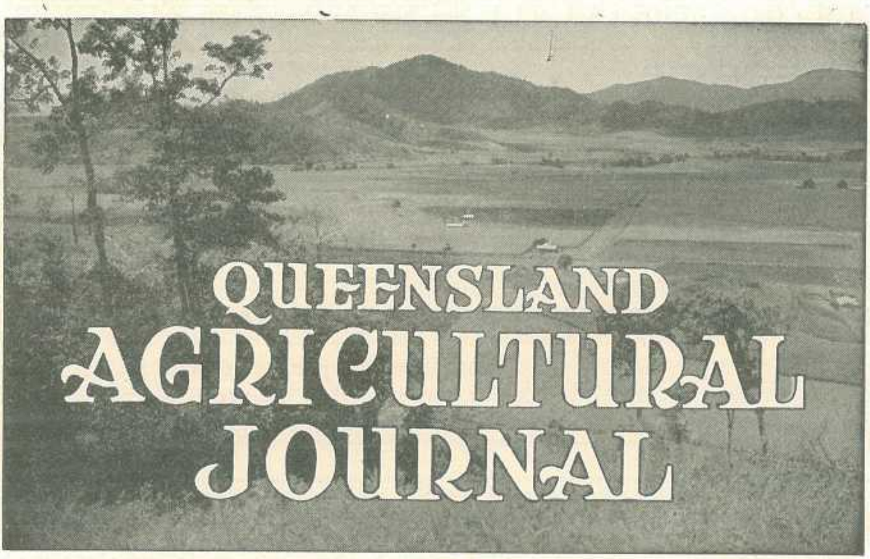
OCTOBER, 1947

Issued by Direction of
THE HONOURABLE H. H. COLLINS
MINISTER FOR AGRICULTURE AND STOCK

GOVERNMENT PRINTER, BRISBANE

# Contents

**ANNUAL RATES OF SUBSCRIPTION.**—Queensland Farmers, Graziers, Horticulturists, and Schools of Arts, **One Shilling,** members of Agricultural Societies, **Five Shillings,** including postage. General Public, **Ten Shillings,** including postage.




Volume 65 | 1 OCTOBER, 1947 | Part 4

# Event and Comment.

## The Case for Fodder Conservation.

THE case for fodder conservation in Queensland has been put concisely, adequately, and in easily readable form in a departmental pamphlet which is now available for distribution to dairy farmers.

Long before the protracted dry season of 1946 a number of Queensland dairy farmers had proved to their own satisfaction that regular storage of stock feed paid them handsomely not only as a dry-time reserve, but for use during that period of the year when pastures are more or less dormant. As pointed out in the publication under review, supplementary feeding of dairy stock is not simply a device for saving stock from starvation. In districts where grazing is never adequate during the whole year, hand-feeding is a necessity if maximum production is to be obtained from a dairy herd. Consideration of some of the points made by farmers who believe in regularly conserving fodder will bring home to any doubter the wisdom of such a practice and its adoption in the ordinary farm routine.

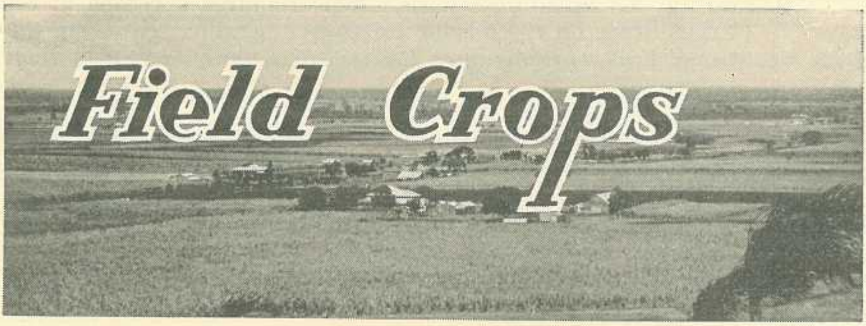
Concrete examples are quoted as proof of the economy of conservation and its practical value, not only as an emergency stock food supply, but also in the maintenance of dairy production at a satisfactory level throughout the year. In the Pittsworth district production figures from several herds of 25 to 50 cows were examined. Herds fed during the dry months with sorghum silage, lucerne, or cereal hay as a base had a butter-fat average of 220 lb. in 1946, while those not hand-fed but had some grazing on standover crops averaged only 170 lb. A farmer in the Oakey district set out to see how his cows responded to hand-feeding. From the beginning of April until late July he had only dry grass in his paddocks. His weekly factory pay fell from £14 in early April to £8 in mid-May. He then started hand-feeding. His next week's pay was £11, and as he increased the ration returns rose to £18 a week. Very little of the feed used by this farmer was home-grown, and chaff and concentrates were bought on a high market. His feed bill from May to July was £71, and his returns totalled £192. Undoubtedly his profit would have been greater had he had more home-grown fodder conserved. An interesting point is that by hand-feeding he was able to double his production at a time when factory output was, generally, very low. A neighbouring farmer fed crushed grain for four dry months (August-November, 1946) at a cost of 13s. 7d. per cow per month. His average return per cow per month was 45s., leaving him with a net profit of 31s. 5d. per cow per month. A typical case of a farmer in the same area who did not feed showed a return of only 19s. 9d. per cow per month for the four-month period.

Another case of three adjacent milk-producing farms in the Warwick district is cited. Two of the farmers who hand-fed largely with home-grown lucerne hay produced milk equivalent to nearly 300 lb. of butter-fat per cow. The third farmer did not feed and his average butter-fat was 145 lb. per cow.

An Allora-Clifton district survey showed that for four herds fed adequately on reserve fodders the production for the dry period, July-December, 1946, was only 7 per cent. less than that for the corresponding period in 1945, whereas combined factory production was down 35 per cent. For four typical non-feeding farms, production was down 50 per cent. If this figure is taken as the average drop in production for all farms not feeding supplementary fodders, net profit from feeding on farms on which costs were kept works out at from £13 to nearly £200 for farms of different sizes. To these profits should be added the benefit of maintaining stock in condition.

Similar surveys were made in other districts, and the evidence gathered was overwhelmingly in favour of supplementary feeding. The production of two milk-producing farms in the Samford district is worth quoting. Farm No. 1, on which there was no home-grown conserved fodder and insufficient purchased concentrates, averaged 250 gallons per cow. Farm No. 2, using silage and adequate bought fodder to make up a balanced ration, averaged 500 gallons per cow.

Other matters dealt with in this thought-provoking publication include the increasing of total annual production; the increasing of off-season output; improvement of quality in dairy produce; testing true production capacity of cows; keeping cows in condition; reducing production and manufacturing costs; the need for co-operation; availability of equipment for silo construction; financial assistance for fodder conservation and silo construction; balancing stock feed mixtures; grazing crops and improved pastures; and planting tables for fodder crops in dairying districts throughout Queensland. This publication, *The Case for Fodder Conservation*, of which copies are now being distributed, is obviously well worth studying by every Queensland dairy farmer.




# Tractor Costs.*

C. G. STORY.

HAPHAZARD methods are of no use to the farmer who wishes to make his farming systematic and efficient. Since the modern farmer employs a number of mechanical units, each of which must contribute its quota towards maintaining the general efficiency of the property, costs of production are of vital concern to him because, when related to his gross returns, they decide to a large extent the profits earned. To obtain his livelihood returns must show a reasonable margin over costs.

A considerable amount of capital is invested in farm machinery of which, on most cane farms, the tractor forms an important part. This power unit has undoubted advantages on the farm, and, since it represents a fairly large outlay, it is both profitable and interesting for the farmer to know accurately how much it actually costs him to run his tractor for any period and also what it costs to do various cultivation operations with the tractor.

Tractor costing does not require any intricate accounting. It can be made simple and straightforward and any owner can readily compute the costs for his own particular unit and conditions. An almost essential adjunct to costing is a *tractor log* in which a daily record should be kept of the following items:—Consumption of fuel, oil, and grease; hours worked; area cultivated and type of work performed. Records of the costs of fuel, oil, and repairs, and dates when costs were incurred, should also be kept in the log.

The cost of running a tractor for any period can be calculated by adding the direct costs of fuel, oil, grease, repairs, and labour to the estimated indirect costs (interest and depreciation) over the same period. Dividing this total by the number of hours worked will give the total cost of the tractor per hour. It should be noted that to determine the overall cost per acre cultivated, an allowance must also be made for interest, depreciation and maintenance of implements used, as well as labour employed. This amount should be added to the previous total before dividing by the number of acres cultivated.

Two methods of tractor costing are suggested.

1. Costing on a daily basis. This method gives immediate information.

---

* From *The Cane Growers' Quarterly* for April, 1947 (Bur. Sug. Expt. Stns., Dept. Ag. & Stk., Q.).

2. Costing on an annual basis. This requires a record of all expenditure on the tractor for twelve months. Knowing the number of working days for the year, daily costs can then be computed.

## METHOD 1.—DAILY COSTING.

(*Note*:—The figures used in the following table are only to illustrate the method. Each owner would, of course, substitute his own particular figures.)

### Indirect Costs.

| | £ | *s.* | *d.* |
|---|---|---|---|
| **Interest.** | | | |
| Value of tractor, £500. | | | |
| Interest allowed, 4 per cent. per annum. | | | |
| Interest for the year, £20. | | | |
| Allowing 100 working days per year, the interest per working day is .. .. .. .. .. .. .. .. | 0 | 4 | 0 |
| **Depreciation.** | | | |
| Assumed tractor life, 6,000 working hours. | | | |
| Equivalent number of 8-hour days = 750. | | | |
| Depreciation per working day = 500 ÷ 750 .. .. .. | 0 | 13 | 4 |
| Total indirect cost per day .. .. .. .. .. .. | 0 | 17 | 4 |

### Direct Costs.

| | £ | *s.* | *d.* |
|---|---|---|---|
| **Maintenance.** | | | |
| Allowing 3 per cent. per annum for tyres and repairs, cost for year of 100 working days would be £15; so that maintenance per working day is .. .. .. .. .. .. .. | 0 | 3 | 0 |
| **Fuel.** | | | |
| Petrol per day .. .. .. .. .. .. .. .. .. | 0 | 1 | 3 |
| Power kerosene, 8 gals. per day at 1/6⅜ per gal. .. .. .. | 0 | 12 | 3 |
| **Crankcase Oil.** | | | |

| | £ | s. | d. |
|---|---|---|---|
| 2 gals. S.A.E. 40 every 120 hrs. at 8s. 3d. per gal. .. | 0 | 16 | 6 |
| 1 filter element every 120 hrs. at 9s. 9d. each .. .. | 0 | 9 | 9 |
| Total | £1 | 6 | 3 |

| | £ | *s.* | *d.* |
|---|---|---|---|
| 120 hours is equivalent to 15 days, therefore daily cost is .. | 0 | 1 | 9 |
| **Differential and Transmission Oil.** | | | |
| 5 gals. per 100 days at 8s. per gallon equals 40s. per 100 days, therefore daily cost is .. .. .. .. .. .. .. | 0 | 0 | 5 |
| **Grease.** | | | |
| 10 lb. per 100 days at 10d. per lb. equals 100 pence per 100 working days, therefore daily cost is .. .. .. .. .. .. | 0 | 0 | 1 |
| **Labour.** | | | |
| Allow £1 per day .. .. .. .. .. .. .. .. | 1 | 0 | 0 |
| Total direct cost per day .. .. .. .. .. .. .. | 1 | 18 | 9 |

### Total tractor cost.

| | £ | *s.* | *d.* |
|---|---|---|---|
| Indirect costs per working day .. .. .. .. .. .. .. | 0 | 17 | 4 |
| Direct costs per working day .. .. .. .. .. .. .. .. | 1 | 18 | 9 |
| Total cost per working day of eight hours .. .. .. .. | £2 | 16 | 1 |

## METHOD 2.—ANNUAL COSTING.

### Indirect Costs.

| | £ s. d. |
|---|---|
| Cost price of tractor.......... | |
| Estimated depreciation at ........ per cent. .. .. .. .. .. | |
| Estimated interest at ........ per cent. .. .. .. .. .. | |

### Direct Costs.

| | |
|---|---|
| Total fuel .. .. .. .. .. .. .. .. .. .. | |
| Total oil and grease .. .. .. .. .. .. .. .. | |
| Total maintenance tyres and repairs .. .. .. .. .. .. | |
| Total labour .. .. .. .. .. .. .. .. .. .. | |
| Total cost per year .. .. .. .. .. .. .. .. | £ |

Daily cost is total annual cost divided by number of working days per year.

## SCHEDULE OF CULTIVATION COSTS.

| | |
|---|---|
| Total tractor cost per day of eight hours is.......... | |
| Area cultivated per day is ........ acres. | |
| Tractor cost per acre is .. .. .. .. .. .. .. .. .. | |
| Estimated cost per acre to cover interest, depreciation, and maintenance of implements used is .. .. .. .. .. .. .. .. | |
| Cost of labour per acre for cultivation .. .. .. .. .. .. .. | |
| Total cost of cultivation per acre .. .. .. .. .. .. | £ |

Depreciation is calculated on anticipated length of life. If 15 per cent. per annum were allowed for depreciation then a life of approximately seven years would be expected. If the tractor lasted longer than this, then depreciation costs would be reduced to nil; repair costs after seven years, however, would tend to increase. On the average, interest may be calculated with safety on 75 per cent. of the original cost because over a number of years the interest costs would decrease due to the depreciated value of the tractor. Moreover, a certain amount should be banked each year to cover depreciation, thereby reducing the "overdraft" on which interest must be paid. In general, indirect costs will vary with the interest and depreciation allowed on the tractor for the period under consideration and with the number of days or hours worked per year. Direct costs will vary with the type of tractor and skill in its operation as well as the mechanical knowledge of the driver. Good tractor management depends upon conscientious daily maintenance, prompt attention to repairs, careful driving, and the avoidance of excessive strain on the machine.

The adoption of low fuel consumption tractors with power lifts and attachable implements enables large areas to be cultivated at low cost and work to be performed rapidly and efficiently at the period when it is required. Where large areas are concerned and greater power is required the crawler tractor has its supporters. In all cases, however, the working cost of these machines plays an important part in the costs of production on the property.

# Irrigation Spears of the Bundaberg District.*

S. O. SKINNER.

DURING recent years, the value of irrigation has impressed itself firmly in the minds of canegrowers in the Bundaberg district. Many growers, previously without irrigation facilities, have made strenuous efforts to locate underground water supplies and to pump the water from drifts which, in many cases, have proved difficult to manage.

In general, many of the underground drifts contain a fair percentage of fine sand and a smaller amount of clay particles. These are known as tight drifts and often present a problem in obtaining a free supply of water. In these drifts, the main type of spear used in earlier years was often found to clog.

It is therefore interesting to describe the various types of spears in use, particularly that known as the "Bag Spear" which is believed to be peculiar to this district.

The Bundaberg underground formations do not lend themselves to driving, hence the pointed spear which is designed for this purpose is little used and is mainly limited to small installations set up in places such as dry sandy creek beds.

*Earlier Main Type.*—This consists normally of a 4 to 6-inch casing drilled with $\frac{3}{4}$-inch holes placed at approximately $1\frac{1}{2}$ inches apart from centre to centre or (as shown in Fig. 106 (*a*)), with holes in staggered rows, placed $1\frac{1}{2}$ inches apart between centres around the spear and 2 inches apart along the length of the spear. A non-drilled area of approximately 3 inches is usually left at the bottom, and the open end of the spear is sealed with a welded plate.

Around the outside of the casing is spirally wound $\frac{1}{8}$ to $\frac{1}{4}$-inch diameter wire with approximately 2 inches between turns, as shown in Fig. 106 (*a*). Over this is placed sheet or wire gauze.

The action of the spear is a direct suction of water through the gauze, through the drilled holes and up through the casing.

This type of spear is still in use, particularly in early installations where they have proved satisfactory, and in new installations where the drift is open. Its chief advantages are its free and direct intake of water through the holes in suitable drifts, and secondly it enables the use of the maximum sized spear casing in a given sized bore hole, as against the bag spear type which will be described presently.

The chief disadvantage is that of clogging in tight drifts. In fine sand and clay a gradual clogging up occurs between the gauze and the metal of the spear between the holes, aggravated by a pocketing effect from the spirally wound wire. This eventually reduces the effective area of the gauze to that immediately opposite the holes only, and with any external clogging of the gauze itself at these points, the efficiency of the spear is further reduced.

*Bag Spear.*—The clogging of the former spear led to efforts to design a spear which would allow the inflow of water to be evenly distributed and maintained over the whole gauze surface, and furthermore

---

* From *The Cane Growers' Quarterly* for April, 1947 (Bur. Sug. Expt. Stns., Dept. Ag. & Stk., Q.).

would eliminate any impediment to flow that would otherwise promote siltation between gauze and spear casing. A leading Millaquin grower is credited with devising what is commonly termed the bag spear, which is the type most widely adopted now.

This spear consists of a 4 to 6 inch diameter casing, on the outside of which are welded four to six ribs, formed of $\frac{3}{4}$ by $\frac{1}{4}$-inch or 1 inch by $\frac{1}{4}$-inch steel on their edges. These ribs are up to some 12 feet in length and extend usually from 9 to 18 inches beyond one end of the casing. On the bottom of these extended ends is welded a steel plate. This forms the bottom end of the spear.

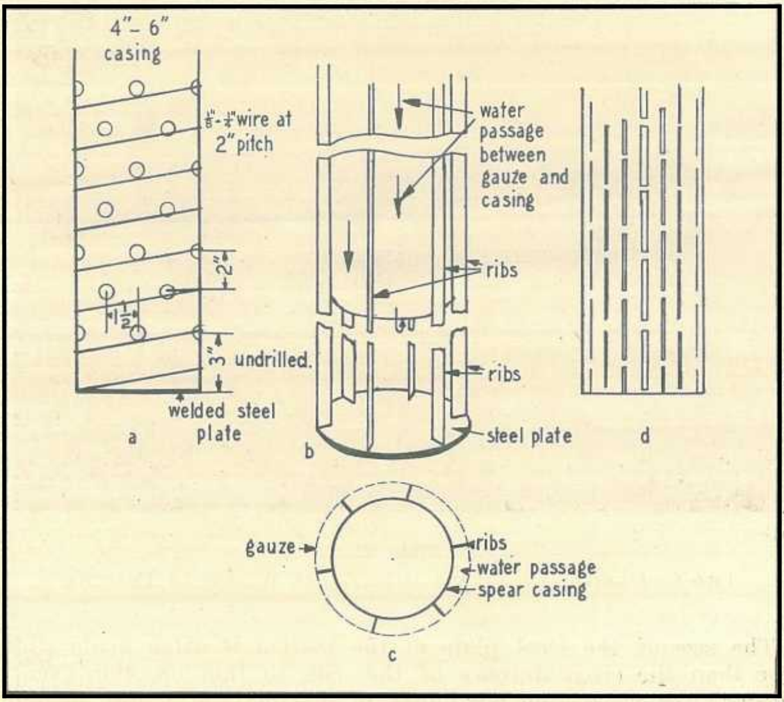



Plate 91.

(*a*) Earlier main type of irrigation spear used at Bundaberg for pumping from underground water supplies; (*b*) showing ribs in relation to the casing in the bag spear; (*c*) a cross sectional view of the bag spear; (*d*) type of irrigation spear used without gauze showing staggering of longitudinal slots around casing.

Over the full length of the ribs is placed sheet or wire gauze. At the top of the ribs the gauze is tapered in so that it can be attached firmly to the casing, usually by the aid of a collar. The gauze is spot soldered down the ribs and firmly soldered at all joins. Fig. 106 (*b*) shows the ribs in relation to the casing, and Fig. 106 (*c*) is a cross-sectional view. Fig. 107 shows the completed spear with gauze fitted.

In operation, the water passes in through the full length of the gauze and falls vertically down to the open end of the casing. Since the channel-way between the gauze and the casing is in the vicinity of $\frac{7}{8}$ inch according to the width of ribs used, it cannot become clogged with any fine sand and clay that passes in through the gauze. This material falls to the bottom of the bag where the turbulence of water in changing its direction is so great, that it passes up with the water to the pump outlet and does not clog.

The length of bag projecting beyond the casing is important. If made over 2 feet with a 6-inch diameter casing, silting in the bottom of the bag has been found to occur. If made under 9 inches with a 4-inch casing, it is believed that the abovementioned turbulance is so great that a restriction is placed on the desired free intake of water.

Plate 92.
TWO COMPLETED BAG SPEARS WITH GAUZE WELDED IN POSITION.

The size of the steel plate at the bottom is often made slightly larger than the circumference of the ribs so that in the event of ''pulling'' the spear, the possibility of leaving the gauze behind is minimised.

The advantages of this spear are firstly, the prevention of clogging, and secondly, the presentation of a much larger surface of gauze in relation to the size of the spear casing. Against this, however, is the disadvantage of requiring a larger, more expensive, bore hole and temporary bore hole casing to place the spear down.

Modifications of the bag spear which are employed, mainly refer to the spear casing within the gauzed area which may be drilled with a limited number of holes of up to 1 inch in diameter. This, while tending to defeat the true function of the bag, would on the other hand, in suitably graded drifts, give a freer intake of water.

*Spears Without Gauze.*—These spears consist simply of a perforated casing. The casing varies from 4 to 6 inches in diameter and the perforations from drilled circular holes to long narrow slits cut by an oxy-acetylene torch. In a typical drilled type, holes are of $\frac{1}{4}$ inch diameter at ½ inch centres over a length of 20 feet, with the bottom end of the spear sealed with a welded plate. This particular spear in a good open drift has given excellent results.

With the oxy cut type, slots range in the vicinity of 3-16th inch wide by 4 inches long with ¾ inch between slots, and with the slots staggered as in Fig. 106 (*d*).

Of the two types of perforation used the slot is believed to possess the advantage of being less subject to clogging. This is based on the assumption that sand and gravel usually approximate a round shape and thus can more readily completely fill and choke a round hole. To fill the slot, however, several pebbles or large grains of sand are required, but in that case there are always some gaps left through which water can pass.

