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**COVER PICTURE:** Miss Diane King Mounted on "Chips" at Her Father's Property, "Kengoon", in the Fassifern Valley. Mr. W. H. King's 648 acre cattle fattening property, with its automatic irrigation system, was admired by the party of journalists on the 1960 R.N.A.—Shell goodwill tour.

**EDITOR:** *E. T. Hockings*

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Plate 1

Hybrid Grain Sorghum Varieties were Compared with the Standard Variety Alpha in this Field Trial at the Hermitage Regional Experiment Station. Yields were: Texas 610 (left), 112 bushels an acre; Alpha (centre), 81; and Combine Kafir 60 x Alpha, 119.

## Hybrid Sorghum Holds Promise

By R. F. MOORE, Plant Breeder, Agriculture Branch

*The first trials of hybrid grain sorghum in Queensland have recently been completed. Results are promising and indicate that a change over to hybrids as occurred with maize may take place with sorghum. Details of the trials are given in this article.*

For many years it has been known that varieties of sorghum, when crossed, exhibit a large amount of hybrid vigour, particularly in the first generation after crossing. This is a similar situation to that which occurs in maize.

The development of sorghum hybrids was delayed by problems of seed production since no simple procedure, similar to the removal of the tassel in maize, was possible in sorghum to allow of complete cross-fertilization. The sorghum head is made up of thousands of flowers each with its own pollen-sacs. Before complete cross-pollination can take place to give first generation hybrid seed, these pollen sacs must be removed or made ineffective. In 1952 a special strain of sorghum which produces no pollen was bred in Texas, United States of

America. This strain is referred to as a "cytoplasmic male-sterile" and has the capacity, when pollinated by pollen from its male-fertile counterpart, to produce offspring which are all male-sterile. When pollinated by pollen from some other strains such as Caprock or Alpha, it produces male-fertile hybrids, some of which are capable of giving increased yields of grain.

### American Results

By 1955 cytoplasmic male-sterility had been introduced into a number of varieties—notably Martin, Wheatland and Combine Kafir 60. These were crossed with varieties which restore male-fertility and the hybrids which resulted were grown in field trials. By planting a large number of trials it was possible to determine



after two years that about eight hybrids were superior.

As a general rule, the hybrids are **early maturing, slightly taller than their parents and have a capacity to produce high yields.**

Yield increases registered in America vary, but in the State of Texas, where from 3 million to 6 million acres of sorghum are planted each year, official estimates of the increase in yield over standard varieties are from 20 to 40 per cent. Hybrids have been accepted rapidly in America and in many States well over 50 per cent. of grain sorghum planted is hybrid.

### Queensland Trials

In May, 1958, the parent lines of some American hybrid sorghums were planted in Queensland under quarantine conditions. During the summer of 1958-59, seed supplies were built up and this seed was planted in seven field trials last summer. The location of these trials and the yields obtained from eight hybrids are given in Table 1. The two standard varieties were planted in each trial for comparison with the hybrids.

The average yield for each hybrid surpassed that of Alpha by 23 to 45 per cent. and that of Early Kalo by 28 to 47 per cent. In only one trial was a hybrid outyielded by a standard variety, and this hybrid (Martin x Caprock) has now been discarded. This aspect of the trials is very pleasing: the hybrids as a group appear



Plate 2

**Parents of Hybrid Grain Sorghums are Produced Under Bags at the Hermitage Regional Experiment Station.**

consistently superior to the standard varieties. Several of the hybrids appear at this stage to be outstanding. These are Texas 610, Texas 630 and Combine Kafir 60 x Alpha.

**Texas 610** is an early maturing hybrid, being similar in maturity to Early Kalo in southern Queensland. The large grain is light-red in colour but is somewhat subject to bleaching. It is almost as tall as Early Kalo. In the 1959-60 trials, it averaged 41 per cent. more grain than the standard variety Alpha.

TABLE 1  
YIELD DATA (BUSHEL/ACRE)

| Strain              | Hermitage | Biloela | Mount Tyson   |              | Gatton | Kingaroy | Warwick | Per Cent. Increase over Alpha |
|---------------------|-----------|---------|---------------|--------------|--------|----------|---------|-------------------------------|
|                     |           |         | Early Planted | Late Planted |        |          |         |                               |
| <b>Hybrids—</b>     |           |         |               |              |        |          |         | %                             |
| Texas 601 .. ..     | 113       | 46      | 75            | 72           | 83     | 62       | 25      | 26                            |
| Texas 610 .. ..     | 112       | 61      | 78            | 76           | 95     | 73       | 36      | 41                            |
| Texas 620 .. ..     | 133       | 39      | 69            | 64           | 91     | 70       | 27      | 31                            |
| Texas 630 .. ..     | 113       | 51      | 72            | 79           | 92     | 76       | 31      | 36                            |
| Texas 660 .. ..     | 125       | 50      | 71            | 72           | 94     | 68       | 32      | 35                            |
| Combine Kafir       |           |         |               |              |        |          |         |                               |
| 60 x Alpha .. ..    | 119       | 51      | ..            | 74           | ..     | 67       | 30      | 45                            |
| Martin x Alpha ..   | 103       | 55      | ..            | 66           | ..     | 68       | 30      | 37                            |
| Martin x Caprock .. | 113       | 56      | 66            | 60           | 75     | 64       | 29      | 23                            |
| <b>Varieties—</b>   |           |         |               |              |        |          |         |                               |
| Alpha .. ..         | 81        | 37      | 60            | 50           | 82     | 50       | 17      | ..                            |
| Early Kalo .. ..    | 74        | 33      | 51            | 57           | 80     | ..       | 16      | ..                            |



**Texas 630** is only slightly behind Texas 610 in maturity. It has a very large white grain. It is similar in height to Texas 610. It averaged 36 per cent. more grain than Alpha.

**Combine Kafir 60 x Alpha** has the leading Queensland variety, Alpha, as its male-parent. Although not grown in America, this hybrid was promising in the five trials in which it was grown here last year. It is early to mid-season in maturity, being earlier than Alpha but not so early as Early Kalo. It is almost as tall as Early Kalo. Its grain size is larger than that of Alpha but smaller than that of the other hybrids. This hybrid, which was sown in only five of the seven trials, yielded 45 per cent. more grain than Alpha.

### Seed Production

Last summer four Apprentice Crossing Plots (to produce hybrid seed) were grown by farmers who in the past have grown Certified Sorghum Seed. The area of each plot was two acres. The purpose of these Apprentice Plots was to enable the farmers to obtain experience in the production of seed and to produce seed so that farmers could test these hybrids on their own properties. Seed from these Crossing Plots has

been allocated to various farmers and there is at present no further seed available. Next year it is planned to grow about 14 Apprentice Crossing Plots, with a total area of approximately 150 acres. They will be produced under Departmental supervision but will *not be Certified Seed Plots*. Ample seed should be available from these Apprentice Crossing Plots for all interested farmers to try on their properties in the summer of 1961-62.

### A Warning

Although hybrid sorghum has proved successful in America, there is no guarantee that it will be suitable for Queensland farmers, although results so far are most encouraging. Testing over a number of years is required to determine this. Next summer about 12 trials will be sown and the results of these trials will be published in this Journal. With the information from these further trials it should be possible to state more definitely what hybrid sorghum can contribute to Queensland grain farming.

If next summer's trial results are as promising as those of last summer, then hybrid sorghum seed could be produced under a *Seed Certification Scheme* in the summer of 1961-62.



Plate 3

**This is a Crossing Plot Grown to Produce the Hybrid Sorghum Combine Kafir 60 x Alpha.** The grower, Mr. C. Ziebell, of Mount Tyson, is standing between Alpha, the pollen parent (left) and Combine Kafir 60, the male-sterile plant that bears the hybrid seed.



# Give Your Pigs Water, And Keep Them Growing

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

To make 1 lb. of pork, a pig must drink 1 gal. or more of water. So, if you expect your pigs to gain 1 lb. or more a day they must have ample water available at all times.

Growing pigs will drink from 1 to 2 gal. and brood sows up to 5 or 6 gal. a day. It has been known for some time that suckers at 6 weeks being fed on creep feed will drink up to 2 gal. a day although they are still being provided with their mother's milk.

Feed costs go up when the consumption of water goes down. Tests show that animals limited by 25 per cent. of the water they would normally consume, cost 25 per cent. more per 100 lb. of gain. This might well mean that pigs short of water to the extent of 25 per cent. could cost as much as £2 a head more at market weight. There goes the profit!

You might ask, "Why don't pigs continually fight over the water when there isn't enough?"