*Type of Gauze Used.*—As is readily appreciated, type of gauze plays a major role in the efficient functioning of any type of gauzed spear, The three main types used are firstly, copper sheet gauze with slotted holes; secondly, copper sheet gauze with round holes; and thirdly, brass wire woven gauze.

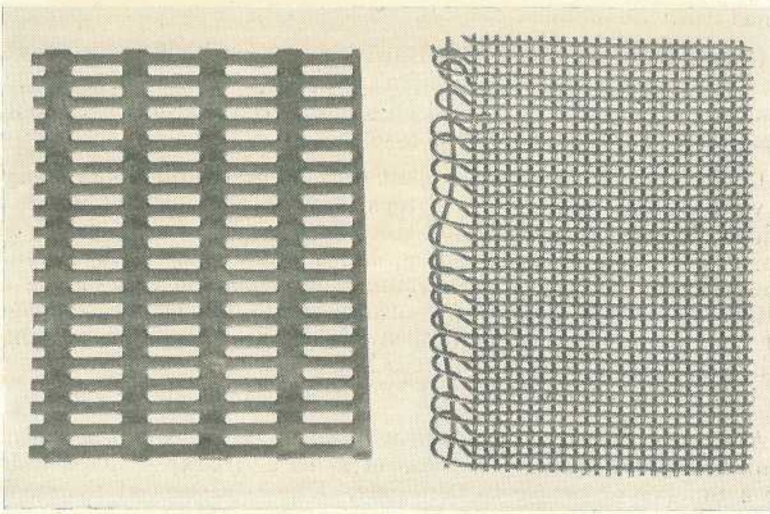


Plate 93.

Samples of Slotted Gauze and Woven Wire Gauze. (Approximately three-quarters normal size.)

Of the three, the former type appears to be the most widely sought, and in appearance is as shown in Fig. 108. The preference for slotted gauze over round holes is based on the advantages of slotted versus round holes against clogging as indicated earlier. The woven wire gauze shown in Fig. 108, while not extensively used in the past, varies greatly in size of weave from 25 to 144 holes per square inch.

The selection of gauze, however, still remains largely one of individual preference with little comparative data as a guide, and is limited at present to that which is procurable. General opinion, however, appears to be directed to the use of larger perforations that will allow a considerable percentage of sand to pass for the good development of the spear site. There is room for thought in the findings of an overseas firm which appears to have done much work on underground supplies, that, although in the past it was considered good practice to select a size of slot that would exclude 60 per cent. to 80 per cent. of the sand, better results can be obtained with larger slots that will pass up to 60 per cent., and in some cases up to 80 per cent., except where the sand is of high uniformity.

# Wallaby Control.*

F. W. READING.

THE destruction caused to cane crops by wallabies has given the Lower Burdekin Cane Pest and Disease Control Board and myself, in the capacity of the Boards' Supervisor, much food for thought. Many and varied efforts have been made to control these pests but such efforts have not met with unqualified success.

Climatic conditions in the Burdekin area, with its wet season of short duration followed by a comparatively dry winter and spring, tend to encourage the wallaby to feed on young irrigated cane after natural grasses have lost their succulent growth.

Damage to young autumn plant cane becomes apparent during the dry winter months when many tops may be eaten off. This is not considered to be very detrimental since the removal of the primary shoot normally promotes better stooling, but in many cases the plant is completely removed from the ground and complete loss of the stool results. With dry conditions continuing into the spring, damage to older cane takes the form of broken sticks, only the growing points of which are chewed. Quite large areas in a field may be affected in a short time though the damage may not be apparent from the headland.

A fair measure of control in pre-war years was exercised by organized shooting when the value of skins and scalp bonuses induced quite a number of people to take part. The attraction of the sporting aspect was also not inconsiderable.

Wartime restrictions on guns and scarcity of ammunition allowed the pest to multiply and penetrate to uncultivated lands within the area, where the growth of long, coarse grass and weeds afforded excellent cover. Burning off harbourage for the pest is not always practicable during the harvesting season, since uncontrollable fires may cause extensive damage to canefields.

Poisoned baits and snares have been found to be ineffective since treated areas seem to be avoided by the wallabies. Strychnine and arsenic, applied both dry and in solution to young cane shoots, green corn cobs, bran and pollard balls, sweet potato, pineapple, bananas,

* Paper submitted to the Pest Boards Conference held at Tully, 29th August, 1946.

Reprinted from *The Cane Growers' Quarterly* for April, 1947 (Bur. Sug. Expt. Stns., Dept. Ag. & Stk., Q.).

cabbage leaves, and sliced pumpkins, gave no noticeable results. Moreover, the use of poisons is not favoured by farmers because of the risk to children and farm animals.

Although the electric fencer has been suggested as a possible means of control, it is believed that it has not been used in this district.

Dogs have been used to check the activities of wallabies in the Burdekin, as well as in most other parts of Queensland. Practically every cane farmer keeps dogs of one type or another, but very few have dogs of a recognized hunting breed. The hunting breeds differ from the common farm dog in their method of working, in that a hunter will follow a scent for a considerable distance and for some time. On the other hand, non-hunting breeds will generally act only when they have the animal in sight and rarely operate beyond the boundaries of the farm.

Plate 94.
Beagle Hound, Fine Haired Type.

The Beagle hound was introduced into the Ayr district in 1944 in an attempt to control the wallaby pest, and now there are twelve operating in the cane area. The Beagle is a true hound, and has been a recognized breed for at least 200 years. It is not as well known as most sporting dogs, because it is not widely exhibited as a show dog, and, as far as is known at present, is being used mostly in the southern States for hare trapping, where it is considered to exercise a partial control of this pest.

In their working habits they seem to leave the house at 3 to 5 a.m. and return at 9 to 10 a.m., except when on a long scent in which case they have been known to remain away for two or three days. Their radius of action is usually not great, although at times the Beagle has been noticed working up to five miles away from the home. It is not known how long they will run without resting, but their endurance when on a trail through the cane paddocks, grass and weeds, and in open country is superior to most farm dogs. However, since the Beagle is a rather small dog it is desirable that it should work in company with other dogs, for when the Beagle finds the pest the larger dog ensures the killing. Alone, the Beagle may not effect a kill, but by disturbing the wallabies persistently in the early hours of the morning, when they seem to feed, damage to crops will be reduced, and the pest may be forced to migrate to pastoral areas where it is less likely to be molested by dogs.

As the wallabies are checked in a locality, the radius of effective action for the number of dogs at present in the Burdekin may become too great. Therefore, it is hoped that additional Beagle hounds will be introduced to drive the pest entirely from the cane area.

There are two types of Beagle hound, both of which are working in this area. Firstly, a type with fine hair, 14 in. to 16 in. in height, and 25 to 30 lb. in weight (Fig. 109); secondly, a dog with coarse hair, much like the Bassett hound, 16 in. to 19 in. in height, and 35 to 40 lb. in weight (Fig. 110). Colours in these types vary, including black and tan, white and pie, or lemon.

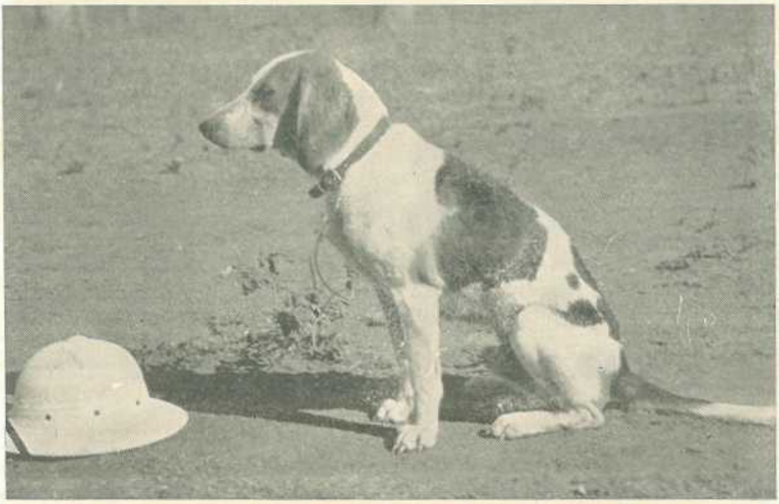


Plate 95.
BEAGLE HOUND, COARSE HAIRED, LARGER TYPE.

The Beagle hound commences working when eight to ten months old, and appears to require no special training. When the dog returns from the hunt, it may be a good practice to feed regularly with some prepared food, for this may reduce scavenging habits. As far as is known, they are not vicious towards man or child. Their stamina appears equal to the rough conditions of the work performed. Distemper and secondary distemper can be successfully treated with vaccine injections, as also can tick paralysis, but dog owners in tick infested areas already know the value of daily examinations for the presence of the dog tick.

# PLANT PROTECTION

## Experiment on the Control of Bacterial Spot of Plums.

R. B. MORWOOD, Pathologist, Science Branch.

IN 1930, bacterial spot, *Xanthomonas pruni* EFS was recorded on plums in the Stanthorpe district. It is also known in New South Wales as well as many other parts of the world. The disease in this State produces a fruit spot, leaf spot, shot hole, and twig canker of plums. Only a limited number of varieties of plum are affected, and the disease has not been found on other stone fruit. Elsewhere it has been reported on peach, apricot, nectarine, and cherry. Orchard observations indicate that the October Purple variety is the most susceptible. This is followed by Santa Rosa, Doris, Beauty, Burbank, and Shiro in descending order of susceptibility. It has not been seen on Wilson nor on English varieties of plum.

### Zinc-Lime Spray Trials.

In the years 1932 to 1937 a considerable number of orchard experiments were carried out for the purpose of establishing control methods for bacterial spot. Promising results had been obtained in America on peach bacterial spot with nitrogenous fertilizers and with a zinc-lime spray. These were, therefore, the basis for the first year's work. However, neither treatment adequately controlled the disease, and heavy infections on nitrate-treated trees led to the dropping of this treatment after the first year. The zinc-lime spray trials were persisted with for three seasons with varying results, the spray used being prepared from 4 lb. of zinc sulphate and 4 lb. of hydrated lime to 40 gallons of water. It was finally concluded that zinc-lime was useless.

### 1935 Season. Exploratory Fungicide Trial.

The next trial was exploratory, using five different spray treatments. The sprays were applied to single trees in four randomised blocks. Block 4 was incorrectly sprayed and was not used in computing results. Details of the sprays and methods of use are given in the following table:—

| —— | Prior to Blossoming 4th September. | After Petal Fall 1st October. | One Month Later. | Two Months Later. |
|---|---|---|---|---|
| Bordeaux mixture .. .. | 6–4–40 | 3–2–40* | .. | .. |
| Home-made cuprous oxide .. | 1–10 | 1–20 | .. | .. |
| Lime sulphur .. .. | 1–15 | 1–60* | 1–120* | 1–120* |
| Colloidal sulphur .. .. | 4 lb. per 100 gals. | 2–100 | 2–100 | 2–100 |
| Shirlan .. .. .. | 10 lb. per 100 gals. | 5–100 | 2–100 | 2–100 |
| Unsprayed .. .. .. | .. | .. | .. | .. |

* Agral II. added at rate of 1 lb. per 100 gallons.

**Results—**

Both the copper sprays (Bordeaux mixture and home-made cuprous oxide) resulted in severe leaf fall when applied after petal fall. They were consequently not used on the later applications.

As the fruit ripened it was evident that the trees receiving copper sprays carried considerably less disease than those getting no copper. The counts of infected fruit at harvest are given below:—

PERCENTAGE OF FRUIT AFFECTED IN 1935 EXPERIMENT.

| —— | Block I. | Block II. | Block III. | Average. |
|---|---|---|---|---|
| Bordeaux mixture .. .. | 0·2 | 0·6 | 6·6 | 2·5 |
| Home-made cuprous oxide .. | 0·8 | 1·6 | 0 | 0·8 |
| Colloidal sulphur .. .. | 3·4 | 2·1 | 47·5 | 17·7 |
| Unsprayed .. .. .. | 3·0 | 2·6 | 42·4 | 16 |
| Shirlan .. .. .. | 13·1 | 3·8 | 27·4 | 14·7 |
| Lime sulphur .. .. | 5·6 | 20·4 | 100 | 42 |

It was evident that copper sprays would exercise a controlling influence on the disease, and subsequent work was directed to the further testing of these fungicides.

### 1936 Season. Trial of Bordeaux Mixture Schedules.

The 1936 season's work was designed to test Bordeaux mixture applications in various schedules to find a method by which this spray would be effective and at the same time avoid the spray injury noted previously. Seven different spray schedules were tested in a block of 56 Doris plum trees. Unfortunately, frost interfered with the fruit setting, and no results could be obtained from the block.

At the same time a smaller trial was continued on the 12 trees which had constituted blocks I. and II. of the experiment which had given results in the previous year. These trees were divided into four blocks. Only one spray was used, and it was applied to two of the three trees in each block. The spray was Bordeaux mixture at the 6–4–40 strength in the dormant and budburst stages and 3–2–40 at the preblossom stage. The third tree in each block remained unsprayed. Results are given in the accompanying table:—

PERCENTAGE OF FRUIT AFFECTED IN 1936 EXPERIMENT.

| —— | Block I. | Block II. | Block III. | Block IV. | Average. |
|---|---|---|---|---|---|
| Unsprayed .. .. | 29·4 | 18·7† | 30·8 | 8·3 | 21·8 |
| Sprayed .. .. .. | 4·2 | 3·0 | 2·4*† | 0·0† | 2·1 |
| | 2·7† | 0·3* | 1·3 | 2·1 | |

* Received extra spray of Bordeaux mixture 1½–4–40 after fruit set.

† Had been sprayed with copper sprays in the previous season.

This trial confirmed the value of Bordeaux mixture in the control of the disease but did not test out alternative schedules. However, good results were obtained by using the three-spray schedule, and this has since been adopted as the standard recommendation for severely affected trees.

### 1937 Season. Final Bordeaux Mixture Trials.

In the following season a further attempt was made to get detailed information on spray schedules. Three separate experiments were made, the first on slightly infected Doris plums, a second on old and heavily diseased October Purple and Santa Rosa plums, and a third on the 12-tree block on which results had been obtained in the previous two seasons.

The first and largest of these, a repetition of the main experiment of the previous season, again gave no results, as the infection on most of the trees was negligible.

In the second experiment the fruit set on the old trees was poor and irregular, and the experiment designed to test the effect of various combinations of one, two, or three sprays was somewhat inconclusive. All that could be stated was that, with the trees which received the standard three-spray schedule, the amount of spot (8 per cent.) was reasonable considering the state of the trees. Those receiving only one spray averaged 30 per cent. spot.

In the third experiment a two-spray schedule was tested in the 12-tree block. Control was not as good as in the previous season, when three sprays were applied. The two sprays were Bordeaux mixture (6-4-40) at budburst and the same material at the 3-2-40 strength at the preblossom stage. Results are given below:—

Percentage of Fruit Affected in Third Experiment of 1937.

| —— | Block I. | Block II. | Block III. | Block IV. | Average. |
|---|---|---|---|---|---|
| Unsprayed .. .. | 32 | 48 | 22 | 19 | 30 |
| Sprayed .. .. .. | 10<br>16 | 27<br>18 | 8<br>6 | 3<br>11 | 12 |

The table indicates the variation in percentage infection of bacterial spot on different trees as well as the control exercised by Bordeaux mixture.

### General Discussion and Recommendations.

The series of experiments was disappointing from the point of view of clear-cut conclusions on the finer points of spray control. However, there was built up a considerable body of evidence to indicate that adequate use of copper sprays in the period between bud movement and blossoming would effect the desired result. In the later years of the work, the information available was disseminated to orchardists, and many adopted the use of copper sprays. Observations soon became available to support the experimental evidence that Bordeaux mixture or an efficient substitute spray controlled the disease.

From a consideration of the results of the experiments and of orchard experience the following schedule has been recommended for application to varieties of plum susceptible to bacterial spot:—

(a) At bud movement, Bordeaux mixture, 6–4–40.

(b) Seven to ten days later, Bordeaux mixture, 6–4–40.

(c) Just prior to full blossom (about three weeks after the first application), Bordeaux mixture, 3–2–40.

If the disease has not been allowed to gain a serious hold on the tree the number of sprays may be reduced to two by omitting the second of these applications. Other copper spray materials may be used provided they disperse and adhere well and provided the prepared spray contains copper equivalent to that in the appropriate Bordeaux mixture. The non-copper sprays tried do not control the disease.

**Acknowledgements.**

Grateful appreciation is expressed for the helpful co-operation of orchardists who made the experiments possible, particularly Messrs. A. Philip, H. Dempster, and Ellwood Bros.

# Protection of Harvested Potatoes from Tuber Moth Attack.

R. C. CANNON, Entomologist.

IN all potato-growing areas of the State, wastage occurs each season through the activities of the potato tuber moth.* In the growing crop, the larvae of this insect mine in the haulms and may cause some reduction in yield when growth is retarded due to drought or similar causes. However, in irrigated crops, or in non-irrigated crops enjoying favourable weather conditions, the reduction in yield is usually slight and of minor importance. The most severe losses are invariably the outcome of tuber infestation just before, during, or immediately after harvesting.

In the earlier stages of growth, when the haulms are green and succulent, larvae of the tuber moth usually restrict their activities to the above-ground parts of the plant. When the haulms commence to die off with the approach of maturity the insects attack the tubers themselves. Late hilling is recommended as a means of mitigating such losses, and, provided a cover of at least 4 inches of soil is placed over the maturing tubers, a fairly effective mechanical barrier is afforded against the entry of the pest. Emphasis must be placed on the lateness of the hilling, an operation which need not be performed till three to four weeks prior to maturity. Many growers commence to hill their crops too early, with the result that insufficient soil remains in the inter-row furrow for the effective construction of the final hill. Tubers surrounded by moist soil are less subject to attack than those in dry soil, and late watering may be an additional safeguard.

Despite these precautions, some tuber infestation may occur due to the inevitable imperfections of cultural practices and to soil irregularities. At night, moths may lay their eggs on any tubers which are exposed on the surface of the ground or accessible through soil cracks. Unhatched eggs or newly-hatched larvae present in the eyes would escape detection when the tubers are picked up after digging.

During harvesting, tubers are exposed on the surface of the ground for a time before being picked up, though it should be the aim to reduce

* *Gnorimoschema operculella* Zell.

this period of exposure to a minimum. The operation of digging will have dislodged larvae from the haulms and some of these will make their way to the tubers. Many of them would escape notice when the tubers are being harvested, no matter how carefully they might be examined.

Several dusts are available which will destroy exposed larvae present on tubers and prevent further infestation. The application of a protective dust at harvesting is therefore a worthwhile precaution. There are three dusts at present on the market which may be recommended for this purpose, namely, derris, D.D.T., and magnesite.

Derris is available as a dust containing 0.5 per cent. or more of rotenone, and acts mainly as a contact insecticide, and is non-toxic to human beings. In recent trials, commercial tubers were treated with derris dust and stored in northern Queensland for a period of 14 weeks during the summer months with a loss of only 0.5 per cent. due to tuber moth. Untreated tubers in the experiment were completely destroyed by the pest. In southern Queensland they have been kept in excellent condition for an even longer period.

If D.D.T. is to be used, a dust containing 2 per cent. of the para para isomer is recommended. There has been some diffidence in recommending D.D.T. for treating table potatoes on account of the lack of information on its effect on the consumer. Recently, however, it has been shown that only negligible amounts of the insecticide remain after cooking, and, since potatoes are invariably cooked, there can be no objection to using D.D.T. on stored table potatoes.

Magnesite is quite harmless to human beings, but acts rather differently and is somewhat less effective under conditions of high humidity. In the above-mentioned trial, magnesite-treated tubers were stored for the fourteen weeks with a loss of 2·5 per cent. due to tuber moth.

For the best results the potatoes should be treated at harvesting, either in the field or in the grading shed. For effective control it is necessary that the tubers be completely covered by a protective film of the dust. About ½ lb. of dust per bag, or 8 lb. per ton, is sufficient for the purpose. In order to obtain satisfactory results with such a small quantity, however, the dust must be applied efficiently or an inadequate cover will result.

There are two methods of application to be recommended, depending on whether the operation is to be carried out in the field or in a grading shed:

(*a*) *Field Method.*—In some areas, it is the regular practice to grade and fill the bags in the field, kerosene tins being used to gather potatoes in the rows. About an ounce of the dust should be thrown into the bottom of the empty tin. When filled with potatoes the contents of the tin are emptied into the bag and the dust swirls amongst the tubers leaving a fine film on the surface of each. After the bag has been filled a few more ounces of dust should be sprinkled on the top so that it may work its way down amongst the contents. The subsequent handling of the bags will serve to further distribute the dust within. It must be emphasized that with this method, each tinful of tubers must have its quota of dust.

(b) *Grading Shed Method.*—If the potatoes are taken into a shed for grading, the dusting can be carried out on a sloping bench. This should be about 8 feet long with a fall of about 6 inches and be provided with suitable sides converging at the bottom end to feed the tubers into the bags. The surface of the bench should be covered with a layer of the dust about one-eighth of an inch thick. The tubers may then be fed on to the higher end of the bench and worked down by hand to the bag, thereby collecting a film of dust. The dust layer on the bench would have to be supplemented from time to time by further additions of the insecticide as required.

On the basis of trials so far carried out there is little difference in the efficiency of magnesite, derris, and D.D.T. if the potatoes are to be stored during relatively dry periods of the year and the choice is made solely on a cost basis. If the storage period is likely to extend into a humid period, as, for example, the summer months, either derris or D.D.T. dusts are to be preferred.

The overall cost of treatment is so low in comparison with the benefits to be derived therefrom that the use of one or other of these dusts should be adopted as routine farm practice.