After the small ones have been pushed away from the water supply for a week or two, they take the line of least resistance. They get con-

ditioned and don't desire so much water. You have known the man who could work for half a day and never take a drink of water, while another carried a water bag at all times. That's conditioning, and that, with pigs, is where the costs occur. When half or more of your pigs no longer demand a full quota of water, gains are reduced and feed costs are increased.

Did you ever sell half of your top weight pen and in a short while have the smaller half rocket away to heavier weights? Could it be that for the first time they are getting enough liquid for maximum gain?

To get your pigs to take a maximum amount of water:

- (1) Have water available from three weeks of age.
- (2) Be sure there is adequate water space.
- (3) Never let the drinking equipment run out of water.
- (4) Keep water cool and fresh.
- (5) Use adequate balanced rations.



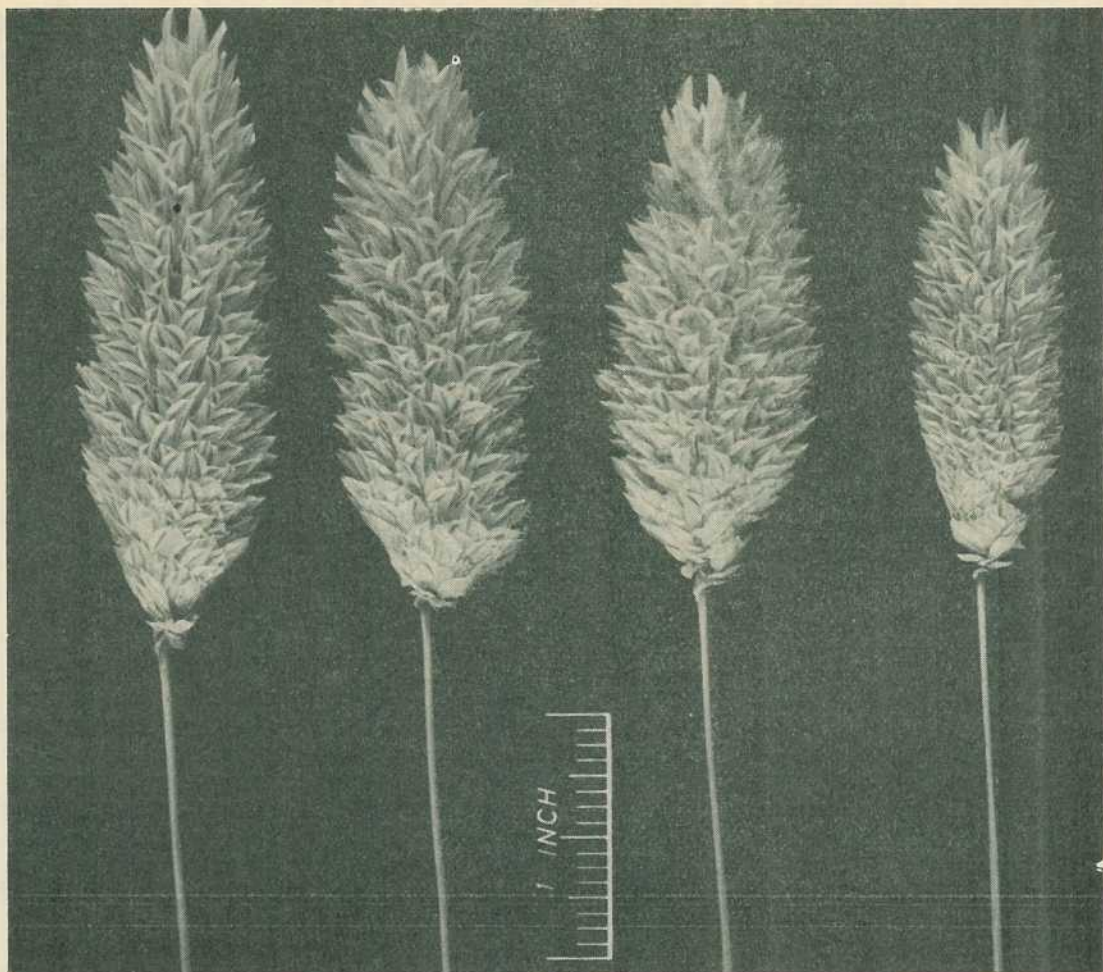


Plate 1

**Selected Heads of the Four Strains in the Canary Seed Strain Trial, Darling Downs, 1958.**  
 From left: Super Mammoth; Webster; Nunbank; and Standard. These heads though fairly typical perhaps emphasise the strain differences in head size and shape.