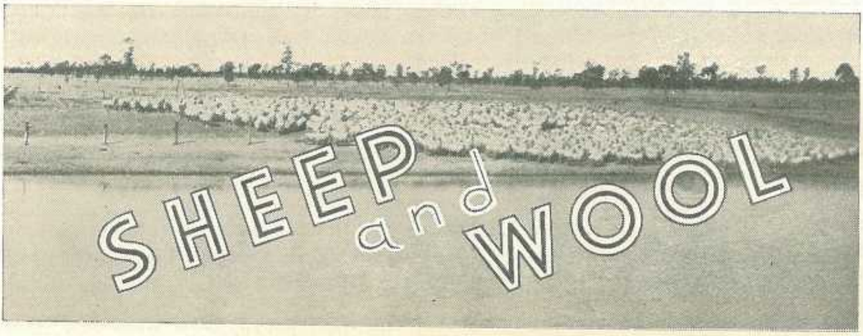
## TREES AND SOIL CONSERVATION.

Many landholders will surround their homesteads with trees to protect them from wind, but the same landowners thoughtlessly destroy timber belts on their properties and completely overlook the fact that the timber belts protect the paddocks from the sweeping winds that pick up the valuable surface soil and carry it away.

In most grazing properties "scalded areas" of varying sizes are to be found. If some obstruction can be placed on these areas to hold the water and wind-blown soil and seeds, it will be found that they quickly begin to build up again. It has been observed where trees have been lopped for drought feed on scalded patches that the grass has built up again in six months under the dead branches when the patch has been devoid of all grass for many years.

On large scalded patches where cropping is not practical, simply ploughing strips across, ½ chain apart, and then ploughing similar strips at right angles will prevent the patches spreading further and building up commences by the arresting of wind-blown soil and seed.

On cultivation lands in the western areas smooth surfaces must not be left if wind erosion is to be prevented. Cases have been seen where oats, sown for grazing, have been fed out bare in the early summer, and then, because of pressure of work, the land has simply been left trampled smooth and devoid of cover. Such an area is quickly affected by the wind, sometimes to the extent that the soil commences to "creep." While working of the whole area is desirable, wind erosion can definitely be controlled, if not stopped altogether, on such lands by simply cultivating strips across the paddock one width of a scarifier wide and spaced 1 chain apart.




# Hand Feeding of Stud Sheep.

G. R. MOULE, Veterinary Officer, Sheep and Wool Branch.

1. *Composition and Utilisation of Foodstuffs—*
   - Carbohydrates.
   - Fats.
   - Proteins.
   - Minerals.
   - Vitamins.
   - Water.
   - Dry matter.
   - Fibre.

2. *Foodstuffs Available in Queensland—*
   - (i.) *Roughages—*
     - Cereal hay or chaff.
     - Lucerne hay or chaff.
   - (ii.) *Concentrates—*
     - (*a*) *Energy-rich concentrates—*
       - Maize.
       - Oats.
       - Wheat.
       - Grain Sorghum.
     - (*b*) *Protein-rich concentrates—*
       - Linseed oil meal.
       - Cottonseed meal.
       - Meatmeal or Meat and bone meal.
       - Blood meal.
     - (*c*) *Cereal by-products—*
       - Bran.
       - Pollard.
   - (iii.) *Mineral Supplements—*
     - Sterilised bone meal.
     - Dicalcic phosphate.
     - Ground limestone.

3. *Importance of Nutritional Balance—*
   - Balance.
   - Overfeeding.
   - Underfeeding.

4. *Some Effects of Different Nutritional Levels*—

5. *Feeding Standards*—
   (i.) Their value in sheep feeding.
   (ii.) The maintenance and production requirements of sheep.
   (iii.) Special production requirements—
      (*a*) Growth and fattening.
      (*b*) Pregnancy.
      (*c*) Lactation.
      (*d*) Semen production.

6. *Calculating Rations.*

7. *Diseases Associated with Faulty Feeding of Stud Sheep*—
   (i.) Calculi or Bladder Stones.
   (ii.) Pregnancy toxaemia or Twin-lamb disease.
   (iii.) Milk fever or Hypocalcaemia.
   (iv.) Bloat and Meal sickness
   (v.) Prussic acid poisoning.

Most wool growers recognise the truth of the old saying "Half the breeding goes down the throat," but stud masters like to add the qualifying phrase "provided you have the blood to start with." No animal can develop the characteristics it has inherited unless it is properly fed. On the other hand, no amount of feeding will make an animal develop desirable characters which are not included in its inheritance, though skilled feeding may mask the effects of inheritance.

During recent years rapid advances have been made in the science of animal nutrition, and the purpose of this article is to present the available information which has immediate application in the feeding of stud sheep. In its preparation information has been drawn from overseas sources, as well as from the Council for Scientific and Industrial Research, and in particular from material collated by Dr. M. C. Franklin. His assistance, and that of Dr. M. White, of the Department of Agriculture and Stock, is acknowledged with appreciation.

## COMPOSITION AND UTILIZATION OF FOODSTUFFS.

All foodstuffs are made up of varying proportions of carbohydrates, fats, proteins, minerals, vitamins and water. Differences in the types of carbohydrates, fats, proteins, minerals, and vitamins also occur. Each group of substances performs specific functions in the animal body. Correct feeding is based on a knowledge of these functions.

### Carbohydrates.

Carbohydrates are composed of carbon, hydrogen and oxygen. The best known carbohydrates are sugar and starch; and the foodstuffs used in stud sheep feeding which are richest in carbohydrates are maize, grain sorghums, wheat and oats.

### Fats.

Fats also are composed of carbon, hydrogen and oxygen, though their proportions and the way in which they are arranged differs from that of the carbohydrates. Carbohydrates and fats are fitted for the energy changes which take place within the animal body as they are readily combustible. They are the chief "fuel" it consumes. They are largely interchangeable in this process of combustion, fat having about 2¼ times the heat value of an equivalent weight of carbohydrate. Linseed meal, cotton seed meal and meatmeal are all fairly rich in fats.

### Proteins.

Proteins constitute a much more complicated group of substances than the carbohydrates and the fats. Besides carbon, hydrogen and oxygen they contain nitrogen and often such elements as sulphur, phosphorus and iron. Minute quantities of other elements are present in specific proteins. Like fats and carbohydrates, proteins can be burnt as fuel, but they have other more essential roles which they alone can perform. The minute cells, of which the living body is composed, are made up largely of proteins. Herein lies the main importance of proteins in the diet of the sheep. Carbohydrates, fats and proteins of foodstuffs can be used as a source of energy, but proteins alone can be used for the various phases of body building—for growth, for wool production, for milk production, for semen production and for keeping the body tissues in repair. Proteins also perform an essential function in the formation of hormones which are substances made by the ductless glands. These glands—including the pituitary, the thyroid, the adrenals, the testicles and the ovaries—make chemical substances which circulate in the blood. They control or influence practically every phase of the life and production of a normal sheep.

Proteins themselves are not simple substances and the building bricks of which they are made are known as amino acids. The molecule of an amino acid is simple when compared with that of protein, but it is complex when compared with a simple substance such as water. Being the building bricks of which proteins are made, amino acids contain carbon, hydrogen, oxygen, nitrogen and sulphur and, as they often include a large number of atoms in their make up, their arrangement admits of many variations. Twenty-five amino acids are known to occur in living tissue and one of them, cystine, is found in large quantities in wool. It is important to remember, however, that all amino acids do not occur in all proteins. Accordingly, it is necessary to arrange for proteins from more than one source to be included in the diet. This prevents any likelihood of a deficiency of one or more essential amino acids. This may occur even when the level of total protein intake appears to be sufficient in quantity to meet the requirements of both maintenance and production. In other words, quality of protein is as important as quantity.

The chief protein-rich foods used in stud sheep feeding includes legume roughages such as lucerne and clover hay, and the protein-rich concentrates linseed oilmeal, cottonseed meal, meatmeal and blood meal. Good quality lucerne hay or chaff contains approximately one third as much protein as cottonseed meal. Bran and pollard also are rich in protein, occupying an intermediate position between lucerne and cottonseed meal.

### Minerals.

The mineral content of the foodstuff is most important because apart from blood and tissue function it governs the development of good strong bone, sound teeth and normal wool.

The minerals known at the present time to be of the greatest importance are calcium (lime), phosphorus, magnesium, copper, cobalt, zinc and iron. Deficiencies of the last three have not been reported as affecting sheep in Queensland. Copper deficiency is known to be very important in many of the grazing areas of this State, but so far there is nothing to indicate that the chaff and grain fed to stud sheep are likely to be deficient in this substance. Adequate supplies of calcium, phosphorus and, to a lesser extent, magnesium are essential for the formation of good bone and sound teeth and also influence growth rate. During the process of digestion minerals are absorbed through the wall of the small intestine and enter the blood stream, which carries them to the various parts of the body. The calcium, phosphorus and magnesium, apart from their use by tissue and blood, are used mainly in the formation and maintenance of sound bone and teeth. The bone tissue is not static; it not only provides a solid supporting framework but also acts as a mineral storehouse and changes continually. Minerals are excreted constantly through the kidneys (in the urine) and through the lower bowel.

Iron, cobalt and copper are stored mainly in the liver. The two former minerals are used extensively in the formation of red blood corpuscles by the red bone marrow in the long bones. Copper performs a number of functions in the body, but one of the chief is the development of normal character in the wool. It was found that the inclusion of small amounts of copper in the ration fed to sheep, which were producing normal wool and which were on what might be considered a diet adequate in copper, led to a marked improvement in the character of the wool.

Small but variable quantities of calcium (lime) circulate in the blood, and its presence is important for the maintenance of heart rhythm and nerve-muscle function. Should the level of blood calcium drop, as sometimes happens in the case of ewes at lambing time, the muscles lose their normal responses and become flaccid. This condition is known as "Milk Fever."

### Vitamins.

Vitamins are chemical substances which occur in minute quantities in foodstuffs. They are essential for the maintenance of good health. The various species of animals have different requirements. Many vitamins are known and have been isolated; others are known by their effects. They are usually designated Vitamin A, Vitamin B complex (of which there are at least six components), Vitamin C, Vitamin D, Vitamin E, etc.

Vitamin A appears to be the most important one from the point of view of the sheep feeder. It is derived from certain yellow pigments found in green grass, leaves, yellow maize, fresh good quality lucerne hay or chaff, and in carrots and pumpkins. It is stored in liver fats and accordingly liver oils are fed in case of Vitamin A deficiency.

Prolonged feeding on rations deficient in this vitamin may lead to temporary infertility on the part of the ram, abortion in ewes and night blindness. It may predispose animals to the development of urinary calculi.

### Water.

All foodstuffs commonly fed to sheep contain water. It is important to know the percentage of water present in the food when high freight charges are likely to be incurred.

## Dry Matter.

A knowledge of the dry matter which is left in a foodstuff after the water is extracted is of value in making up rations, because it is the quality of dry matter in a feed which governs the amount the sheep can eat. Correct feeding demands that the animal's appetite is satisfied, and that adequate nutrients be included in the ration to meet the body's requirements.

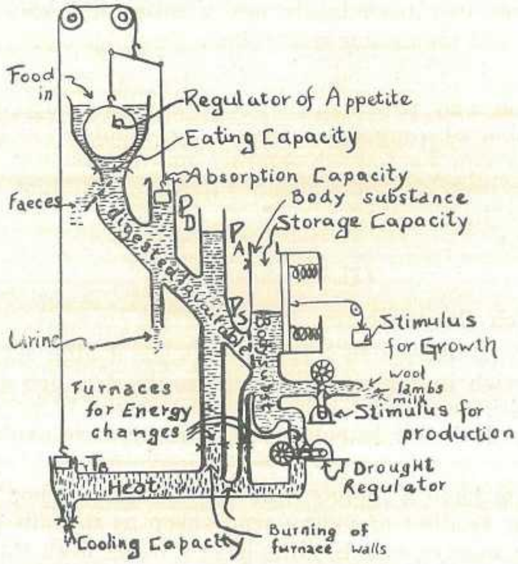



Plate 96.

Shows, Diagramatically, How the Energy from Foodstuffs is Used by the Body (after Kleiber).

Ps is the animals potential for the storage of energy, which can be used for growth and/or production.

When it increases Pd (absorption potential) allows increases until Pa (potential storage capacity) is reached.

The time in which Pa, i.e., maximum capacity is reached will depend upon the rate at which energy is drawn off for growth and production of wool, milk and lambs.

When there is insufficient food intake to meet the body's requirements the drought regulator comes into operation.

## Fibre.

Some foodstuffs contain more fibrous material than others. Oats, for instance, have a fibrous husk and this grain contains more fibre than an equivalent weight of maize. Much of this fibrous material is broken down into simpler and more readily digestible substances in the rumen (paunch) through the action of colonies of bacteria which are normally found in that organ. A knowledge of the fibre content of a foodstuff is of value for two reasons. Firstly, highly fibrous feeds are less digestible and therefore of lower food value than foodstuffs of lower fibre content. Secondly, much of the energy in fibrous feeds is given off as heat and cannot be used for liveweight increase or other productive purposes. In cold weather this heat fraction is valuable in maintaining normal body temperature whereas in hot weather it is largely wasted.

## FOODSTUFFS AVAILABLE IN QUEENSLAND.

### (I.) Roughages.

*Lucerne Hay or Chaff.*—Lucerne hay or chaff is good sheep feed because, among the roughages, it has good energy value and is rich in protein. It supplies Vitamin A and its mineral content is good in that it is rich in calcium. Many stud masters do not like feeding lucerne as they consider it colours the yolk too much. When it is fed, care should be taken to introduce it gradually into a ration and slowly increase the quantity until the maximum is reached.

*Cereal Hay or Chaff.*—Oaten or wheaten hay or chaff are often used for sheep feeding and, provided they are of good quality, they are useful for the provision of roughage. Their fibre content is high, but their nutritive value can be low, depending on the amount of grain they include. Their protein, calcium and Vitamin A content are lower than those of lucerne hay or chaff.

### (II.) Concentrates.

**(a) Energy-rich Concentrates.**

*Maize.*—Maize is rich in starch, i.e. it has a high starch equivalent. It is not very rich in protein and accordingly it is necessary to supplement maize with some protein-rich concentrate. It is a useful source of Vitamin A. It is low in calcium. Maize meal is preferable for stud sheep.

*Oats.*—Oats have a higher fibre content than other grains; this is desirable in the feeding of young stud sheep as it leads to the development of a good roomy paunch. Oats have a fairly high starch equivalent, but like maize are not rich in protein nor in calcium (lime). A disadvantage of some oats is the barb, which might cause damage to the eye or some other sensitive part. On the other hand sheep like oats and it is a very safe concentrate to feed.

*Wheat.*—The feeding value of wheat is about the same as maize, but it contains little Vitamin A. It should be milled or crushed roughly and fed in carefully controlled quantities to prevent over engorgement or meal sickness. Wheat is low in calcium, but fairly satisfactory for phosphorus.

*Grain Sorghum.*—Grain sorghum is one of the best grain crops grown in Queensland. Its feeding value is about the same as maize, but usually it is a better "buy" on a nutrient basis. Its protein content may be lower than that of the other cereals. In most years the supply is good. The grain is very hard and accordingly it must be crushed. The mineral content is somewhat like maize, low in calcium, and not particularly high in phosphorus.

**(b) Protein-rich Concentrates—**

*Meatmeal.*—Meatmeal is a useful source of protein and is fairly cheap in normal circumstances. It is rich in essential amino acids, especially cystine, and accordingly it is a desirable component of rations for stud sheep fed for wool production. Meatmeal is very rich in calcium (lime) ($CaO$ 5.14 per cent.) and phosphorus ($P_2O_5$), 4.88 per cent.).

*Cottonseed meal.*—Cottonseed meal is very rich in protein and has a fairly high energy value. Sheep seem to like it, but it has a disadvantage in that it may impart a yellow colour to any wool it soils. At the same time, some stud masters consider it darkens the yolk too much. It is only fair in calcium content, but rich in phosphorus.

*Linseed Oil Meal.*—Linseed oil meal has high protein and fat contents and this makes it a valuable foodstuff. It ensures sufficient yolk development and assists in keeping the digestive tract moving freely. Its mineral content is good, being fair in calcium and rich in phosphorous.

**(c) Cereal By-products—**

*Bran and Pollard.*—Bran is of particular value. It is highly palatable, rich in digestible protein, carbohydrates and fats, comparatively high in phosphoric acid, but poor in lime. It has a laxative effect. Pollard is richer in fat and digestible carbohydrates, lower in fibre than bran. It is inclined to become a pultaceous (soft, pulpy) mass in the rumen and could lead to meal sickness and accordingly is not often fed to sheep

### (III.) Mineral Supplements.

Most rations contain adequate phosphorus for sheep, but many are deficient in calcium or the calcium (lime) and phosphorus present are unbalanced.

Accordingly it is often necessary to add calcium (lime)-rich mineral mixtures to the ration. Sterilized bone meal is a useful source of calcium (lime) for ewes, but care should be used in feeding it to rams as it may lead to the formation of calculi (stone in the bladder). As an alternative source, finely ground limestone may be used. It has been demonstrated clearly that the availability of calcium (lime) to the sheep depends on the fineness of the grinding and it is desirable that most of the limestone should pass through a sieve of 100 to the inch mesh.

*Selecting Foodstuffs.*—Cost and suitability have to be considered in selecting feed for stud sheep. Soy beans are good sheep feed, but are not grown in Queensland. On the other hand, maize and grain sorghum are produced in considerable quantities in this State and accordingly supplies should be reasonably plentiful. In stud sheep feeding cost does not assume the importance it does in the drought feeding of flock sheep, but nevertheless it should be considered and changes in the ration can be made to meet variations in the cost of the desired nutrients.

## THE IMPORTANCE OF NUTRITIONAL BALANCE.

"Balance" is a term often used in connection with the feeding of animals. It can refer to the relationship between the body's demands for nutriments (for the carrying on of essential functions and continued production) and the available food, as well as the relationship of one substance to another. For instance, best results are obtained by feeding proteins and carbohydrates in certain proportions. It also is necessary to ensure "balance" in the feeding of calcium and phosphorus. The ratio of these two minerals should preferably be between 2:1 and 1:2.

Dietary deficiencies or imbalance of the various substances which go to make up a ration can produce unfortunate results, as well as affect the efficiency with which the available food is utilized. If protein-rich foodstuffs which are of poor quality, when considered from the point of view of variation in amino acid content are used, a deficiency of certain essential amino acids may result. This might lead to impairment of growth through inability on the part of the animal to utilize those amino acids which were present. As a general rule, proteins of animal origin, such as those found in meatmeal or dried milk, contain more and a greater variety of the amino acids necessary for growth than do the proteins of plant origin.

Sheep fed on a correctly balanced diet receive an optimum amount of the energy-producing fats and carbohydrates in proportion to the amount of protein. This ensures that the energy requirements of the body are met by the carbohydrates and fats and the proteins are not burnt as fuel, but remain to fulfil their correct role as body builders. In other words, the protein is being used with maximum efficiency. Thus to obtain the best use of the protein in a ration it is essential that the supply of energy from non-protein sources be adequate.

### Overfeeding.

Sheep may overeat if given the opportunity. On the other hand, many sheep are forced to overeat, from the point of view of nutrients consumed, because the rations offered them are deficient in either (*a*) dry matter or (*b*) roughage (fibre). This results in a ration which is too rich, and although the animal may eat sufficient only to satisfy its appetite it might quite easily be overfed. Heavy financial loss may occur from overfeeding, as resulting sickness may cause temporary or permanent disability of valuable animals. In addition, money and labour are wasted providing the sheep with more nutrients than they require or can utilize.

### Underfeeding.

Under-nutrition may be quantitative, or qualitative or both. The effects of dietary deficiencies on animals depend on kind of animal, age, type of production, duration of the deficiency and whether or not adequate stores of the missing factor have been laid down previously when the sheep was on a complete ration.

A deficiency of fats, carbohydrates, proteins or minerals may retard growth. This is not so harmful if of only short duration. The body of a young animal has remarkable capacity for repair and can resume growth after a period of dietetic deficiency. However, it is desirable that this should not occur when dealing with young stud animals since a prolonged period of nutritional stress during the active stage of growth of a young animal may permanently affect its subsequent development. Animals so treated may be undersized at maturity.

It also is important that underfeeding or sudden food checks should not occur towards the end of pregnancy or pregnancy toxaemia (twin lamb disease) may result.

## SOME EFFECTS OF NUTRITIONAL LEVELS.

The limiting effects of the plane of nutrition on wool production has been amply stressed. In a recent experiment conducted by the Council for Scientific and Industrial Research an average run of strong wool sheep were fed on a ration which allowed them the extremely low protein intake of only one ounce per head per day, i.e. the ration contained about 2 per cent. protein. When the protein content was increased to about 16 per cent., so that the sheep's daily protein intake was about eight ounces per head per day their wool weights increased by about 250 per cent. This range of production was found to be less marked for fine wool sheep. In addition, large-framed strong wool sheep proved their capacity to utilize a sufficient quantity of the basal ration, which consisted mainly of straw, to maintain themselves. Small-framed fine wool animals were unable to utilize enough of such poor quality rations to fulfil the body's demands. However, when the diet was modified to contain more readily available nutrients the fine wool sheep reached their maximum production on a lower protein level than that required for strong wool sheep.