## Giant Canary Or Not?

By L. E. BRANDS, Adviser, Agriculture Branch.

Only five years ago, canary ranked highly as a grain crop on the Downs. It has lost that position, however, over the last few years, although this season shows a revival. This precarious situation is a direct result of fluctuating supplies and demands. The main canary seed producing countries, Turkey, Morocco and the Argentine, offer a very uniform Mammoth type of grain.

Favourable climatic and soil conditions and perhaps more efficient grading methods, hand harvesting and threshing, probably account for the bigger seed size.

So far, there has been no incentive for the Australian producer to grow "giant" canary. Only once, a premium has been paid for the bigger seeds and at times of low world market



supplies, seed size appears to be of no importance at all.

The apparent aim should be to grow the highest yielding varieties when big demands are anticipated.

To compare the yielding ability of different strains of canary, the Department carried out varietal trials in the Bowenville area during the past three years. The results of these trials revealed the following:

| Varieties        | Average Yields Per Acre in Lb. |               |               |
|------------------|--------------------------------|---------------|---------------|
|                  | 1957 %                         | 1958 %        | 1959 %        |
| Super Mammoth .. | 633 ( 88.0)                    | 1,343 ( 99.4) | 979 ( 85.9)   |
| Nunbank ..       | 694 ( 96.5)                    | 1,379 (102.1) | 1,094 ( 96)   |
| Webster ..       | 717 ( 99.7)                    | 1,340 ( 99.3) | 1,086 ( 95.3) |
| Standard ..      | 719 (100)                      | 1,351 (100)   | 1,139 (100)   |

The 1958 season with good, timely rainfall, shows excellent yields and very slight differentiation between the varieties.

Heavy rains and strong winds towards maturity and delayed harvesting caused the lower yields in the 1959 crop. The difference in production of Standard and Mammoth is quite apparent. The 1957 crop shows poor results due to moisture shortage. Here again Mammoth shows significant lower yielding ability.

Summarised, the position is that the Standard types of canary should be preferred to the Mammoth types, unless, of course, a special demand for the bigger seeds should occur.

With unstable markets, canary will remain a chance crop.



## Predicting the Protein Content of Wheat

Before flowering, the growth of the wheat plant has been directed towards the production of leaf and stem. It has drawn on the available plant foods in the soil, the moisture, the carbon dioxide in the air and the sunshine. The nitrogen and sugar compounds, at this stage, are relatively simple and in a soluble form. This is a necessary condition, in order that these compounds can be readily transported to the head. After reproduction has occurred, these soluble compounds are transformed into the insoluble protein and starch.

At the critical period of flowering, the plant should receive no setbacks such as would result from frost, disease and lack of rain.

With the desire to have a knowledge of the protein content in advance for segregation purposes, predictions are very useful. This information would allow the allocation of the necessary storage space. (Growers are accustomed to predicting grain yields, and in the barley industry, predictions are made of the amount of malt extract available from malting barley.)

From experimental work conducted by the Agricultural Chemical Laboratory, it has been found that at flowering time the total weight of nitrogen in the leaves and stalks has almost

reached a maximum value. About 40 per cent. of the total amount of nitrogen is retained in this section of the plant while the balance of 60 per cent. is transported to the head, during the period from flowering to full maturity. In terms of the weight of nitrogen, the head at maturity has about four times that which it had at flowering.

On a chemical analysis of the head at flowering, and the grain at maturity, the nitrogen percentage in the head at flowering is found to be about four-fifths of the value of the grain, both being on a moisture-free basis. Translating this result into more practical terms, the percentage of nitrogen (moisture free) at flowering, multiplied by six, is equal to the protein content (approximately) of the grain at 13.5 per cent. moisture content.

There are several factors to be observed when using predictions of this nature: The figures used are approximate; the conditions from flowering to maturity must be reasonably normal; head analyses should be made no later than the full flowering period; no fertilizer should have been used, either on the plant or in the soil; the sampling error at flowering is large compared with the grain sample.

—W. T. KELSO, Senior Cereal Chemist.



# This Dairy Herd Responded To More Feed

By L. A. WILLIS, Adviser in Cattle Husbandry.

During the four years from 1951 to 1955, the dairy herd of Mr. Harold Beattie, Coomera, averaged an annual production of 107 gal. of milk and 40 lb. butterfat **per acre**. Based on a return of 3s. 6d. lb. commercial butter, this represented a gross return of £8 8s. an acre on this 240-acre farm on the Coomera River flats in South-eastern Queensland. For the next four years, 1955-59, Mr. Beattie succeeded in achieving an average annual production of 150 gal. of milk and 56 lb. butterfat showing an average gross return of £11 15s. an acre. It's worth remembering that both of these four-year periods included a drought year.

An average **increased** return of £3 7s. an acre on 240 acres amounts to £804 a year over a four-year period.

As Mr. Beattie has had a wholemilk quota over this period ranging from 500-700 gal. a week, with the remainder of his milk sold at manufactured milk prices, his actual gross returns per acre would be greater than estimated here. However, for comparative purposes the price quoted serves to illustrate the improvement in production per acre.

The Beattie family's herd of 65 to 75 A.I.S. milkers has been production-recorded since 1951. Their figures reflect the progress made by using production records to assess feeding and farm management.

The production record of Mr. Beattie's herd is shown in Table 1, while Table 2 shows production and estimated returns on an acre basis.

TABLE 1

| Recording Year | No. of Cows | Average Production per Cow |                  | Lactation in Days |
|----------------|-------------|----------------------------|------------------|-------------------|
|                |             | Milk in gal.               | Butterfat in lb. |                   |
| 1951-52        | 65          | 371                        | 135              | 243               |
| 1952-53        | 67          | 456                        | 176              | 232               |
| 1953-54        | 53          | 404                        | 145              | 259               |
| 1954-55        | 60          | 440                        | 167              | 258               |
| 1955-56        | 65          | 511                        | 197              | 256               |
| 1956-57        | 71          | 435                        | 163              | 277               |
| 1957-58        | 65          | 523                        | 190              | 277               |
| 1958-59        | 75          | 614                        | 233              | 285               |

TABLE 2

| Recording Year | No. of Cows | Production per Acre |                  | Estimated Return Per Acre at 3s. 6d. Lb. C.B. |
|----------------|-------------|---------------------|------------------|---|
|                |             | Milk in gal.        | Butterfat in lb. |   |
| 1951-52        | 65          | 100                 | 37               | £ s. d.<br>7 14 0                             |
| 1952-53        | 67          | 127                 | 48               | 10 3 0  |
| 1953-54        | 53          | 89                  | 32               | 6 13 0  |
| 1954-55        | 60          | 110                 | 42               | 8 15 0  |
| 1955-56        | 65          | 138                 | 53               | 11 4 0  |
| 1956-57        | 71          | 129                 | 48               | 10 3 0  |
| 1957-58        | 65          | 142                 | 51               | 10 13 0                                       |
| 1958-59        | 75          | 192                 | 73               | 15 8 0  |

How has this increased return been obtained? Better feeding is probably the main factor, with other practices such as careful selection of herd replacements and controlled calving playing a part.

However, better feeding has not meant an increase in quantities of purchased concentrates.