The variation in the amount of wool produced was accompanied by a marked alteration in both staple length and mean fibre diameter. Potentially strong-woolled sheep produced wool of fibre diameter equivalent to a 64-66's spinning count on poor diets; by improving the

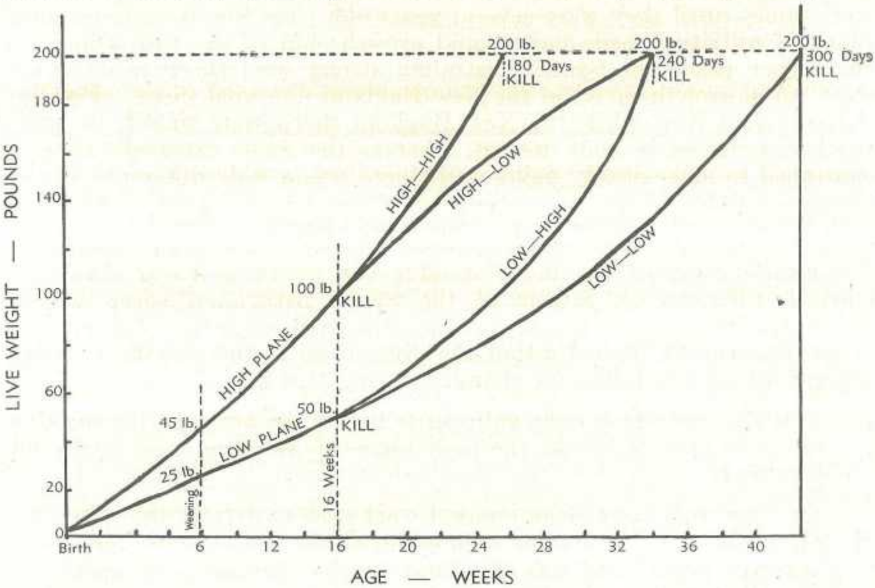



Plate 97.

Showing the Effects of Different Nutritional Levels on Sheep Fed for Mutton Production.

Four types of feeding were undertaken—

(1) High—high, i.e., the sheep were on a high plane of nutrition from birth to slaughter at 200 lb. live weight in 180 days.

(2) High-low, which group were well fed for the first 16 weeks and then transferred to a low plane of nutrition. These sheep were slaughtered at 240 days when they also had reached 200 lb. live weight.

(3) Low-high, in which the sheep were poorly fed for the first 16 weeks and were then transferred to a high plane of nutrition. They also attained 200 lb. live weight in 240 days.

(4) Low-low, when the sheep were poorly fed all the time and it took them 300 days to attain a live weight of 200 lb.

An examination of the carcasses at slaughter revealed that the animals fed on a high-high plane of nutrition had an optimum balance of muscle and fat to bone. Those on the high-low lacked fat and bloom. Those on the low-high were lacking in both muscle and fat. What fat was present was unevenly deposited.

Those on the low-low plane of nutrition had long, poorly covered bones and they lacked both muscle and fat.

protein supply the diameter became greater and when at the maximum level of production wool with a spinning count of 56's was produced. While the change in typical fine wool animals was less marked, the mean fibre diameter was found to vary with the protein supply, but neither a high production rate per unit area of skin nor the production of a strong wool was achieved by these animals.

A survey of the rations fed to stud sheep indicates that they usually contain between 10 and 13 per cent. protein, and preliminary experiments carried out in New South Wales indicate that it is not profitable to feed more than the optimum protein requirements in the hope of increasing the wool weights.

In another C.S.I.R. experiment, New England fine wool and South Australian Merino lambs were used and representatives from each "strain" were fed at different planes of nutrition, from the time they were lambs until they were several years old. The sheep on the higher plane of nutrition made more rapid growth; but of the two strains on the higher plane the South Australian strong wool sheep made much more rapid growth than did the New England fine wool sheep. Finally, there came a time when the New England sheep were unable to make further increases in body weight, whereas the South Australian sheep continued to make steady gains until there was a wide difference in the average weights of the two groups of sheep. On the restricted diets both strains made approximately the same growth.

Examination of the fleece weights cut by these sheep showed a marked difference in favour of the South Australian sheep within nutritional groups. A summary of the data from the first twelve months of the experiment indicates that the differences in the nutritional level brought about the following changes during this period:—

(1) The average weight gain made by all the animals, irrespective of the strain, was 56 lb. on the high plane of nutrition, and 19 lb. on the low plane.

(2) Dry weight of clean scoured wool produced from the unit area of skin tattooed on the side of each sheep at the time of their introduction into the experiment was, for those on the high plane of nutrition, 2.2 times that of the animals on the low plane.

(3) Staple length was correspondingly greater, being 8 cm. and 6.25 cm. respectively.

(4) The average super 80 class wool of the animal on the low plane of nutrition became a 64/70's in animals on the high plane.

(5) Conformation differences were most marked; those animals receiving adequate diet developed mature proportions within one year, while those on the low plane of nutrition retained a "leggy" juvenile appearance.

(6) The measured density of the fibre population decreased considerably during the first year of the animals' lives. Greater changes were noted in the sheep on the high plane of nutrition corresponding to the greater rate of skin expansion. The low plane retarded the development of the secondary (wool growing) follicles. In the fine wool animals the tattooed skin area increased in size by 103 per cent. between the ages of 2 and 16 months when the animals were on a high plane of

nutrition, but only by 40 per cent. when the animals were on a low plane. In the South Australian sheep, the increase in size of the skin areas between the ages of 2 and 8 months were 85 per cent. and 26 per cent., respectively, for the high and the low planes of nutrition.

The influence of the plane of nutrition on mutton sheep is no less marked than in merinos. Conformation of an animal determines the relative proportions of high- and low-priced cuts. At the same time, the relative proportions of different parts of the body change as the animal grows and with the way it is fed. Blocky joints are required, giving the least surface area to volume of meat. This means less drying on cooking and calls for greater depth of fleshing in relation to bone length.

Several investigations have been made into the effect of plane of nutrition on carcass quality and it has been found that a continued high plane of nutrition ensured the development of a high proportion of muscle and fat to bone and, in general, promotes the early development of all parts of the body which are usually late in developing. A low plane of nutrition had the opposite effect, encouraging the development of bone thickness and discouraging the development of muscle and fat.

The effects of variations in the plane of nutrition are shown diagramatically in fig. 2 and a summary of the carcass proportions is given below the figure.

The conclusions that are to be drawn from these experiments do not hinge so much on the respective merits of different breeds of sheep, but on the effects of feeding on sheep. Obviously, the way the sheep are fed and prepared for show is important and can influence very materially the reputation studs acquire. The important thing from the point of view of production, however, is the ratio of the feed supplied to the wool or mutton produced. This is referred to as the efficiency of food utilization.

Fig. 3 shows the relationship between this efficiency of food utilization and age and live weight increases. The form of these graphs varies with breeds and for strains within breeds. There also is ample reason to believe that efficiency of food utilization is an important consideration in the selection of sheep. Animals which are efficient convertors of available food to wool or mutton are well known to every flock master as "good doers" and they are more likely to stand up to "hard" conditions. This is obviously an important point and one worthy of selection. Gross overfeeding of stud sheep is not likely to make it apparent.

## FEEDING STANDARDS.

### (I.) Value of Feeding Standards in Planning Rations.

During the process of digestion the various foods are broken down to simpler units. Some of the available nutrients are absorbed into the blood stream, some utilized by microörganisms but often broken down again and absorbed, and the remainder excreted as faeces. On being absorbed the proteins, carbohydrates and fats have to meet the immediate demands made by the body for the maintenance of function. Anything which is left over is used for the production of body tissue (as in growth), of wool, of milk, of lambs by ewes and of semen by rams.

Obviously then the nutritional requirements of animals can be divided into:—

(1) Those for maintenance.

(2) Those for production.

As the result of many experiments the amounts of food required for these various functions have been measured. Unfortunately, similar methods of evaluating the foodstuffs have not always been adopted. The position is further complicated by the large number of factors which may affect maintenance requirements. The live weight of the animal, the weather (more food being required in cold weather to keep the animal warm), the level at which the sheep are used to being fed, the digestibility of the food, the individuality of the animals, their age, infestation by parasites, the heat produced by the food during the course of its digestion, as well as the interaction between two or more foodstuffs, all cause variation and allowance has to be made for them.

Many different systems have been used by animal nutritionists in an effort to provide an easy and accurate method for evaluating feedstuffs. Although all of them tend, perhaps, to oversimplify the problem of relative food values, they do provide a useful practical basis by which two or more feedstuffs may be compared with a reasonable degree of accuracy. One widely used method of comparison reduces the value of feedstuffs to units of starch equivalent. In this system each fodder unit is equal in food value to 1 lb. of starch. On this basis, oats contain 56 food units per 100 lb., wheat contains 72 food units, and good quality cereal chaff approximately 40 food units. Furthermore, stock maintenance and production requirements also have been worked out in terms of these fodder units and thus provide a ready method whereby definite quantities of food can be evaluated in terms of stock requirements or vice versa.

There are marked differences in the way the various breeds of sheep respond to feeding. Variations also occur between individuals within the same breed, and these variations hinge largely on the efficiency with which the sheep convert the available food to wool or flesh. The observant stud master is familiar with the individuality of his animals and knows that he must make allowances for them.

It also should be remembered that the weather conditions influence materially the nutritional requirements of animals. As most of the heat generated from food for the purpose of keeping the sheep warm comes from the digestion of fibre, it is advisable to decrease the amount of fibre in the ration during very hot weather. Conversely, fibrous foods should be fed liberally during very cold weather.

Feeding standards are a useful guide for the man planning rations and within a reasonable latitude, depending on the individuality of the animals, are much more accurate than guess work.

### (II.) Maintenance and Production Requirements of Sheep.

The maintenance and production requirements of sheep have been measured on a number of occasions by different workers, and feeding standards have been defined for sheep for various weights and under different conditions.

The C.S.I.R.'s Nutrition Laboratory at Adelaide has worked with merino sheep on an improved "energy system" and their results compare favourably with world standards.

The following table shows the requirements of sheep of different live weights:—

TABLE 1.

| Live Weight (lb.). | Dry Matter (lb.) per week. | Starch Equivalent (lb.) Requirements per week for | | Digestible Crude Protein (lb.) Weekly requirements for | |
|---|---|---|---|---|---|
| | | Maintenance. | Production per lb. L.W. increase per week. | Maintenance. | Maintenance plus production. |
| 60 | 14·5 | 6·10 | 1·5 | 0·24 | 1·5 |
| 70 | 16·2 | 6·9 | 1·5 | 0·28 | 1·5 |
| 80 | 17·9 | 7·6 | 1·5 | 0·32 | 1·75 |
| 90 | 19·1 | 8·33 | 1·75 | 0·35 | 1·75 |
| 100 | 20·4 | 8·8 | 2·0 | 0·38 | 1·75 |
| 110 | 21·7 | 9·65 | 2·25 | 0·42 | 1·75 |
| 120 | 22·9 | 10·15 | 2·5 | 0·46 | 1·75 |
| 130 | 24·2 | 10·6 | 2·75 | 0·5 | 1·75 |
| 140 | 25·5 | 11·25 | 3·00 | 0·54 | 1·75 |
| 150 | 26·8 | 11·65 | 3·5 | 0·58 | 1·75 |
| 160 | 28·0 | 12·3 | 3·75 | 0·62 | 1·75 |
| 170 | 28·9 | 12·5 | 4·0 | 0·66 | 1·75 |
| 180 | 29·8 | 13·0 | 4·0 | 0·70 | 1·75 |
| 190 | 30·6 | 13·5 | 4·0 | 0·74 | 1·75 |
| 200 | 31·5 | 14·0 | 4·0 | 0·78 | 1·75 |

## (III.) SPECIAL PRODUCTION REQUIREMENTS.

*Growth and Fattening.*—From the standpoint of the feeding of sheep, growth is essentially a storage of protein. Other substances, particularly water, are stored as the animal grows, but protein storage is the main characteristic of growth in all animals. This fact is of particular importance in the rearing of mutton sheep.

The growth of an animal is usually measured in terms of live weight increases, and if live weights are plotted against age a curve similar to that in fig. 2 is obtained. This clearly demonstrates the period of rapid growth when the animal is young and the subsequent diminution in growth rate. Figure 2 shows the relationship between live weight and cumulative feed consumption and it demonstrates the gradual decrease in the conversion of food into body substance as age increases.

These two figures explain why the protein requirements of young animals are high when compared with those of old animals. Although protein is an essential requirement for growth, the inclusion of starch foods is necessary to maintain nutritional balance. This is seen from table 1, the data of which has been plotted in figure 3. It will be noticed from this table that young growing animals require 1.5 lb. starch equivalent per week for 1 lb. weekly live weight increase while older animals may require up to 4 lb. starch equivalent per week, per 1 lb. (weekly) live weight increase. This is because live weight increases in older animals come mainly from fat which requires about 2 to 2½ lb. starch equivalent per week to ensure the storage of ½ lb. of fat.

The proportion of minerals, particularly of calcium to phosphorus in the diet of growing sheep, also is of importance. In an experiment conducted by C.S.I.R., lambs were fed in three groups based on differences in the ratio of calcium (lime) to phosphorus. The results are tabulated below:—

| Ratio of Calcium to Phosphorus | 1:5.6 since weaning | 1:5.6 till 9 months then 1:1.2 to 20 months | 1:1.6 since weaning |
|---|---|---|---|
| Average live wt. when 20 months old | 51.5 lb. | 71.5 lb. | 125.5 lb. |

*Pregnancy.*—The period between conception and birth is, obviously, important in the life of both the ewe and the lamb. During the first three months of uterine life the lamb does not make very rapid growth, but thereafter its development is considerably hastened and at birth may weigh as much as 10 lb. During the last two months of gestation, the lamb makes heavy demands upon the food available to the mother which must maintain herself as well as feed her young. The ideal is to feed the ewes so that they make gradual but regular increases in body weight during this period. If a 110 lb. live weight ewe is to be fed so that her live weight increases by 10 lb. during the last two months of pregnancy it is clear from table 1 that an additional 12.5 lb. starch equivalent will have to be fed each month, i.e. approximately 3.1 lb. starch equivalent per week above maintenance requirements.

Extra food units are necessary for foetal development, i.e. the ewes should be fed extra to provide for the growth of the lambs they are carrying. Approximately 1 lb. of starch equivalent is required for every pound of foetus. Thus a ewe producing a lamb weighing 10 lb. at birth should, assuming 8 lb. of foetal development occurs during the last eight weeks of pregnancy, require an additional pound of starch equivalent per week.

Ewes, in common with all other female animals, have the power to draw on their body reserves to meet the demands of the growing foetus. While it is inevitable that this should be so it is important that the ration fed to inlamb ewes should be as near complete as possible as further heavy drains will be made on the mother during the period of lactation. This means the ewes should be on a gradually rising plane of nutrition from the commencement of the 4th month of pregnancy till the lambs are weaned. Increasing the ration of the ewes during the last two months of pregnancy ensures larger, better developed lambs and this is an important consideration.

*Lactation.*—Young lambs obtain large amounts of food from their mothers' milk. Milk is nature's ideal food and the maintenance of a good milk supply is an important consideration in the feeding of ewes. Merinos do not milk as long, nor as heavily, as the British breeds or crossbred ewes, and accordingly, do not require quite as much food for milk production. The table below gives an approximate comparison of the milking qualities of crossbred and merino ewes.

| Month | Gallons per month. [X-bred.] | Merino. |
|---|---|---|
| 1 | 8 | 5.4 |
| 2 | 9.7 | 3.6 |
| 3 | 7.2 | 2.8 |
| 4 | 5.4 | |

In planning a ration for ewes in milk, it is necessary to add 4 lb. starch equivalent per gallon of milk. Thus, if the ewes were producing about 5 gallons of milk per month they would require an extra 20 lb. starch equivalent per month or an additional 5 lb. per week above maintenance.

Information on the mineral requirements of ewes in milk does not appear to be available, but by analogy from the requirements of dairy cows they should receive from 10 to 15 gms. of calcium per day and from 15 to 20 gms. of phosphorus.

*Semen Production.*—The production of normal semen is the main function for which rams are kept. Abnormal semen may mean lowered fertility and poor lambings.

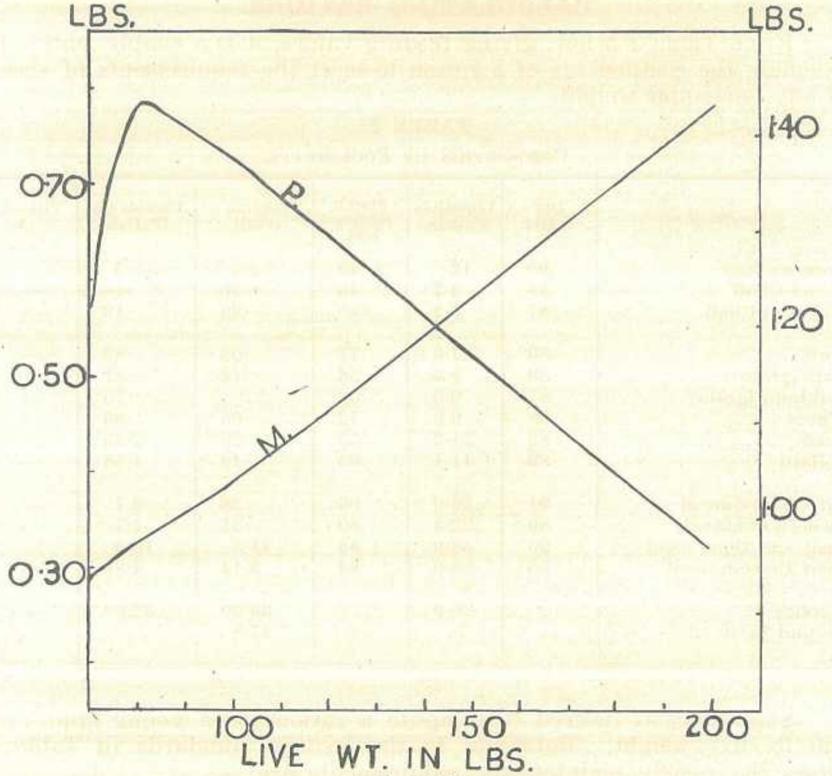



Plate 98.

Showing the Protein Requirements of Sheep of Different Live Weights for Maintenance (M) and Production (P) in lbs. per Week.

It is seen that the maintenance requirements increase with live weight increases and that the protein requirements for production are high while the animal is growing and it decreases as it reaches maturity.

Adequate vitamin A is an important essential in the diet of rams for a long period prior to, and during service. Vitamin A deficiency leads to degeneration of the cells lining the tubules in which the sperm are made. Adequate Vitamin A ensures this does not occur.

No Australian work is known in which protein requirements of rams at work have been investigated. Russian work indicates that about 13 oz. of protein are required per week by a ram doing usual stud work. This would be covered by the 1.75 lb. per week fed to the heaviest ram, whose maintenance requirements are .78 lb. per week. This would leave .97 lb. (15.5 oz.) protein for production of semen and wool. In a stud ram at work, however, semen production would take preference over wool production and it may be necessary to exceed the accepted feeding standards as far as protein requirements are concerned.

Rams subjected to temperatures of over 95 deg. F. for long periods show varying degrees of seminal degeneration. Work done in America recently indicates that feeding certain proteins to rams may have an important effect on ameliorating these undersirable effects, and accordingly proteins from a wide range of sources should be fed.

## CALCULATING RATIONS.

From Table 2 below, giving feeding values, it is a simple matter to calculate the components of a ration to meet the requirements of sheep of any particular weight.

TABLE 2.

COMPOSITION OF FOODSTUFFS.

| Foodstuff. | Dry Matter. | Digestible Protein. | Starch Equivalent. | Calcium (CaO). | Phosphorus ($P_2O_5$). | Vitamin A. |
|---|---|---|---|---|---|---|
| Lucerne Hay .. .. | 90 | 12 | 40 | 2·5 | ·5 | + |
| Oaten Chaff .. .. | 88 | 3·7 | 40 | ·36 | ·18 | — |
| Wheaten Chaff .. .. | 87 | 3·2 | 40 | ·29 | ·13 | — |
| Corn .. .. .. | 89 | 7·6 | 77 | ·02 | ·82 | + |
| Oats (grain) .. .. | 89 | 8·0 | 56 | ·14 | ·81 | — |
| Sorghum (grain) .. | 87 | 9·0 | 68 | .. | ·75 | — |
| Wheat .. .. .. | 88 | 9·0 | 72 | ·05 | ·86 | — |
| Bran .. .. .. | 89 | 11·3 | 55 | ·20 | 2·80 | — |
| Pollard .. .. .. | 89 | 11·1 | 65 | ·12 | 1·58 | — |
| Cotton seed meal .. | 91 | 36·0 | 66 | ·36 | 2·7 | — |
| Linseed Oil meal .. | 89 | 22·4 | 80 | ·51 | 1·7 | — |
| Meat and Bone meal .. | 95 | 53·0 | 68 | 11·5 | 10·3 | — |
| Meat Protein meal .. | 95 | 65·0 | 84 | 5·14 | 4·88 | — |
| Calphos .. .. .. | .. | 20·0 | .. | 33·00 | 32·00 | — |
| Ground Lime .. .. | .. | .. | .. | 47·8 | .. | — |

Suppose it is desired to compute a ration for a young stud ram 120 lb. live weight. Reference to the feeding standards in Table 1 shows the weekly maintenance requirements are:—

| | lb. |
|---|---|
| Dry matter .. .. .. .. .. .. .. | 22.9 |
| Starch Equiv. .. .. .. .. .. .. | 10.15 |
| Protein .. .. .. .. .. .. | .46 |

For production of 1 lb. live weight increase per week (as normal growth), and of wool the ram would require:

| | Per week. lb. |
|---|---|
| Starch Equivalent .. .. .. .. .. | 2.5 |
| Protein (to make total of 1.75 lb.) .. .. .. | 1.29 |

The total requirements will then be:—

| | lb. |
|---|---|
| Dry matter .. .. .. .. .. .. | 22.9 |
| Starch Equivalent .. .. .. .. .. | 12.65 |
| Protein .. .. .. .. .. .. .. | 1.75 |

Suppose a mixture is made of:—

| | lb. |
|---|---|
| Lucerne chaff .. .. .. .. .. .. | 50 |
| Wheaten chaff .. .. .. .. .. .. | 20 |
| Oats (grain) .. .. .. .. .. .. | 75 |
| Maize .. .. .. .. .. .. .. | 25 |
| Linseed meal .. .. .. .. .. .. | 5 |
| Meat meal .. .. .. .. .. .. | 2 |
| Salt (fine) .. .. .. .. .. .. | 1 |

By consulting table 2 showing the composition of foods it is easy to calculate, by simple proportion, the amount of dry matter, protein, starch equivalent, calcium and phosphorus in the ration. This was found to be:—

| Foodstuff. | Amount. | Dry Matter. | Digestive Proteins. | Starch Equivalent. | Calcium. | Phosphorus. |
|---|---|---|---|---|---|---|
| Lucerne chaff .. .. | 50 | 45·00 | 6·00 | 20·00 | 1·250 | ·250 |
| Wheaten chaff .. .. | 20 | 17·40 | ·64 | 8·00 | ·058 | ·026 |
| Oats (grain) .. .. .. | 75 | 66·75 | 6·00 | 42·00 | ·105 | ·607 |
| Maize .. .. .. .. | 25 | 22·25 | 1·90 | 19·25 | ·005 | ·205 |
| Linseed meal.. .. .. | 5 | 4·45 | 1·12 | 4·00 | ·025 | ·085 |
| Meat protein meal .. .. | 2 | 1·90 | 1·30 | 1·68 | ·103 | ·098 |
| Salt (fine) .. .. .. | 1 | .. | .. | .. | .. | .. |
| | 178 | 157·75 | 16·96 | 94·93 | 1·546 | 1·271 |
| 1lb. mixture contains .. | .. | ·88 | ·095 | ·53 | $CaO : P_2O_5$ 1 : 0·82 | |
| 3lb. per day equals 21lb. per week .. .. .. | .. | 18·48 | 1·99 | 11·13 | .. | |
| 3½lb. per day equals 24½lb. per week .. .. | .. | 21·56 | 2·33 | 12·98 | .. | |
| 4lb. per day equals 28lb. per week .. .. .. | .. | 24·64 | 2·66 | 14·84 | .. | |

As the feed requirements (per week) of the 120 lb. ram are:—

Dry matter 22.9 lb. Dig. Prot. 1.75 lb. S. Equiv. 12.65 lb. Feeding the animal 3 lb. of the mixture per day will not give him enough dry matter; will meet his protein requirements, but would leave him short in starch equivalent. A ration of 4 lb. per day would give him excess in dry matter, protein and starch equivalent, while 3½ lb. per day would meet his requirements for dry matter and starch equivalent, but would provide an excess of protein. This may not be particularly harmful, but is wasteful and is inclined to mask the important difference in efficiency with which some sheep convert protein to wool.