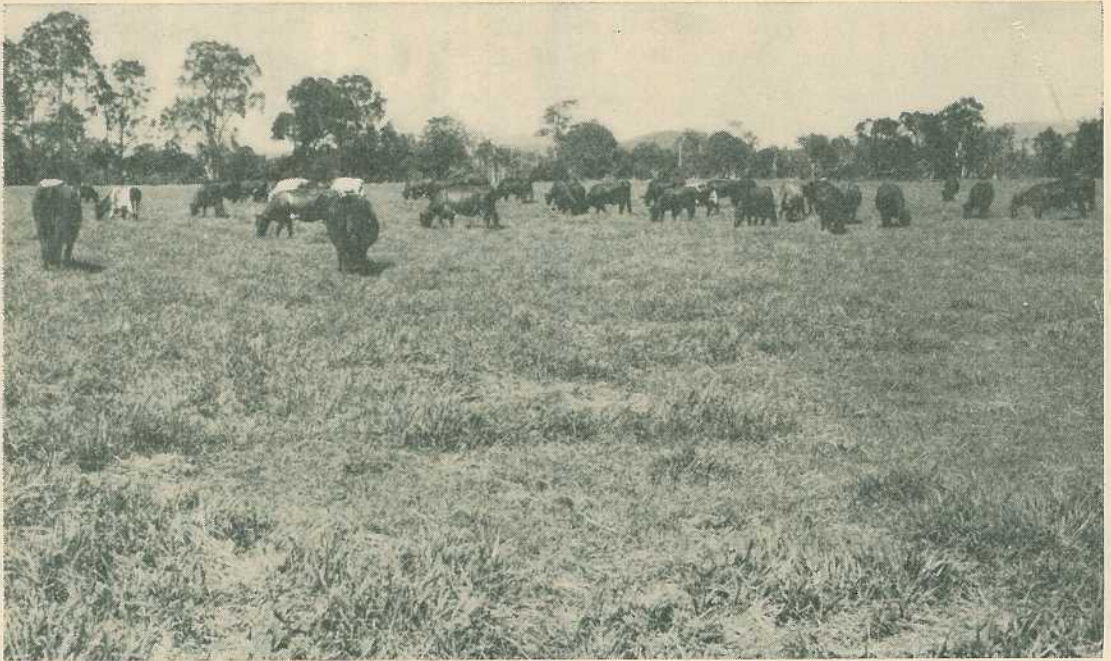


Plate 1

**Paspalum and White Clover Give Good Grazing on the River Flats.**



Plate 2

**Saccaline is grown to Supply Feed when Pastures are lacking in Bulk.**





Plate 3

**The Windbreak of Pine Trees is both Useful and Decorative.**

In fact, the rate of concentrate feeding has not changed from 1951 to 1959. Better feeding in this case has meant better utilization of the feed

that has been grown, an improvement in the quality and productivity of the pastures and the use of crops to fill the gap when pasture growth slowed down. In brief, this is what has been done.

The increased quantity of feed available has warranted the use of more cows. This has helped to boost the per acre return in an economical way.

**Subdivision** of this 240-acre farm into 30 paddocks has played an important role in boosting production. The combined effects of spelling paddocks, ripping, fertilizing and mowing when needed, maintain a good growth of paspalum and clover on the flats near the banks of the Coomera River.

Each autumn the pastures are mown and top-dressed with superphosphate at the rate of one bag to the acre. This helps to provide a good growth of clover during the winter and early spring when grass growth is somewhat slow.

To supplement the pastures, 13 acres of cultivation provide extra feed. Six acres of maize and sweet sorghum with three acres of cowcane and four acres of elephant grass help to maintain the cows' condition and enables them to convert the good quality pasture and concentrates into profitable production.

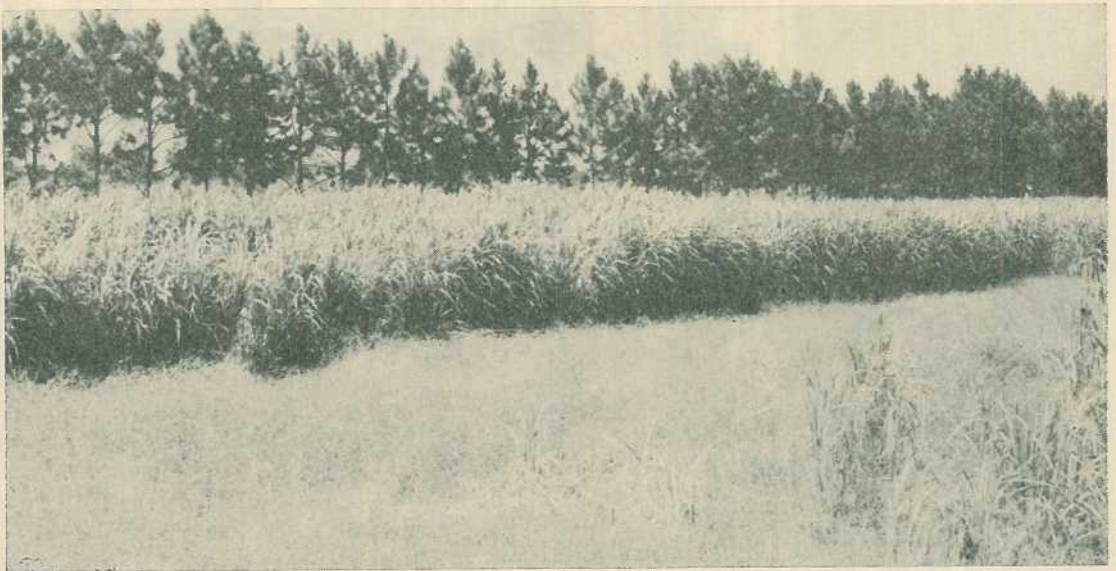


Plate 4

**Cowcane is a Bulky Fodder Especially Useful in Late Winter.**



The use of a bull paddock to control matings enables calvings to be arranged at the most profitable time of the year.

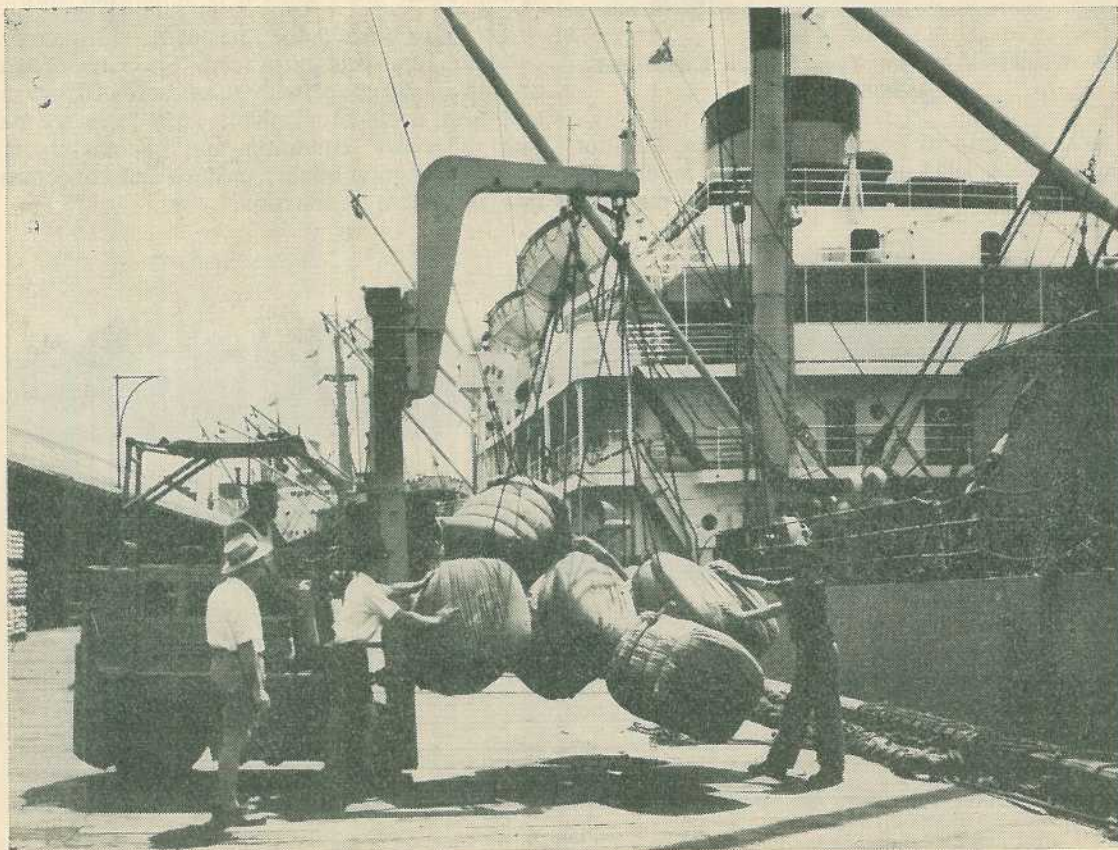
Herd replacement heifers are bred on the property. All heifers from top-producing cows are reared and are dehorned with a hot iron. Mr. Beattie realises the importance of maintaining good growth in heifers to get high production from them during their life in the milking herd.

He feeds wholemilk to the calves for the first month. From one month of age the calves are fed lucerne chaff and a good quality meal mixture.

Mr. Beattie has realised the importance of applying his production records to his feeding, breeding and farm management. His results indicate what can be achieved by making better use of farm resources.



## Wool Goes Overseas



Queensland Wool Consigned to Genoa Being Loaded at Dalgety's Wharf, Brisbane.



# bucket and bail

**Electric Dairy Water Heaters.** From reports from field officers, there appears to be some misunderstanding concerning the operation of electric dairy water heaters and the operation of the "Boiling Switch" frequently incorrectly named "Booster Switch".