The substitution of wheaten chaff for the lucerne and of lucerne for the wheaten chaff will give an almost ideal ration at 3½ lb. per day, as is seen from the summarized results:—

| —— | Per week. | | |
|---|---|---|---|
| | Dry Matter. | Digestible Protein. | Starch Equivalent. |
| 3lb. per day .. .. .. .. .. | 18·48 | 1·68 | 11·13 |
| 3½lb. per day .. .. .. .. .. | 21·56 | 1·96 | 12·98 |
| 4lb. per day .. .. .. .. .. | 24·64 | 2·24 | 14·81 |

The ratio of Calcium (CaO) to Phosphorus ($P_2O_5$) is 1 : 1·32.

*Feeding Stud Ewes.*—Rations for stud ewes are computed in the same way as those for rams. Live weight increases can be controlled by careful attention to the number of pounds of starch equivalent given to the sheep. It is not usual to have to consider lactation in ewes which are being prepared for show, but should it be necessary to feed ewes with lambs at foot the starch equivalent for milk production can be added to the maintenance requirements before working out suitable rations.

## DISEASES ASSOCIATED WITH FAULTY FEEDING OF STUD SHEEP.

*Calculi.*—One of the most important diseases associated with the feeding of stud sheep is urinary calculi of rams.

Urinary calculi are deposits of salts which form in the urinary tract. They congregate most commonly in the bladder or tube of the penis, and may vary in size from sebulous grains to deposits up to about the size of a marble. Calculi cause considerable loss amongst Queensland sheep. Most commonly they are seen in stud sheep which are being stall fed. Many valuable animals have been affected. As calculi form gradually, it is not possible to tell when rams are in the "incubative" stage and often animals have died after sale and delivery to their new owners. This unfortunate occurrence has brought more than one stud into unnecessary disrepute.

All the indications are that the causes of calculi are dietetic. The available evidence suggests that Vitamin A deficiency, imbalance of calcium, phosphorus and magnesium are probably the main factors operating in the formation of urinary calculi in sheep. It is possible that there are other factors involved which have not yet been recognised, and further work is proceeding.

Conditions leading to concentration of urine, such as dry feeds rich in minerals, hot dry climate, and drinking water with appreciable concentrations of magnesium, or calcium carbonates may be contributing causes.

*Prevention.*—Avoid dietetic errors mentioned above by obtaining assistance from the Department of Agriculture and Stock in planning rations. Inclusion of sufficient Vitamin A is important. Excess phosphorus in bran or grain should be offset by supplying calcium as finely ground limestone or calcium-rich foods. Feeding a ration over rich in calcium is often helpful as it assists in the excretion of magnesium through the bowels. (Trouble sometimes starts when bowel excretion of magnesium is low and this substance is excreted through the kidneys.) Avoid bone flour as a sole source of lime as it is rich in magnesium.

*Treatment.*—Treatment is difficult and not always successful.

If the blockage is in the urethral process (the worm) the condition may be relieved by amputating the process and this will not interfere with the fertility of the ram. However relapses frequently occur, blockages taking place further back. In these cases massage towards the orifice is sometimes useful.

It may be helpful to acidify the urine of the sheep by giving daily doses of ammonium chloride (15 grains).

*Pregnancy Toxaemia.*—(Twin Lamb Disease). Twin Lamb Disease is a misnomer for this condition as it does not occur only amongst ewes carrying twin lambs.

A considerable amount of work has been done on pregnancy toxaemia but the exact chemical changes which take place in the body when the disease develops are not, as yet, clearly understood. It is known, however, that during the terminal stages of pregnancy the demands on the mother made by the lamb are very great, and if the ewe's food intake is not large enough she draws on her own body supplies to meet this increased demand. Apparently times occur when the rate of withdrawal from the body stores exceeds the rate at which the liver can convert the stored nutrients into a form in which they can be readily utilised by the body. When this happens, poisonous by-products are formed as the result of the incomplete conversion and the ewes develop typical symptoms of pregnancy toxaemia. As the damage done during these changes is often irreparable treatment is difficult and it is better to aim at prevention. This consists of keeping the sheep on a rising plane of nutrition right up to lambing and preventing any breaks in the regular daily intake of food through yarding for prolonged periods.

*Milk Fever.*—The disease commonly known as milk fever is often confused with pregnancy toxaemia. Milk fever is not a good name for the condition as it is brought about by a sudden diminution of the amount of calcium circulating in the blood. The condition responds readily to treatment, which consists of the injection of from 30-50 cubic centimetres (1-1¾ oz.) of 20 per cent. (1 in 5) calcium-boro-gluconate solution. The feeding of a ration adequate in calcium prior to lambing and during lactation is, however, an important consideration in the management of stud ewes which are being hand fed.

*Bloat and Meal Sickness.*—Bloat sometimes occurs amongst fed sheep and "meal sickness" is fairly well known by most men who have supervised sheep feeding. Animals are predisposed to the conditions by an insufficiency of fibre in the ration, i.e. not enough dry matter occurring in the form of hay or coarser grasses, such as Mitchell, from a little grazing. Meal sickness can be brought about by sheep eating too much finely ground cereal such as wheat, particularly if the ration is deficient in bulk. With both these conditions prevention is better than cure and correctly planned rations can help a good deal in preventing trouble.

*Prussic Acid Poisoning.*—It has been clearly demonstrated that prussic acid poisoning may occur amongst stud sheep which have been subjected to a prolonged period of fasting and then fed liberal amounts of linseed meal or nuts.

Obviously, this is not likely to occur when stud sheep are being prepared for show, though it may take place in the case of animals which are transported long distances by rail or motor float.

Symptoms shown are usually of short duration and they include rapid respiration and cyanosis of the visible mucous membranes. Death is sudden.

Treatment consists of giving affected sheep a 2 oz. drench of photographic hypo (sodium-thio-sulphate) (5 oz.) in water (1 pint).

Prevention consists of generous supplementary feeding of rams with good roughages, concentrate mixtures, or good quality hay for ten days prior to trucking; avoiding long periods of starvation while in transit, and preventing the animals from having ready access to unlimited supplies of linseed nuts on arrival at their destination.

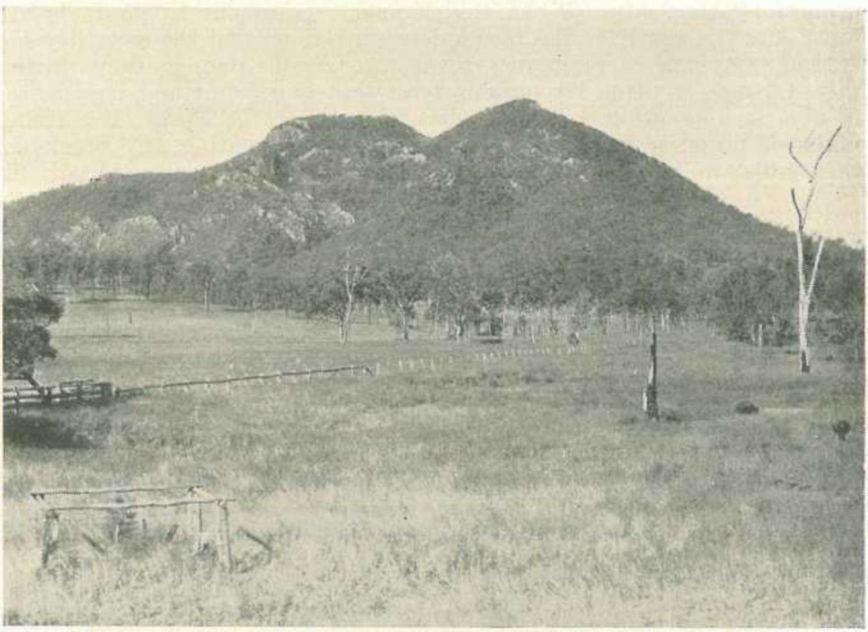
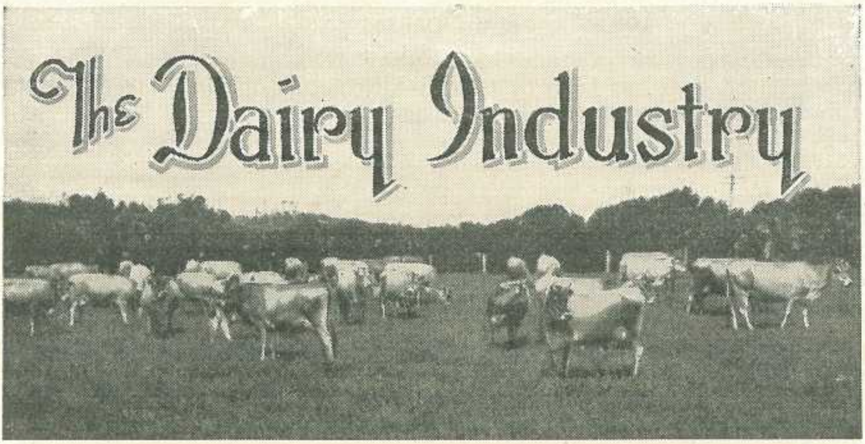


Plate 99.

Mount Moon, West Moreton.—View from the homestead, Kingpah, the property of Mr. J. Faulkner.

[*Photograph, Department of Agriculture and Stock.*




# Low Butterfat Tests in Milk.

F. C. COLEMAN, Senior Dairy Adviser.

FACTORY and depot managers who are handling milk may soon be faced with a recurrence of one of the industry's bugbears, namely, low butter-fat tests which fall short of the minimum standard of 3.3 per cent. butter-fat. During the greater part of the year attention is centred on the bacteriological quality of milk, but from July until October or November low butter-fat tests become a serious problem, requiring the attention of all concerned.

## Standard of Milk.

Under "*The Dairy Produce Acts,* 1920 *to* 1944," the standard of milk is defined as follows:—

> Milk shall be the normal, clean, fresh secretion obtained by completely emptying the udder of a healthy cow, properly fed and cared for, and shall be exclusive of the milk obtained during fifteen days immediately prior to and ten days directly following on parturition. It shall contain not less than eight and five-tenths part per centum of milk solids not fat, not less than three and three-tenths part per centum of milk-fat, and not less than twelve parts per centum of total milk solids. It shall not contain any added water, separated milk, preservative or other foreign substance, and shall not have had any milk-fat removed from it by skimming, separating, or any other process. Its freezing point shall be not higher than 0.55 degrees centigrade below that of pure water. The specific gravity of the total milk solids shall be not higher than 1.35.

Certain conditions operate during the short but difficult period from July to November, and all contribute to unsatisfactory tests. It is the purpose of this article to name and explain them.

A certain dairy officer testing cows for a well-known breeder remarked on the low tests of the cows during September and October, whereupon the breeder said, "I have kept records for the past forty years and I would like you to see them. These show that at this time every year the cows always test low." That was several years ago and experience since has proved the truth of this statement.

## Main Causes.

The experience of those controlling the quality of milk in the Brisbane District has been that two main factors operate, together with minor, but none the less important ones.

### Calving Period.

In most dairy herds a large proportion of cows calve during the spring. This means a decided increase in volume of milk providing that the weather, crop and pasture conditions are favourable.

Soon after calving, however, there is a gradual reduction in the percentages of fat and solids-not-fat which tend to fall for the first three or four months, at which time the quantity peak is usually reached. The fat content, then, remains fairly steady for a period and then starts to increase as the quantity of milk decreases.

It frequently happens during the spring that as many as 70 per cent. or more of milkers in a herd are those which have just freshened. It is therefore obvious that in such cases the great bulk of the milk produced by them will be of low butter-fat content.

This applies to all breeds, but is of special significance when the breed or breeds of the cows in the herd comprise the lower testing breeds and strains.

### Effect of Interval Between Milkings.

As the period between milkings is increased so will the tests vary, decreasing with the longer period and greater volume and increasing with the shorter period and smaller volume.

Many suppliers producing milk for the Brisbane market, milk at intervals of 15 hours and 9 hours in the July to November period; and quite a number have been known to milk at intervals of 16 hours and 8 hours.

It can thus be clearly seen that in both these instances if the herd consisted mainly of fresh cows and a sample of their bulk milk were taken at the 15th or 16th hour, the test would be very near and probably below the minimum standard of 3.3 per cent.

It is stated that in the case of mixed milk from a herd, for each hour that the interval exceeds 12 hours, the fat is lowered 0.10 to 0.15 per cent., and for each hour the interval is under 12 hours the fat is raised 0.20 to 0.25 per cent. Thus, if the milking periods were even and the morning's test was 3.5 per cent., it could be reduced to below 3.1 per cent. if the period were lengthened to 15 hours.

Experiments carried out at Garforth and Cambridge on the effect of intervals between successive milkings on the composition of milk show results as follow:—

| Period of Experiment. days. | Length of Night Interval. hours. | Fat. per cent. | Length of Day Interval. hours. | Fat. per cent. |
|---|---|---|---|---|
| 14 | 15 | 2·87 | 9 | 4·26 |
| 28 | 12·5 | 3·18 | 11·5 | 3·80 |
| 21 | 15 | 2·94 | 9 | 4·40 |
| 14 | 12 | 3·64 | 12 | 3·45 |
| 14 | 16 | 2·33 | 8 | 4·47 |

In the first place, therefore, the bulk test of the herd is very seriously reduced by milking a high percentage of fresh cows and in the second place it is further aggravated and tests reduced even lower still by such long periods as 15 and 16 hours between evening and morning milkings.

These two factors have by far the greatest influence on butter-fat tests and their combination, at a period of the year when the nutritive value of pastures in Queensland is believed to be at a low level, is responsible for seriously reducing the food value of milk. In fact, milk which fails to reach the 3·3 per cent. standard is not legally considered to be milk and can be dealt with as required.

**Condition of Stock.**

There are other reasons for low tests, an important one being the condition of the milkers. Fat tests of cows in poor condition, due to the drought, sunk to a very low level last year, and whenever stock reach that state it is reasonably certain that if the cow is giving any milk at all it will test extremely low.

**Low Testing Cows.**

Many milk producers have set their eyes on "'quantity above all else," and so in a great many herds there exists a considerable number of low-testing animals. A proportion of the latter will considerably depress the bulk test of the herd and their exclusion would have the opposite effect.

This question is exercising the minds of many milk producers at this very moment, as the following extract from *The Northern Star* (N.S.W.), of 24th May, 1947, will show:—

> Faced with reports from health inspectors that the milk being supplied to Brisbane and other towns often showed a shortage of butter-fat—which under the *Pure Foods Act* is the same as being considered to have been adulterated—many milk suppliers from over the border have been visiting Kyogle dairy farms with a view to buying certified dairy cows which have high tests over a long period of testing and the heifers from such tested cows.

## Mastitis Milk.

The inclusion of mastitis-affected milk in the bulk supply can be very easily done if strict vigilance is not observed. Such milk will not only have an adverse effect on methylene blue tests, but will also lower the butter-fat tests. The fat and casein contents of cows suffering from this disease are markedly reduced.

**Careless Handling of Milking Machines.**

Carelessness and thoughtlessness in handling machines is a common cause of milk adulteration. The practice of flushing out the milk line with cold water before and after milking can be a cause if care is not taken to prevent the water entering the milk in the vat or cans. This should be very carefully avoided.

**Age of Cows.**

The butter-fat test of cows seems to decrease with increasing age, being more noticeable after the ninth and tenth years. This is not regarded as a serious factor, however.

**Effect of Thorough Stripping on Butter-fat Test.**

The fat content of milk gradually increases as the milking of the cow progresses, so that the strippings contain the highest percentage. This fact is generally recognised by most dairy farmers, but the wide difference between the first-drawn and last-drawn milk may surprise many.

The following table by Van Slyke illustrates this increase:—

VARIATION IN FAT CONTENT OF MILK DURING MILKING.

*(Percentage of Fat.)*

| Portion. | Cow A. | Cow B. | Cow C. |
|---|---|---|---|
| First .. .. .. | 0·90 | 1·60 | 1·60 |
| Second .. .. | 2·60 | 3·20 | 3·25 |
| Third .. .. .. | 5·35 | 4·10 | 5·00 |
| Strippings .. .. | 9·80 | 8·10 | 8·30 |

It is very evident, therefore, that neglect to strip thoroughly may have a very reducing effect on the fat content at any time of the year, but particularly so in this low testing seasonal period. Other factors such as feeding, changes in feeding, abnormal weather conditions, oestrum or heat, and efficiency of milking may all affect the test.

## Methods of Prevention.

**Intervals between Milking.**

In those herds where low butter-fat tests are being experienced an effort should be made to so alter times of milking that there is no wide difference between them. Conditions seldom exist where two equal periods of 12 hours are possible, the time of pick-up by the carrier and other circumstances affecting this arrangement. It is very often possible, however, to arrange for a 13-hour period between evening and morning milking and an 11-hour period between morning and evening. This will have a marked effect in improving the butter-fat test, particularly if other recommendations are followed. Rearrangement of milking times may cause some inconvenience for a while, but the period for which this is necessary is not a long one, and a reversion to more convenient times could be made when tests show an improvement.

**Spring Calving.**

There are many advantages to be gained by having a separate paddock for the bull as opposed to allowing him free range with the herd. One of these is that calvings may be regulated, and this is advantageous when the feeding-off of crops has to be considered as well as the seasons, and also the important question of subsidies. Apart from these, however, if portion of the herd calved at the beginning of the winter instead of the majority calving in the spring, the danger of low fat tests would be considerably minimised.

When certain conditions operate together the reduction of the fat test to a very low level is most marked. These conditions, which usually operate at one and the same time and are responsible for bringing the tests of even high-testing breeds down below the minimum standard are—(1) the great majority of milkers consisting of fresh cows; (2) a long interval of 15 or 16 hours between evening and morning milking; and (3) the period of the year being a low nutritional and low testing one. It is therefore advisable to regulate calvings to avoid having too many cows freshening at the one time, otherwise low fat tests are inevitable. If calves are being reared, milk from these low-testing fresh cows could be reserved for feeding them.

### Stripping.

It has already been shown that the last milk from each quarter is particularly rich in butter-fat, whilst the first milk contains a low percentage of fat. It is therefore suggested that cows should not be stripped during the evening milking, in order to allow the higher-testing milk to be carried on to influence the milk the following morning, when the cows should be stripped very thoroughly. During the morning milking, also, the test could be further improved by rejecting a few jets of the low-testing fore-milk from each quarter, which thus increases the test of the remaining milk. In any case, the rejection of this milk is always a good practice, as it contains numbers of bacteria which have gained entrance through the opening of the teat canal. It also enables the milker to examine the milk for mastitis before adjusting the teat cups.

### Mastitis.

As previously explained, milk affected with contagious mastitis can be very low in butter-fat, and, in addition, may be responsible for a quick reduction of the methylene blue time. Milk affected with contagious mastitis, if not pasteurised, may cause septic sore throat in human beings and food poisoning in children. The importance of detecting it, therefore, is very evident. Milk from each quarter should be carefully examined by the strip-cup method before milking is continued, and any milk showing pus, blood clots, or even minute pinpoints of curd, must be excluded from the bulk supply. Remember that low tests and mastitis go hand in hand.

### Adulteration of Milk.

It has been wisely remarked that "the only legitimate way to put water into milk is to give cows plenty of it to drink." Frequently, however, during the process of milking by machine, water is allowed to run into the milk. This is adulteration, pure and simple, even though it may be unintentional. When chlorinated water is run through the teat cups and milk line prior to milking, every care should be taken to see that the milk vats, cooler, buckets, and cans are completely devoid of this water before commencing to milk. Then, again, when milking has ceased and the first treatment of cold or warm water is being given, the same care must again be exercised. If a bucket is placed beneath the releaser to catch this water, the bottom of the bucket should be scrupulously clean. This method, however, is not recommended. Where adulteration of milk with water is suspected it is detected by the lactometer and butter-fat tests.

### Condition of Stock.

The great advantages of keeping stock in good condition at all times, not only during the lactation period but also before calving, are so well known that they need not be stressed. It should be kept in mind that low condition and low tests usually go together. Investigations into low-fat tests now being carried out by officers of this Department and field officers of the Milk Board show that where the cattle are well fed and where the feed is well balanced better results are obtained.

### Order of Milking.

Cows yielding large quantities of milk should be milked last in the evening and first in the morning. This will balance the milking periods for those higher-producing but lower-testing animals.

### Low-testing Animals.

An efficient dairy farmer, apart from his other qualifications, is the one who is in a position to assess the worth of each animal in his herd; one who knows not only exactly the quantity which each cow gives but also its butter-fat test. Some individual cows are consistently low-testing, and unless this low test is compensated for by particularly large quantities of milk it is unprofitable to retain them in the herd. Enlightened farmers realise that there is only one method of ascertaining this and that is to test each animal at regular intervals throughout the lactation period.

### Removal of Teat Cups.

If teat cups are left on a cow too long after it has been milked a small amount of milk left in the loop of the rubber milk tube will become churned. This will be drawn through and will be caught in the filter pad of the strainer. The loss of this valuable butter-fat will decrease the test. This is very noticeable in cows which have been milking for some time, their milk naturally being higher testing. In addition, damage to udder tissue may result unless teat cups are removed promptly.

## TEMPERAMENT IN DAIRY COWS.

Some cows are naturally aggressive while others are timid. The aggressive beast is a menace in the assembly yard and may cause considerable injury to other cows, involving the owner in financial loss through loss of time in treating the injured animals, cost of medical supplies used, and depletion of yield from affected animals.

In most cases, the most profitable remedy is to dispose of the offending animal, but in others, a satisfactory solution is to be found in dehorning. The main objection raised to dehorning is that the appearance of the herd is somewhat spoilt. In the commercial herd this factor should not be taken into account, because the principal objective is milk and butter fat yield, and show value is negligible. In the case of pure bred stud book herds, objections have been raised to this practice, but these cattle represent a very small percentage of the milking cows in the dairy herds, and because of the handling and care which they receive from birth, they are, on the whole, much less aggressive in the yard and respond more readily to the process of "breaking in" than is the case with grade cows.

The timid beast causes less damage in a herd than the aggressive animal, but at the same time, its presence in the herd is a disturbing factor which causes loss of production. Some animals will, at the sight of any unusual object or movement, cause a mild stampede, in which injury is likely to occur to the most docile beast in the herd through violent contact with other animals or through being rammed on to wire or other fencing material.

Both aggressiveness and timidity are hereditary qualities, and in culling on account of these defects it may be advisable to remove more than one member of a family from the herd.

# The Detrimental Effect of Sunlight on Milk.

V. R. SMYTHE, Assistant Dairy Technologist.

IT is well known that sunlight is very beneficial in the dairy. The ultra-violet rays in sunlight are deadly to bacteria, and in this fact lies the explanation why so many milking sheds, which are constructed so as to exclude sunlight, are so often evil smelling. In such a state, of course, they present a menace to clean milk production. But it is not so well known that sunlight has a very adverse effect on milk itself. The ultra-violet rays penetrate no more than a fraction of an inch into milk, and consequently any bactericidal action, except where the milk may be in a very thin film, is negligible.

When milk is left exposed to sunlight it often develops an objectionable powdery taste. This taste is the forerunner to the tallowy and rancid flavours which render milk quite undrinkable. These undesirable flavours result from oxidative changes in the milk fat brought about by the sunlight. It would seem that once these changes commence they can go further without the milk being again exposed to sunlight.

Sunlight is also detrimental to the vitamin C of milk. It was found by experiment that milk in clear glass bottles exposed for one hour to indirect light in a shady place lost approximately half the vitamin C it contained. The longer the exposure the greater was the destruction. It also has been found that this effect of light is proportional to the amount of ultra-violet radiation it contains, which would make sunlight much more harmful than indirect light. When, however, milk is contained in brown bottles, the destruction of vitamin C is very slight.

The amount of vitamin C normally present in cows' milk is insufficient for human needs, and for infant feeding some other rich source, either orange or tomato juice, is used to make up the deficit. Nevertheless, even though milk is deficient in this important food element, there is no advantage to be gained by destroying what is present.

Another vitamin found in milk, riboflavin, also is sensitive to the destructive action of sunlight. Riboflavin is one of the vitamins grouped under the heading of vitamin B and is present in considerable quantities in whole milk, skim milk, and whey. In one experiment, milk was stored in clear-glass pint bottles and exposed to direct sunlight on a porch. More than one-quarter of the riboflavin present was destroyed in half an hour, and almost three-quarters in three and a half hours. As with vitamin C, the loss was greater the longer the sunlight was allowed to shine on the milk. In another experiment, the loss of riboflavin caused by sunlight was reduced to one-sixth with raw milk and one-eleventh with pasteurized milk by using brown glass instead of clear glass bottles.

Sunlight may cause a further deterioration in milk by warming it, thereby facilitating the growth of milk-spoiling bacteria. The obvious lesson to be learnt from this is to allow as much sunlight as possible to get into the dairy, but not to allow it to shine on milk.

# PRODUCTION RECORDING.

List of cows and heifers, officially tested by officers of the Department of Agriculture and Stock, which qualified for entry into the Advanced Register of the A.I.S., Jersey, and Guernsey Societies' Herd Books, production records for which have been compiled during the month of August, 1947 (273 days unless otherwise stated).

| Animal. | Owner. | Milk Production. | Butter Fat. | Sire. |
|---|---|---|---|---|
| | | Lb. | Lb. | |
| | AUSTRALIAN ILLAWARRA SHORTHORN. | | | |
| | JUNIOR, 3 YEARS (STANDARD 270 LB.). | | | |
| Bunya View Thelma's Pride | W. D. Davis, Chinchilla | 10,071·7 | 403·988 | Bingleigh Royal |
| Murray's Bridge Flower | C. K. Roche, Wheatvale | 9,045·7 | 322·132 | Chasmin Jellicoe |
| | SENIOR, 2 YEARS (STANDARD 250 LB.). | | | |
| Jamberoo Princess 2nd | A. F. Ezzy, Mt. Emblyn | 6,558·4 | 285·210 | Murray's Bridge Florrie's Prince |
| | JUNIOR, 2 YEARS (STANDARD 230 LB.). | | | |
| Ardilea Sadie 5th | Hinricksen and Sons, Clifton | 7,227·75 | 264·243 | Newstead Musician |
| Ardilea Flower 17th | Hinricksen and Sons, Clifton | 7,350·90 | 261·810 | Newstead Musician |
| | JERSEY. | | | |
| | MATURE COW (STANDARD 350 LB.). | | | |
| Westwood Eileen | F. Porter, Cambroon | 8,594·2 | 506·159 | Hunstreets Emperor's Volunteer |
| Palmridges Doon | H. Sigley, Jaggan | 6,180·7 | 421·081 | Overlook Bindle |
| Westwood Lassie Belle | F. Porter, Cambroon | 7,324·6 | 399·037 | Stretton Carnation's Volunteer |
| Windsor Princess Isobel | H. G. Johnson, Gleneagle | 7,400·85 | 390·814 | Bobs of Wingate |
| | SENIOR, 3 YEARS (STANDARD 290 LB.). | | | |
| Westwood Silverelda | F. Porter, Cambroon | 7,756·15 | 419·667 | Westwood Combination |
| | JUNIOR, 3 YEARS (STANDARD 270 LB.). | | | |
| Brooklands Cream Flake | W. S. Conochie, Sherwood | 8,342·3 | 465·766 | Englove Cunning Victor |
| | SENIOR, 2 YEARS (STANDARD 250 LB.). | | | |
| Mayfair Beauty 8th | J. W. Carpenter, Helidon | 4,893·4 | 296·595 | Trecarne Golden King 2nd |
| | JUNIOR, 2 YEARS (STANDARD 230 LB.). | | | |
| Lawnview Gracie | W. A. Berderow, Fairney View | 6,325·2 | 373·287 | Oxford Maxie |
| Grasmere Victory's Carina (365 days) | F. Z. Eager, Petrie | 8,210·75 | 368·149 | Oxford Brown Victory |
| Brooklodge Lovely | J. J. Ahern, Connondale | 5,967·85 | 337·139 | Trecarne Some Victor 4th |
| Trinity Lady Graceful | J. S. McCarthy, Greenmount | 5,893·05 | 286·477 | Trinity National Victory |
| Brooklodge Ruthenia | J. J. Ahern, Conondale | 4,863·15 | 267·816 | Trecarne Some Victor 4th |
| | GUERNSEY | | | |
| | JUNIOR, 3 YEARS (STANDARD 270 LB.) | | | |
| Tattenbar Patsy | W. A. K. Cooke, Witta | 6,267·3 | 305·471 | Laureldale Trump |
| Laureldale Veronica 3rd | W. A. K. Cooke, Witta | 5,408·35 | 279·354 | Minnimurra Tcpsy's Sequel 2nd |
| | SENIOR, 2 YEARS (STANDARD 230 LB.) | | | |
| Lindwood Calm | E. G. Foxton, Maleny | 5,450·95 | 272·312 | Lindwood Buddy |

# Beef and Dairy Cattle Champions.

## R.N.A. SHOW BRISBANE, 1947.

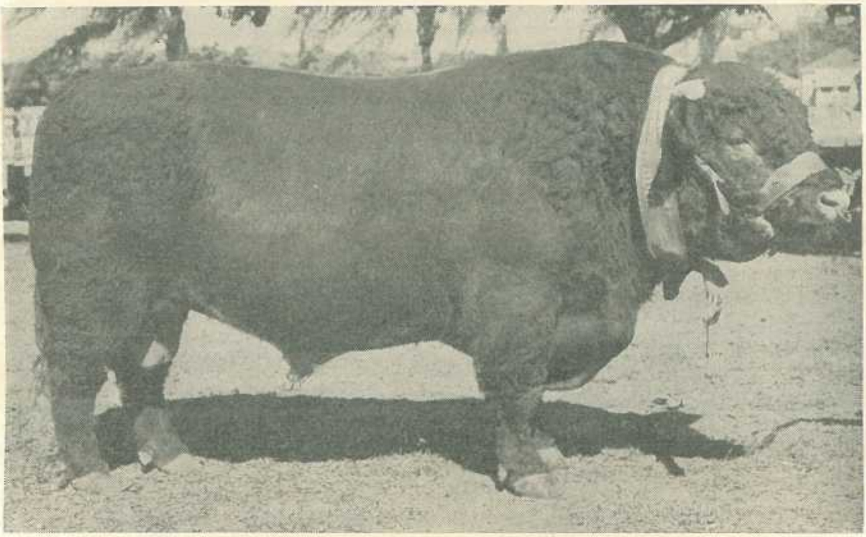


Plate 100.
CHAMPION SHORTHORN BULL.—"Coonong Officer Commanding."
D. R. McCaughey.

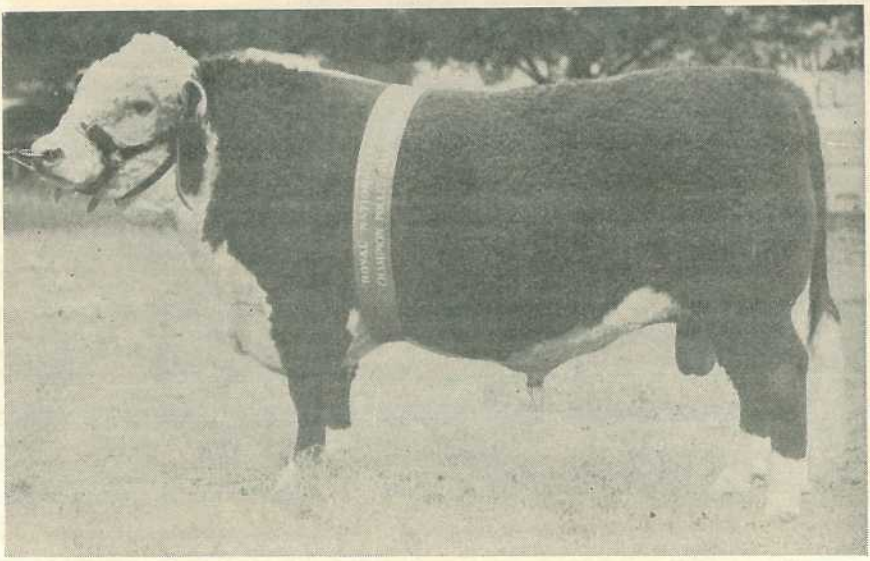


Plate 101.
CHAMPION POLLED HEREFORD BULL.—"Eulogie Commissioner." E. W. McCamley.

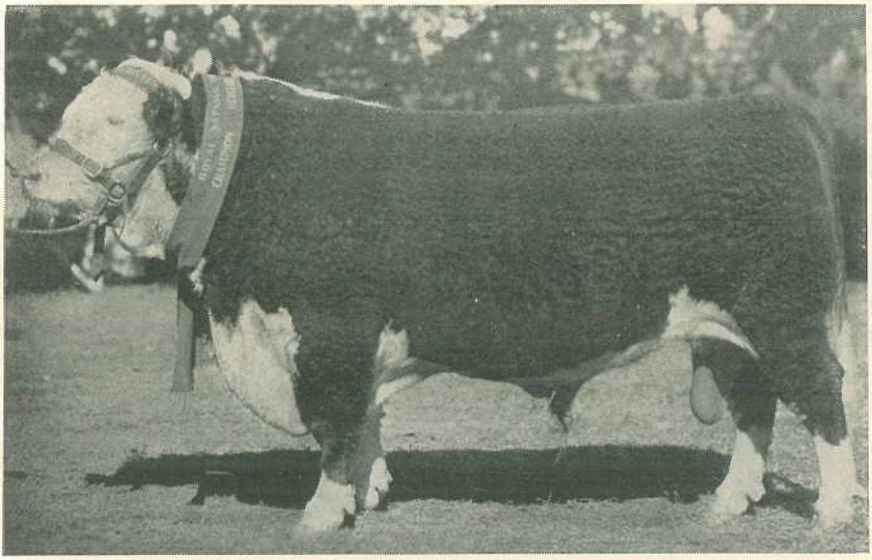


Plate 102.
Champion Hereford Bull.—"Bexley Demonstrator." Hays Bros.

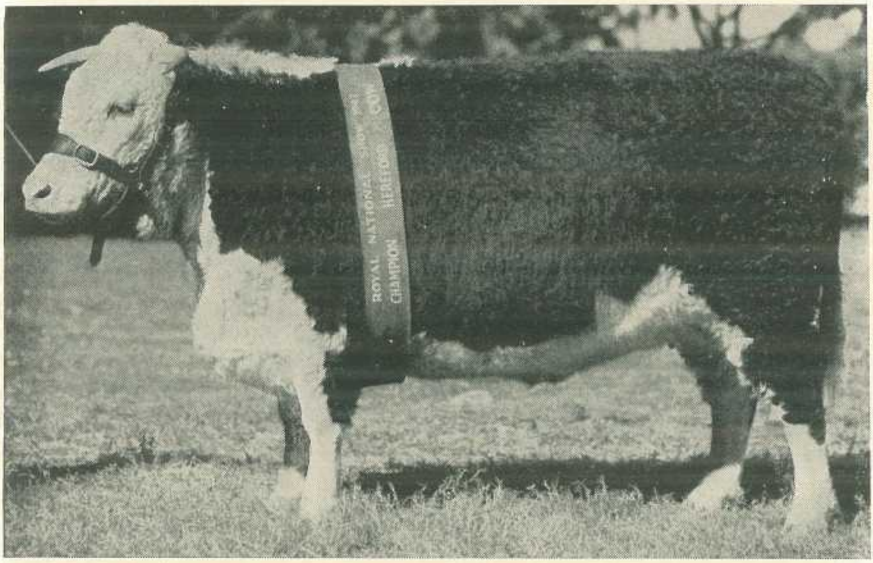



Plate 103.
Champion Hereford Cow.—"Myall Carissima 10th." Fenwick Bros.

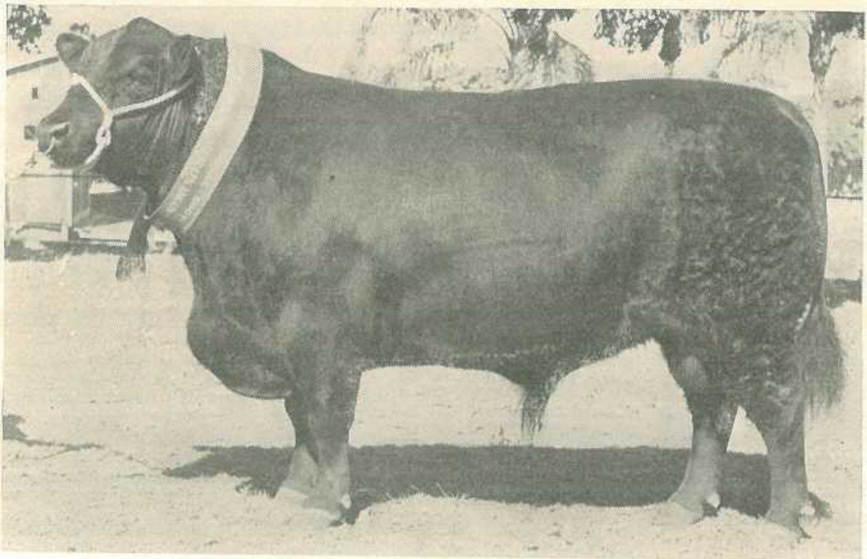


Plate 104.
CHAMPION ABERDEEN ANGUS BULL.—"Wallah Ottawa." H. A. White.

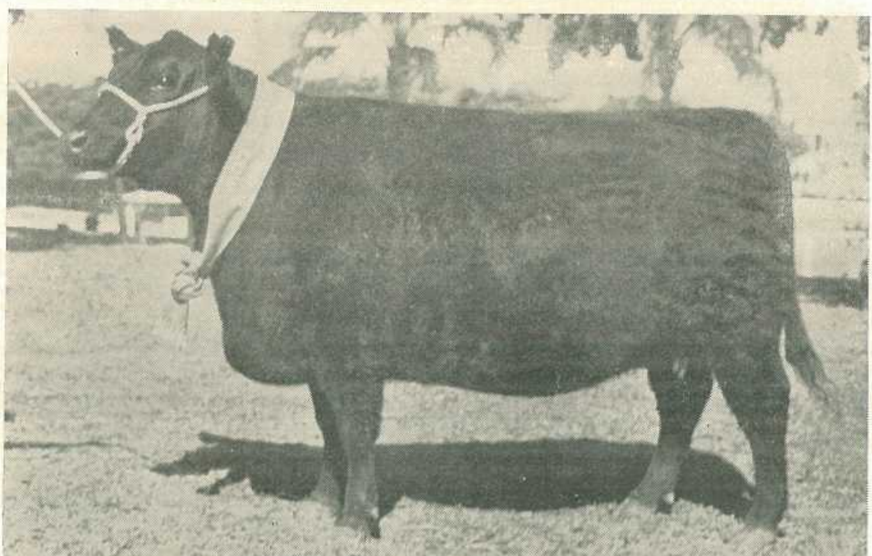


Plate 105.
CHAMPION ABERDEEN ANGUS COW.—"Bald Blair Bint." H. A. White.

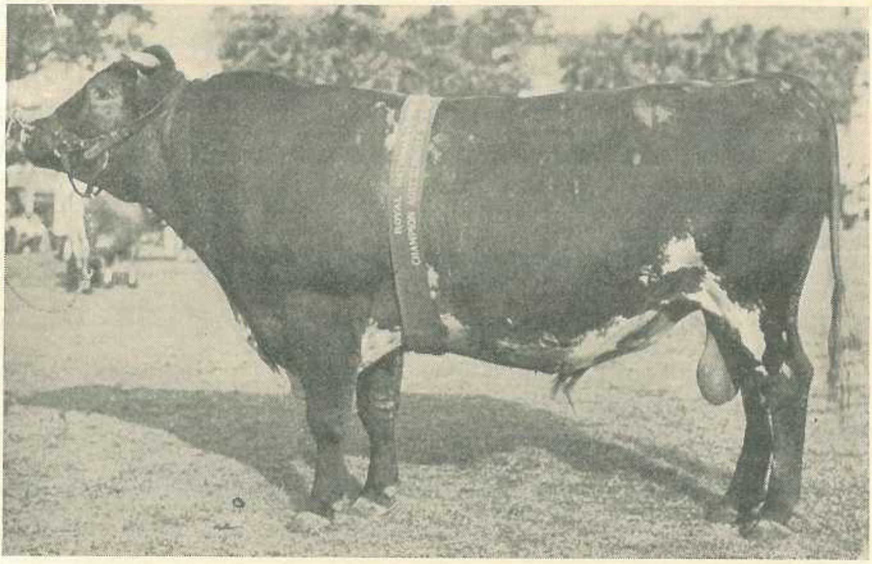


Plate 106.
CHAMPION AUSTRALIAN ILLAWARRA SHORTHORN BULL.—"Sunny View Evelyn's Masterpiece." Klein Bros.

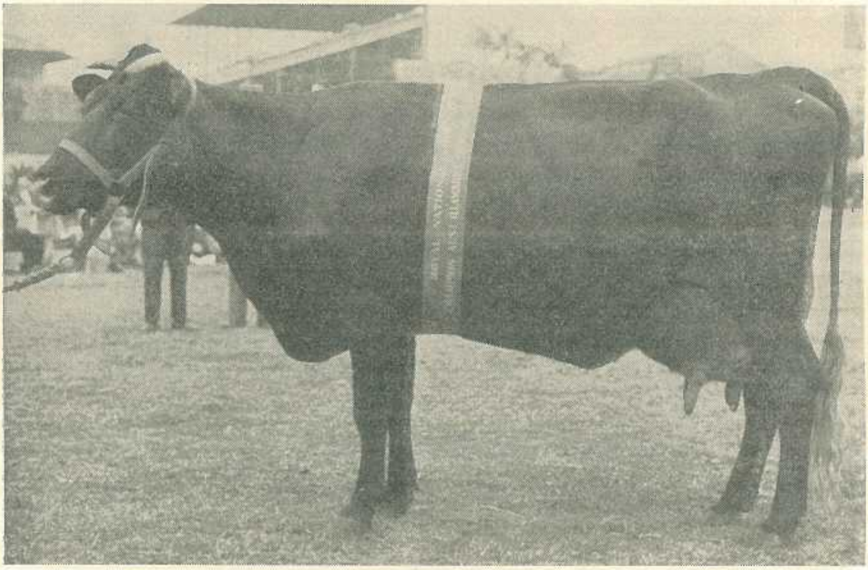


Plate 107.
CHAMPION AUSTRALIAN ILLAWARRA SHORTHORN COW.—"Ennismore Bud 2nd." E. W. Jackson.

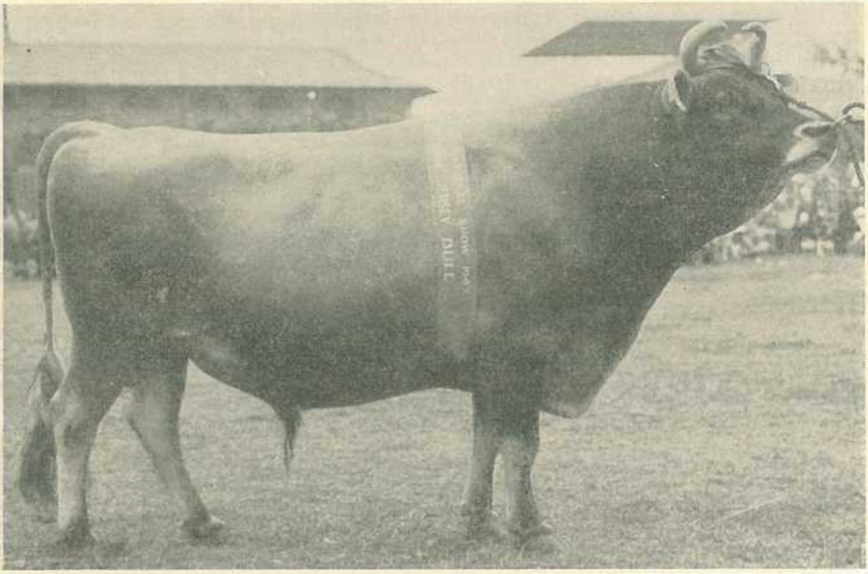


Plate 108.
CHAMPION JERSEY BULL.—"Glenview Royal Chief." A. L. Semgreen.

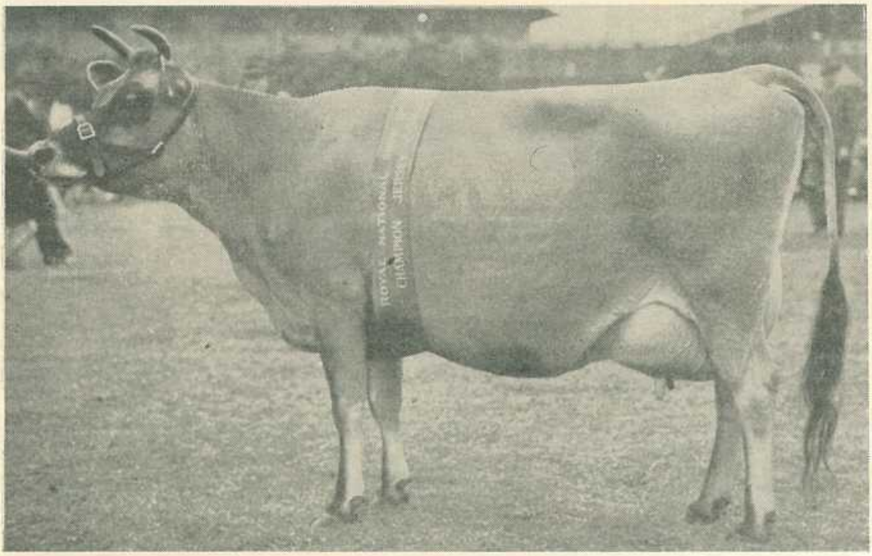


Plate 109.
CHAMPION JERSEY COW.—"Trecarne Dairymaid 4th." T. A. Petherick.

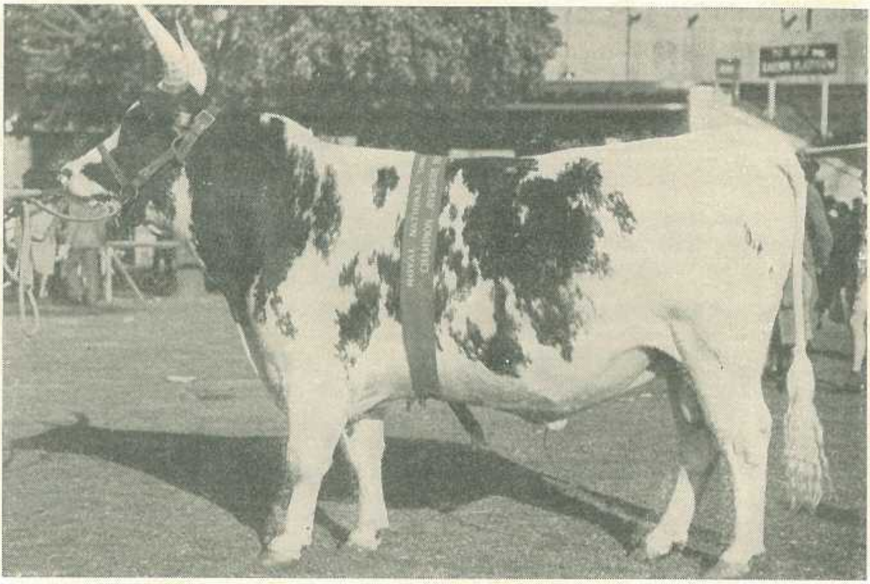


Plate 110.
Champion Ayrshire Bull.—"Myola Master 2nd." M. J. Brownlie.

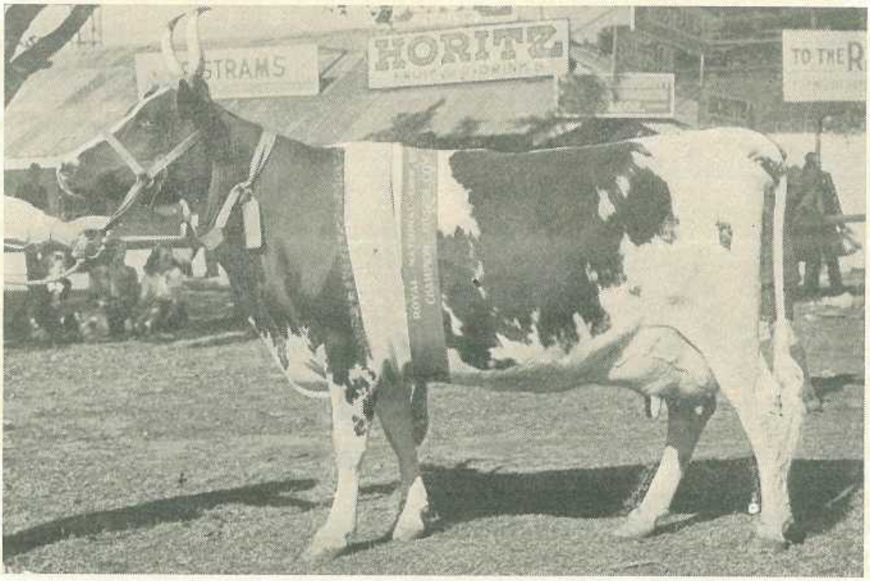



Plate 111.
Champion Ayrshire Cow.—"Crescent Farm Isabel 3rd." N. J. Mann.

# MARKETING

### Production Trends.

Good soaking rains fell in all dairying districts early in September, followed by some showery weather. Pastures have responded well to the rain and mild weather. Dairy cattle are in good condition, and in many herds the numbers of cows in milk are increasing, due to spring calvings.

Northern potato crops yielded well, and tubers reaching the Brisbane market are of excellent quality. Harvesting of the South Queensland crop is expected to commence towards the end of October.

On the Darling Downs, the early sown wheat crops made rapid growth under the mild conditions. The late sown crops are making excellent growth and give promise of a record yield. The early rains during the month came at a very opportune time and have been responsible for increasing the anticipated production of wheat to 10,000,000 bushels.

A considerable quantity of grain sorghum is still stored on farms. In all districts land is being prepared for new season's crop but, so far, only isolated areas have been planted.

All sugar mills are crushing, and in most districts sugar content is satisfactory. The Queensland estimate of 550,000 tons of sugar remains unchanged.

### Proposed Potato Marketing Board.

The Executive Council has approved of the issue of a notice of intention to set up a Potato Marketing Board under the *Primary Producers' Organisation and Marketing Acts* consisting of five elected representatives of potato growers and the Director of Marketing or a deputy appointed by the Minister. The board will not be constituted, however, until potato growers are given an opportunity of requesting a ballot on the question. If a petition signed by not fewer than 100 growers is received within one month after the issue of the notice of intention, a vote of potato growers will be taken and the Board will not be set up unless 60 per cent. at least of those voting are in favour of the proposal.

The Commonwealth wartime marketing arrangements for potatoes will terminate next year, and discussions have taken place at various meetings of the Australian Agricultural Council in regard to the marketing of this crop. The scheme adopted by the Australian Agricultural Council provides for the setting up of potato marketing boards in each State under State legislation. Potato marketing boards have already been established in New South Wales, Victoria, and Western Australia. In Tasmania, a ballot of growers will be held in the near future to determine whether or not a board will be set up in that State.

### Farm Mechanisation.

The trend throughout the world towards mechanisation of farming operations has shown a sharp rise during the last decade. This increased use of machinery during the war years made possible the harvesting of large crops at a time when limited labour was available. The Bureau of Agricultural Economics, U.S. Department of Agriculture ("The Agricultural Situation," June, 1947) published figures recently indicating that over two-thirds of present grain production in the United States will be harvested by combines compared with only one-quarter ten years ago. A nation-wide survey in 1945 showed that combines were used to harvest 80 per cent. of wheat, 40 per cent. of oats, 65 per cent. of barley, 50 per cent. of rye, 60 per cent. of flax seed, 35 per cent. of buckwheat, and 40 per cent. of rice.

# GENERAL NOTES

### Pullorum Disease in Poultry.

Blood tests of 200,000 head of poultry for pullorum disease were made by the Department of Agriculture and Stock in the course of the past 12 months; of that number, 4·8 per cent. gave positive reaction. This result shows no variance from that of tests made in the previous year; since then, however, the number of flocks tested has increased by about 25 per cent.

Pullorum disease is transmissible from carrier birds to chickens, and, if present, the death rate is high.

Birds free from the disease are being used for breeding during the present hatching season, thus reducing the risk of its occurrence among the chickens hatched.

Unfortunately, the nature of the disease is such that its presence cannot always be detected in the first blood test and subsequent tests are desirable. The continued co-operation of hatchery owners is therefore necessary before an assurance can be given that all chickens distributed from Queensland hatcheries are free from pullorum disease.

### Groundsel is not Poisonous to Stock.

Groundsel bush is not poisonous to stock, according to results of feeding tests by the Department of Agriculture and Stock at the Animal Health Station, Yeerongpilly. The only ill effect observed was impaction; although cows may go off their milk after feeding on the weed. Groundsel has no fodder value and stock will eat it only when very hungry.

### The Pig Industry.

In keeping with the outlook for increased production of pigs and improvement in the quality of pig meats, particularly where pig raising is combined with dairying and grain growing, the staff of the Pig Branch of the Department of Agriculture and Stock has been increased in the past two years.

In addition to the advisory staff stationed at Brisbane, advisers are now attached to the Burnett and the Atherton Tablelands districts. Mr. R. Grieve is located at Murgon, and Mr. T. Abel at Atherton.

Advice on the feeding, housing, breeding, and rearing of pigs for the home and export markets may be obtained from these officers or from the Pig Branch of the Department of Agriculture and Stock, Brisbane.

### Chicken Sexing.

When the practice of determining the sex of day-old chickens became general, instances occurred where the cockerel chickens were sold as "day-old chicks." The purchasers, not being aware that the sex had been determined, sometimes bought with the expectation that there would be about an equal number of birds of each sex. Buyers are now protected under *The Poultry Industry Act of* 1946. Persons engaged in chick sexing are now required to pass a qualifying examination and to obtain a licence. It is obligatory on licensees to mark all chickens, determined as males, by spraying them with a violet stain. Buyers of chickens may, therefore, be sure that very few, if any, chickens carrying a violet stain are hens.

### Water Blister of Pineapples.

A Proclamation has been issued under *The Diseases in Plants Acts* adding water blister of pineapples (*Ceratostomella Paradoxa*) to the list of diseases declared under these Acts. More effective control of the disease will now be possible under the supervision of inspectors of the Department of Agriculture and Stock.

# Rural Topics

## Milk Yield of Goats.

How much milk will a goat give? This is a commonly asked question. Whilst championship stud animals under test have yielded more than 5,000 lb. in a year, and gallon-a-day milkers are not uncommon, a good average grade animal, well fed and kept under good conditions, should yield apout 2 quarts per day over a lactation period of seven to ten months, states a departmental pamphlet. Goats, like cows, vary in their milk yield according to the breed, the individual within the breed and, what is most important, the feeding and general attention they receive.

Goats' milk is almost pure white in colour. It is a comparatively rich milk, intermediate in fat content between that of a Jersey cow and a Friesian cow, *i.e.*, containing approximately 5 per cent. The fat globules are small in size, and this, combined with a small curd, is said to make the milk more easily digestible and, therefore, very suitable for infants and invalids. It is claimed that goats' milk is digested in one-sixth of the time taken to digest cows' milk. Goats' milk can be used unsterilized, thus avoiding impoverishing the vitamin factor. This is possible by reason of the knowledge that tuberculosis in the goat is extremely rare. In Australia there appears to be no record of tuberculosis in goats.

The producers of goats' milk should remember, however, that goats' milk can readily become contaminated. It is, therefore, imperative that the utmost care should be given to keeping the goat stalls, pens, milking utensils, &c., scrupulously clean. Dirty premises and unattractive conditions ruin any milk business.

The following is an average analysis of goats' milk compared with other milks:—

| —— | Goat. | Ewe. | Cow. | Human. |
|---|---|---|---|---|
| | Per Cent. | Per Cent. | Per Cent. | Per Cent. |
| Protein .. .. .. | 4·06 | 5·37 | 4·48 | 1·52 |
| Butter-fat .. .. .. | 5·14 | 3·65 | 3·13 | 3·55 |
| Sugar .. .. .. .. | 5·28 | 5·46 | 4·77 | 6·50 |
| Minerals .. .. .. | 0·58 | 0·79 | 0·60 | 0·45 |
| Total Solid Matter .. .. | 15·06 | 15·27 | 12·98 | 12·02 |
| Water .. .. .. .. | 84·94 | 84·73 | 87·02 | 87·98 |
| | 100·00 | 100·00 | 100·00 | 100·00 |

Besides its value as a human food, goats' milk has been found especially valuable for feeding poultry, dogs, and calves.—*From an advisory pamphlet, New South Wales Department of Agriculture.*

## Four Faults in Milking.

There are many points at which cream can be contaminated, and if his product is to be consistently graded "choicest" it is necessary for the farmer to be watchful at them all. Careless milking methods are a common cause of trouble. Second-grade taints may be introduced as a result of any of the following:—

1. Failing to wash the hands regularly and frequently while milking, and to change the water as soon as dirty.

2. Failure to wipe the cow's udder free of dust, mud and manure, and to wash the teats prior to milking, preferably with water to which a little hypochlorite has been added.

3. Using unclean cloths for the cow's udder, or dirty towels for the milker's hands.

4. Failing to reject the first few squirts of milk from each teat.

# GADGETS AND WRINKLES

**Insulating Iron Roofs with Sawdust Concrete.**

In New Zealand, as in Australia, corrugated iron is the standard roofing material in rural districts, but it has the serious disadvantage that it gives very poor protection against changes of temperature. This fault is of considerable economic significance in relation to the housing of pigs, and as a means of improving the insulating qualities of iron roofs on pig houses in the Bay of Plenty district the laying of sawdust concrete over the iron has been tried.

*Use for Old Iron.*

Although the addition of sawdust concrete to an iron roof is chiefly to insulate it, it has the added advantage of enabling a durable and satisfactory job to be made of a roof using very old and rough iron such as has been used to cover stacks or has been through a fire.

Obviously the pitch of the roof must not be very steep or there will be difficulty in getting the concrete to stay in place while setting, but it is very unlikely that any farm buildings will have too steep a roof for this purpose.

*Preparing the Roof.*

Farm buildings do not, as a rule, have any superfluous timber in them, and although sawdust concrete is comparatively light, it is advisable to put in a few extra purlins under the roof—say at not more than 3 ft. centres—so that there will be little give or spring in the iron when it is being walked on while the concrete is being laid.

To prepare the roof for laying the concrete, set up a strip of boxing along each end of the roof so that it projects about half an inch above the highest lead-head nail in the roof. Unless the pitch is rather steep it is not necessary to put boxing at the front and back edges as the concrete should be stiff enough to lie there and be finished off with the float. The main purpose of the boxing at the ends is not so much to retain the concrete as to give a guide for screening down to a uniform thickness.

If the iron is old and battered any nail holes or cracks in the bottom of the corrugations should be stopped up with a black mastic putty. Then give the whole surface a brush over with a cement and water wash and let it dry.

The concrete is made with clean pinus insignis sawdust, preferably from the breaking-down saw—a rule which applies in all uses of sawdust for concrete. As there is no wear on the roof the mixture can be weaker than for a floor, and five parts of sawdust to one of cement is amply strong. In fact, the mixture has been made much weaker than this in the Bay of Plenty without any trouble, and it has been found that six parts of sawdust, two parts of clean sand, and one part of cement makes a satisfactory mixture.

*Can be Put Down in One Operation.*

Make the mix as dry as possible so that there will be no danger of surplus water flowing through it and carrying the cement away, and the whole thickness can be put down in one operation instead of in separate layers as is necessary with a thick sawdust concrete floor. Tamp the concrete down into the corrugations with the back of the spade and finish off the surface evenly by laying a screed along resting on the boxing strips at each end of the roof. If the roof is too long for this to be done, a strip of wood of the right width can be laid in one of the corrugations for the end of the screed to rest on, and the roof done in breaks of a convenient width.

If the concrete passes over a ridge it is advisable to lay a strip of fowl netting double on the iron down the ridge and work the concrete through and over it so that there is some reinforcing along the ridge. When the concrete is hard enough to walk on—in about three weeks in fair weather—dampen it and apply two coats of sand and cement paint to seal the surface against moisture. It is advisable to protect the new concrete from rain and essential to protect it from frost by covering with bags while it is setting, but do not re-wet it during the setting process, as is sometimes done with ordinary concrete.—From *The New Zealand Farmer*.


# 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.*

## BETWEEN TWO YEARS AND SIX.

*What is a Healthy Child.*

"But," says Billy's mother on her first visit to the Toddlers' Health Centre, "I can't think Billy is sick just because he is thin and breathes through his mouth. He takes after my mother—she was always thin and she used to snore, too."

"Joan has never had a doctor since she was born and I know she is not really sick," says another mother, "but she's always been nervy and fussy about her food."

As with many parents, here are two mothers who are puzzled because their toddlers do not measure up to the best standards of health and yet they cannot believe them to be sick.

On the other hand, too many parents are satisfied with a child that is "not sick" and excuse or explain away signs of ill health on often quite erroneous grounds.

The child who is "not really sick" is actually the same as the child who is "not really well."

Nothing but really healthy children should satisfy parents.

*The healthy child* has rosy cheeks and red lips. His eyes are bright. His skin is smooth and his body straight and strong with a good solid bony structure and firm, well-developed muscles. He grows taller and gains weight month by month. He is active, alert and interested in everything. He plays vigorously, creeping, running, jumping and climbing according to his age. His mother may find him a strenuous companion with his never-ending desire for activity. He is probably noisy and gets pleasure out of banging and shouting and singing.

He is hungry at mealtimes and needs no coaxing to persuade him to eat and when bedtime comes he pops straight off to sleep and sleeps like a log. His bowels move regularly and he does not complain of pains or aches. His teeth are clean and not decayed and his gums firm and pink.

*How to keep a check on Health.*

Intelligent parents want their child kept well. After all, if they have a motor car they have it checked over at regular intervals by a capable mechanic and thus avoid accidents and lengthen the life of the car. The machinery of the human body is just as much in need of regular inspection. The toddler's visit to the child health centre or to the doctor's consulting room should be made into an interesting excursion. Teach him to be proud of his weight card and his good health report and his sound clean teeth. Tell him what sister or doctor will do, and why. A child should never be deceived about a visit to the doctor. It is foolish to tell him "The doctor isn't going to touch you" or "He won't make you take your clothes off"; and a mother who threatens to "call the doctor if you are not good" is a very senseless mother indeed. Watch for another toddler's article next month.

Further advice on this and other matters can 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.

## Summer Fruit Drinks for Children.

Children are quick to acquire a taste for all manner of summer drinks, often to the detriment of their health. Many so-called orange and lemon drinks contain no fresh fruit at all, but are made from chemicals and artificial colouring matter. Not only do they not have the food value that the real fruit possesses, but they may be definitely injurious. The only drinks of this kind that the child should be permitted to have should be made from the fresh fruit juice.

Mothers who make real fruit juice drinks for their children will not be teased for artificial soda and other harmful drinks. Fruit juices not only satisfy thirst; the natural fruit acids they contain supply beneficial elements to the child's diet.

*Pineapple Drink.*—Wash the skin of a pineapple. Place in a lined saucepan with the core and enough cold water to cover. Cook slowly ¾ hour. Add 3 tablespoons or more sugar and the juice of 1 orange or lemon. Strain and allow to cool. Chill and serve.

*Fruit Punch.*—Take ½ cup lemon juice, 1 cup orange juice, grated rind ½ orange, 1 tablespoon grated lemon rind, 1 quart water, 3 or 4 cups sugar. Cook water and sugar for 3 minutes, cool and mix with orange and lemon juice, rind, &c. To this add the following ingredients:—(1) 1 quart ginger ale, ¼ cup preserved ginger cut up finely, (2) 1 cup grated pineapple, 1 pint soda water.

*Fruit Cup.*—Take 2 lemons, 1 quart boiling water, 2 oranges, 4 passionfruit, 1 ripe pear (if available), 4 tablespoons sugar, few drops cochineal. Wash lemon, peel thinly into a large jug or bowl; squeeze juice and place it in jug with rind and sugar; pour the boiling water over this and cover till cold. Strain into glass jug, colour very pale pink, add slices of oranges, passion-fruit pulp and cut pear or other fruit. Place in ice chest and serve very cold.

## IN THE FARM KITCHEN.

*Cheese and Celery Pie.*

One small head of celery, about 3 heaped tablespoons grated cheese, 1 egg, ½ pint milk, pepper. Chop the celery and cook till tender in a very little salted water. Leave to get cold while you make some pastry, and line a tin or piedish with it. Put a piece of bread on the pastry to prevent it from rising, and bake in a moderate oven for about ten minutes. While it bakes, heat the milk in a saucepan, add the celery, most of the cheese, the egg and some pepper. Stir the mixture over a gentle heat until it thickens a little, and pour it into the pastry case (with the breadcrust removed). Sprinkle the rest of the cheese on top, and bake in a slow oven until it is set and nicely browned.

*Fish au Gratin.*

One pound cooked white fish, ½ pint white sauce, ¼ teaspoon salt, pinch of pepper and mustard, 1 oz. grated cheese, mashed potato, chopped parsley. Flake the fish into a well-greased casserole. Edge with mashed potato. Add seasoning and pour over the sauce. Sprinkle with browned breadcrumbs and cheese. Dot with small pieces of margarine. Bake in a quick oven for about 30 minutes.

*Brandy Snaps.*

Two ounces black treacle, or golden syrup, 2 oz. brown sugar, 2 oz. lard or dripping, 2 oz. flour, ½ teaspoon ground ginger. Melt the treacle or syrup, sugar and fat together. Sift in the flour and ginger. Drop teaspoons of this mixture on to a well-greased baking tin—well apart to allow for spreading—and bake for 15 minutes in a moderate oven. Remove from the oven, and while still warm roll around the handle of a wooden spoon.

## QUEENSLAND WEATHER IN SEPTEMBER.

September of 1947 was an outstanding period of *phenomenally good over average rains* throughout the State, especially in the normally low seasonal rainfall areas of the Carpentaria and Western Border Divisions. A great deal of the Peninsula recorded 1- to over 2-inch rainfalls, and average district totals throughout ranged from 1¾ to 3 inches; many areas received over 2 inches up to 315 points in the Central Highlands, 338 in the South Coast-Moreton, and 429 in the Port Curtis. The main rain periods were during the first week of the month and from the 25th to the 27th and during the latter days the drier sections in the East Carpentaria and Central Highlands to the Central and North Coast were benefited. The marked improvement in all pastoral and agricultural areas which started during August has been generally consolidated. Rain distribution was of the soaking type, promoting growth, and replenishing surface water supplies and starting reasonable stream flows inland. From Curraveva, Cooper's Creek for several days unusual seasonal stream heights of 4 feet 8 inches to 4 feet 9 inches were reported. A substantial part of the wheat area rain fell early in the month and good growing conditions have been maintained.

*Pressure.*—The production of the *near record to record September general rain distribution* was mainly due to the persistence of the rare early seasonal southward movement of warm tropical air. At the beginning of the month a well-defined trough formation in the Northern Territory and Western Queensland was connected with a vigorous closed curved depression in South Australia. The subsequent movement of this combination and the following cold front produced widespread rains in Eastern Australia. The southern centre moved rapidly across Tasmania but a shallow wave depression formed in Western Queensland on the 5th moving through the South-East of the State on the 6th. Fairly substantial continental light pressure controls followed, broken between the 14th and 16th by another trough and southern low general movement with rain activity mainly in the southern States. The rain period 26th to the 28th showed persistent tropical influences in an isobaric dip formation over Western Queensland penetrating a stable high pressure centre over the South-East of the Continent. Rain production was increased by weak cold front influence from the Central Interior high pressure ridge. With the southern high over New South Wales and the West Tasman Sea 25th to 28th, fresh to strong south-east winds to rather rough seas prevailed along the Queensland coast.

*Temperatures.*—Maximum temperatures were generally below normal, especially inland, ranging from 4.3 deg. below at Longreach to 5.9 deg. at Boulia and Mitchell. Minimum temperatures were mostly above normal 1 to 3 deg. from 0.4 deg. at Rockhampton to 4.6 at Georgetown. Palmerville had maximum readings over 90 deg. on 23 days—Normanton 21.

*Cold to Frost Periods.*—Stanthorpe registered screen temperatures under 40 deg. on 10 nights (9th-12th 17th-21st, and 24th) (lowest screen and grass minima 28deg/21 deg. on the 11th). Bybera 8 nights, 32 deg./21 deg. (11th).

*Brisbane.*—Pressure $\frac{9 + 3}{2}$ 30.103 inches (normal 30.050 inches).

*Temperatures.*—Mean maximum 74.0 deg. (normal 75.5 deg.) mean minimum 56.5 deg. (normal 54.8 deg.). Mean temperature 65.3 deg. (normal 65.1 deg.). Highest daily 81.1 deg. on 29th, lowest 47.0 deg. on 11th.

*Rainfall.*—293 points on 13 days. *Average* 198 *on* 8 *days. General Fogs,* 2 nights. *Fog Patches,* 8 nights.

The rainfall position is summarised below—

| Division. | Normal Mean. | Mean September, 1947. | Departure from Normal. |
|---|---|---|---|
| | Points. | Points. | Per cent. |
| Peninsula North | 13 | 66 | 408 above |
| Peninsula South | 24 | 311 | 1,196 ,, |
| Lower Carpentaria | 17 | 124 | 629 ,, |
| Upper Carpentaria | 36 | 161 | 347 ,, |
| North Coast, Barron | 92 | 160 | 74 ,, |
| North Coast, Herbert | 155 | 416 | 169 ,, |
| Central Coast, East | 108 | 189 | 75 ,, |
| Central Coast, West | 70 | 203 | 190 ,, |
| Central Highlands | 102 | 315 | 209 ,, |
| Central Lowlands | 65 | 275 | 323 ,, |
| Upper Western | 29 | 260 | 797 ,, |
| Lower Western | 44 | 235 | 434 ,, |
| South Coast, Port Curtis | 141 | 429 | 204 ,, |
| South Coast, Moreton | 206 | 338 | 64 ,, |
| Darling Downs, East | 167 | 256 | 53 ,, |
| Darling Downs, West | 104 | 231 | 122 ,, |
| Maranoa | 118 | 255 | 116 ,, |
| Warrego | 88 | 196 | 123 ,, |
| Far South-West | 56 | 197 | 252 ,, |

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. |
|---|---|---|
| 1 | p.m. 8.43 | a.m. 6.27 |
| 2 | 9.50 | 7.17 |
| 3 | 10.53 | 8.13 |
| 4 | 11.51 | 9.16 |
| 5 | .. | 10.23 |
| 6 | a.m. 12.42 | 11.30 |
| 7 | 1.26 | p.m. 12.36 |
| 8 | 2.05 | 1.39 |
| 9 | 2.40 | 2.41 |
| 10 | 3.13 | 3.41 |
| 11 | 3.45 | 4.40 |
| 12 | 4.19 | 5.40 |
| 13 | 4.54 | 6.39 |
| 14 | 5.33 | 7.39 |
| 15 | 6.15 | 8.37 |
| 16 | 7.02 | 9.32 |
| 17 | 7.52 | 10.23 |
| 18 | 8.46 | 11.08 |
| 19 | 9.40 | 11.49 |
| 20 | 10.35 | .. |
| 21 | 11.30 | a.m. 12.25 |
| 22 | p.m. 12.25 | 12.58 |
| 23 | 1.19 | 1.29 |
| 24 | 2.15 | 2.00 |
| 25 | 3.12 | 2.30 |
| 26 | 4.13 | 3.02 |
| 27 | 5.17 | 3.38 |
| 28 | 6.24 | 4.19 |
| 29 | 7.33 | 5.06 |
| 30 | 8.41 | 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 | 11 | 28 | 26 | 43 | 0 | 19 | 28 | 51 |
| 6 | 12 | 27 | 27 | 43 | 1 | 18 | 29 | 51 |
| 11 | 21 | 15 | 38 | 31 | 12 | 7 | 43 | 35 |
| 16 | 30 | 9 | 45 | 24 | 20 | 0 | 53 | 26 |
| 21 | 25 | 13 | 42 | 28 | 17 | 2 | 49 | 31 |
| 26 | 14 | 23 | 30 | 39 | 5 | 14 | 34 | 44 |
| 30 | 9 | 30 | 25 | 44 | 0 | 20 | 26 | 53 |

**MINUTES LATER THAN BRISBANE (NORTHERN DISTRICTS).**

| Date. | Cairns. | | Cloncurry. | | Hughenden. | | Townsville. | |
|---|---|---|---|---|---|---|---|---|
| | Rise. | Set. | Rise. | Set. | Rise. | Set. | Rise. | Set. |
| 1 | 7 | 49 | 36 | 63 | 20 | 49 | 7 | 41 |
| 3 | 3 | 55 | 34 | 67 | 18 | 52 | 4 | 45 |
| 5 | 9 | 51 | 37 | 64 | 21 | 50 | 8 | 43 |
| 7 | 13 | 43 | 39 | 59 | 24 | 45 | 12 | 36 |
| 9 | 24 | 31 | 46 | 52 | 31 | 37 | 21 | 27 |
| 11 | 34 | 21 | 54 | 44 | 38 | 29 | 29 | 18 |
| 13 | 44 | 10 | 61 | 37 | 45 | 23 | 37 | 10 |
| 15 | 52 | 4 | 66 | 33 | 50 | 19 | 43 | 5 |
| 17 | 55 | 3 | 68 | 32 | 51 | 18 | 45 | 4 |
| 19 | 52 | 8 | 66 | 36 | 50 | 21 | 43 | 8 |
| 21 | 44 | 11 | 61 | 38 | 45 | 23 | 37 | 11 |
| 23 | 34 | 21 | 54 | 44 | 38 | 29 | 29 | 18 |
| 25 | 24 | 31 | 46 | 52 | 31 | 37 | 21 | 27 |
| 27 | 14 | 42 | 39 | 59 | 24 | 44 | 13 | 36 |
| 30 | 3 | 53 | 34 | 66 | 18 | 51 | 4 | 44 |

*Phases of the Moon.*—Last Quarter, November 6th, 3.03 a.m.; New Moon, November 13th, 6.01 a.m.; First Quarter, November 21st, 7.44 a.m.; Full Moon, November 28th, 6.45 p.m.

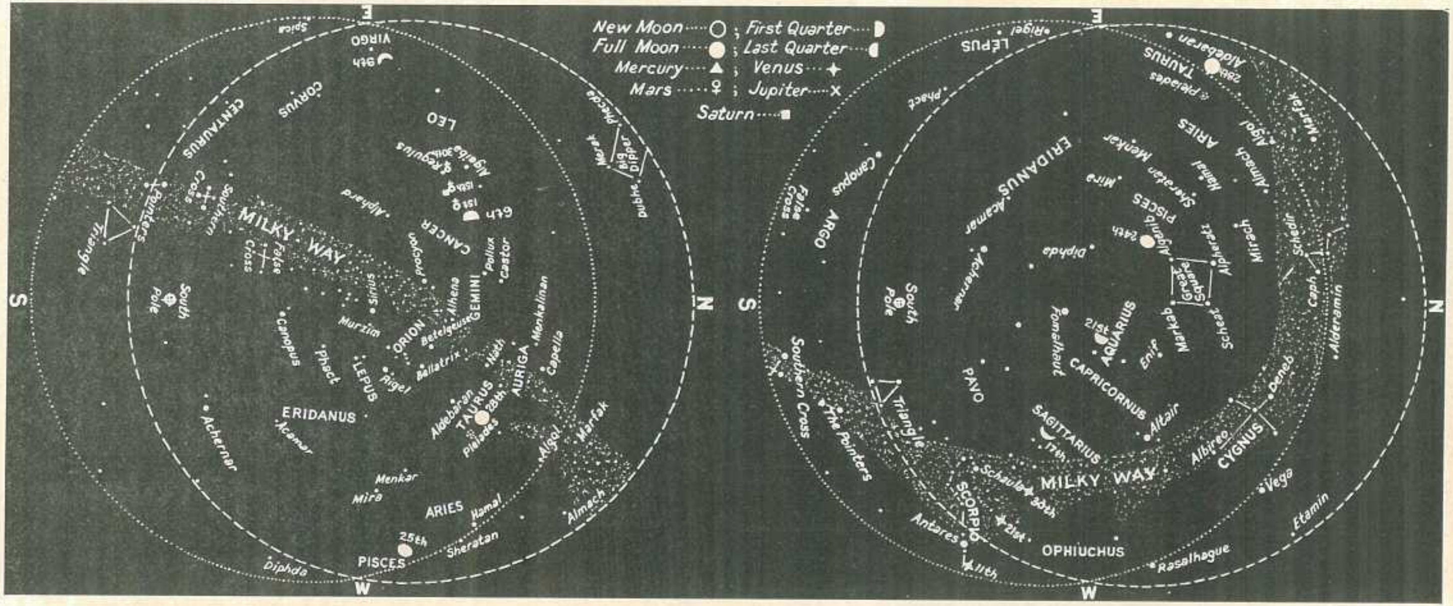
On November 15th the Sun will rise 20 degrees south of true east and true west respectively, and on November 10th and 24th the Moon will rise and set approximately at true east and true west.

On November 13th (Eastern Australian Date) there will be an annular eclipse of the Sun, but it will not be visible from Australia. The greater part of the earth from which it is visible is over the Pacific Ocean, but the path of annular phase also extends into South America. As a partial eclipse it may be seen from the western portion of North America and the northern portion of South America.

*Mercury.*—Will remain in the constellation of Libra all this month. At the beginning of November it will set about 50 minutes after the Sun, and on the 5th will be in conjunction with the Sun, when it will rise at sunrise and set at sunset; after which it will become a morning object and will reach its greatest angle west of the Sun on November 22nd, when it will rise about 1 hour before sunrise.

*Venus.*—At the beginning of the month, in the constellation of Libra will set 1 hour 10 minutes after the Sun. On the 9th in the constellation of Scorpio it will pass less than 1 degree to the south of Jupiter and by the end of the month will be a brilliant object in the western evening sky when it will set 1¼ hour after the Sun.

*Mars.*—This planet and Saturn are now in the same region of the sky. On the 1st Mars will rise between 1 a.m. and 2 a.m. and on the 11th will pass less than 1 degree to the north of Saturn while on the 27th it will pass 2 degrees to the north of Regulus.




*Jupiter.*—Now moving out of the evening sky. On the 1st it will set only about 2 hours after the Sun and by the end of the month will be too close in line with the Sun for observation.

*Saturn.*—At the beginning of November will rise between 1.15 a.m. and 2.15 a.m. and on the 30th will rise between 11.15 p.m. and 12.30 p.m. depending upon the place of observation within the State.

*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 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 one 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.

## SEPTEMBER RAINFALL.

*(Compiled from Telegraphic Reports.)*

| Divisions and Stations. | Average Rainfall. | | Total Rainfall. | |
|---|---|---|---|---|
| | Sept. | No. of years' re-cords. | Sept. 1946. | Sept. 1947. |
| | In. | | In. | In. |
| *North Coast.* | | | | |
| Atherton .. .. | 0·74 | 42 | Nil | 6·39 |
| Cairns .. .. | 1·65 | 61 | 0·09 | 2·92 |
| Cardwell .. .. | 1·47 | 71 | Nil | 5·92 |
| Cooktown .. .. | 0·56 | 67 | 0·01 | 0·58 |
| Herberton .. .. | 0·55 | 57 | Nil | 1·30 |
| Ingham ... .. | 1·51 | 51 | 0·52 | 3·09 |
| Innisfail .. .. | 3·52 | 62 | 0·11 | 7·22 |
| Mossman .. .. | 1·93 | 19 | 0·24 | 5·21 |
| Townsville .. .. | 0·70 | 72 | 0·01 | 2·62 |
| *Central Coast.* | | | | |
| Ayr .. .. .. | 1·21 | 56 | Nil | 2·49 |
| Bowen .. .. | 0·77 | 72 | Nil | 1·04 |
| Charters Towers .. | 0·75 | 61 | Nil | 2·32 |
| Mackay .. .. | 1·60 | 72 | 0·12 | 1·26 |
| Proserpine .. .. | 1·89 | 40 | 0·09 | 4·26 |
| St. Lawrence .. | 1·19 | 72 | 0·32 | 1·81 |
| *South Coast.* | | | | |
| Biggenden .. .. | 1·38 | 44 | 1·13 | 3·64 |
| Bundaberg .. .. | 1·48 | 60 | 1·08 | 5·56 |
| Brisbane Bureau .. | 1·98 | 95 | 3·67 | 2·93 |
| Caboolture .. .. | 1·76 | 67 | 3·96 | 3·49 |
| Childers .. .. | 1·64 | 48 | 0·71 | 4·85 |
| Crohamhurst.. .. | 2·49 | 50 | 3·23 | 3·87 |
| Esk .. .. .. | 1·94 | 56 | 4·26 | 2·67 |
| *South Coast—cont.* | | | | |
| Gatton College .. | 1·43 | 44 | 5·20 | .. |
| Gayndah .. .. | 1·47 | 72 | 2·23 | 4·26 |
| Gympie .. .. | 2·02 | 73 | 1·48 | 3·45 |
| Kilkivan .. .. | 1·61 | 62 | 0·96 | 3·39 |
| Maryborough .. | 1·84 | 72 | 0·76 | 4·53 |
| Nambour .. .. | 2·26 | 47 | 3·25 | 5·07 |
| Nanango .. .. | 1·71 | 61 | 2·19 | 2·48 |
| Rockhampton .. | 1·22 | 72 | 1·23 | 3·92 |
| Woodford .. .. | 2·04 | 55 | 3·06 | 3·07 |
| *Darling Downs.* | | | | |
| Dalby.. .. .. | 1·61 | 73 | 1·64 | 2·27 |
| Emu Vale .. .. | 1·66 | 47 | 3·85 | 2·82 |
| Jimbour .. .. | 1·52 | 64 | 1·64 | 2·15 |
| Miles .. .. .. | 1·26 | 58 | 1·72 | 3·18 |
| Stanthorpe .. .. | 2·19 | 70 | 4·47 | 3·05 |
| Toowoomba .. .. | 2·01 | 71 | 4·42 | 3·82 |
| Warwick .. .. | 1·75 | 78 | 4·49 | 2·73 |
| *Maranoa.* | | | | |
| Roma .. .. | 1·32 | 69 | 0·84 | 2·69 |
| St. George .. .. | 1·03 | 62 | 2·29 | 2·50 |
| *Central Highlands.* | | | | |
| Clermont .. .. | 0·95 | 72 | 0·01 | 3·26 |
| Springsure .. .. | 1·22 | 74 | 0·23 | 3·54 |

# CLIMATOLOGICAL DATA FOR SEPTEMBER.

*(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. |
| | In. | Deg. | Deg. | Deg. | | Deg. | | Pts. | |
| *Coastal.* | | | | | | | | | |
| Cairns .. .. .. | .. | 82 | 67 | 86 | 16, 19, 30 | 62 | 1, 2, 10, 12 | 292 | 9 |
| Herberton .. .. .. | .. | 76 | 57 | 83 | 6 | 50 | 1, 10 | 130 | 5 |
| Townsville .. .. .. | .. | 81 | 66 | 83 | 18 | 56 | 10 | 262 | 6 |
| Rockhampton .. .. | 30·12 | 78 | 59 | 90 | 30 | 49 | 10 | 392 | 10 |
| Brisbane .. .. .. | 30·15 | 74 | 57 | 82 | 29 | 47 | 11 | 293 | 13 |
| *Darling Downs.* | | | | | | | | | |
| Dalby .. .. .. | .. | 73 | 48 | 84 | 30 | 37 | 10, 11 | 227 | 7 |
| Stanthorpe .. .. .. | .. | 67 | 42 | 79 | 14 | 28 | 11 | 305 | 8 |
| Toowoomba .. .. | .. | 69 | 48 | 78 | 29 | 40 | 4, 11, 18 | 382 | 9 |
| *Mid-Interior.* | | | | | | | | | |
| Georgetown .. .. | 30·06 | 90 | 66 | 95 | 14 | 58 | 1, 10 | 145 | 2 |
| Longreach .. .. .. | 30·12 | 81 | 52 | 93 | 30 | 40 | 17 | 260 | 8 |
| Mitchell .. .. .. | 30·13 | 72 | 49 | 87 | 30 | 37 | 10 | 299 | 8 |
| *Western.* | | | | | | | | | |
| Burketown .. .. .. | .. | 88 | 65 | 96 | 21 | 58 | 19 | 93 | 4 |
| Boulia .. .. .. | 30·05 | 80 | 59 | 98 | 30 | 50 | 9, 18 | 125 | 5 |
| Thargomindah .. .. | 30·10 | 74 | 54 | 90 | 30 | 45 | 10 | 47 | 2 |

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

Commonwealth of Australia,
Meteorological Bureau, Brisbane.