Certainly it costs more to heat 14 gal. of water to boiling point (212 deg. F.) than to 180 deg., but in the dairy there is no option. The water for final rinsing must be boiling if it is to do the job intended. The "booster switch" does not switch any more heating elements on, as only one 1,000 watt element is fitted to water heaters. This switch simply disconnects the thermostat so that the power feeds directly into the element, regardless of the water temperature. The water can then be brought to boiling from 180 deg. during the 1 hr. milking time.

Electric dairy water heaters should not be confused with the new electrically heated pressure steam sterilizers recently approved for dairy use. These units provide steam for heating additional quantities of water and for steam sterilizing the machines and utensils.

—J. D. ELRINGTON, *Senior Dairy Adviser.*

**Use Colostrum Wisely.** For a very special reason, the first milk supplied by a cow after calving differs in composition from normal milk. The milk is reddish yellow in colour and has a strong odour and a bitter taste.

When it is born, the young animal has no reserves of vitamins. Colostrum is designed to compensate for this deficiency and in addition it supplies a large amount of protein fat and antibodies. For instance, the first milk drawn may contain up to 16 per cent. protein in contrast to a normal level of 3.3 per cent., and the mineral content may be 1.1 per cent. in comparison with 0.7 per cent. in later milkings.

With normal rearing the calf should be left with the cow for the first 24 hours, then weaned in isolation, and fed colostrum for at least three to four days.

While colostrum, or beastings, as it is sometimes called, is ideal for the young animal it is unfit for human consumption. It should not be included in the bulk herd milk for at least 10 days.

—W. D. MITCHELL, *Dairy Technologist.*

**New Foods From Milk.** The Queensland dairy industry is moving away from its traditional dependence on butter, the Minister for Agriculture and Forestry (Hon. O. O. Madsen, M.L.A.) said. Milk powders and continental-type cheeses are providing outlets for milk that would otherwise go into butter.

This is a trend that will give greater stability to dairying, he said. Farm incomes will no longer be influenced so severely by fluctuations on butter export markets.

In the last year, four big dairy associations had decided to install either milk concentrating or spray drying equipment. This will enable them to take milk from suppliers all the year round.

As well as the milk drying plants, a buttermilk drying plant has been established at Monto by the Port Curtis Co-operative Dairy Association. This brings the number of Queensland factories producing buttermilk powder to eight.

At the same time there has been a parallel move in the cheese industry to produce continental-type cheeses for the home market.

Trial production in Brisbane of cultured, unsalted butter has been successful, and this product seems assured of a small but steady market.



Production of hydrochloric casein will commence at the Maleny factory this season. This material will be used for glues in the plywood industry.

Mr. Madsen said the chances of finding export markets for powdered milk depended on a demand for milk protein foods from south-east Asia countries. As the economies of these countries becomes stabilised they can be expected to look to Australia, their nearest neighbour, to supply these necessary milk foods.

But at present the home market offers the best opportunity. The value of milk protein, either

skim-milk powder or buttermilk powder, is widely recognised in the stock raising industries. These materials can be used for feeding pigs, poultry and cattle. Demand exceeds the supplies at present available.

Mr. Madsen said the progress being made in finding alternative uses for milk was heartening. In the long term it would put a variety of new milk products on the Queensland market and free the dairy industry of its dependence on unstable overseas butter prices. The combined effect of this would be to make dairy farming a more rewarding occupation.



*It's written for Queenslanders*

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Plate 1: Pigs from the South Burnett Arriving in Good Condition at Cannon Hill.

## These Pigs Went To Market

By P. D. RANBY, Veterinary Officer.

It is advisable to avoid overfeeding pigs before trucking them to market. On the evening before, give them only a light feed or no food at all, for pigs transported by road on overloaded stomachs can die during the journey.

Plate 1 shows a truckload of pigs which have just arrived in good condition at the market. Note the slightly hollow flank. This indicates that they have not been overfed just before the journey. The pigs left the South Burnett area early in the morning. The sawdust litter in the back of the truck is still clean after the four-hour journey to market.

There is a risk if pigs are trucked on full stomachs. The rapid, jerky movements of the moving truck seem to place a nervous stress on pigs. If their stomachs are too full, they are unable to vomit. In addition, the distension of their stomachs is aggravated when they are tumbled about during the journey. Under these conditions, deaths have resulted.

In April, a bacon factory near Brisbane reported deaths in a truckload of pigs from

Kingaroy. Eleven of the porker pigs died. The pigs were large whites in good condition and had travelled during the cool of the early morning. Post-mortem examination of a number showed no abnormality except that their stomachs were very distended with sorghum meal.

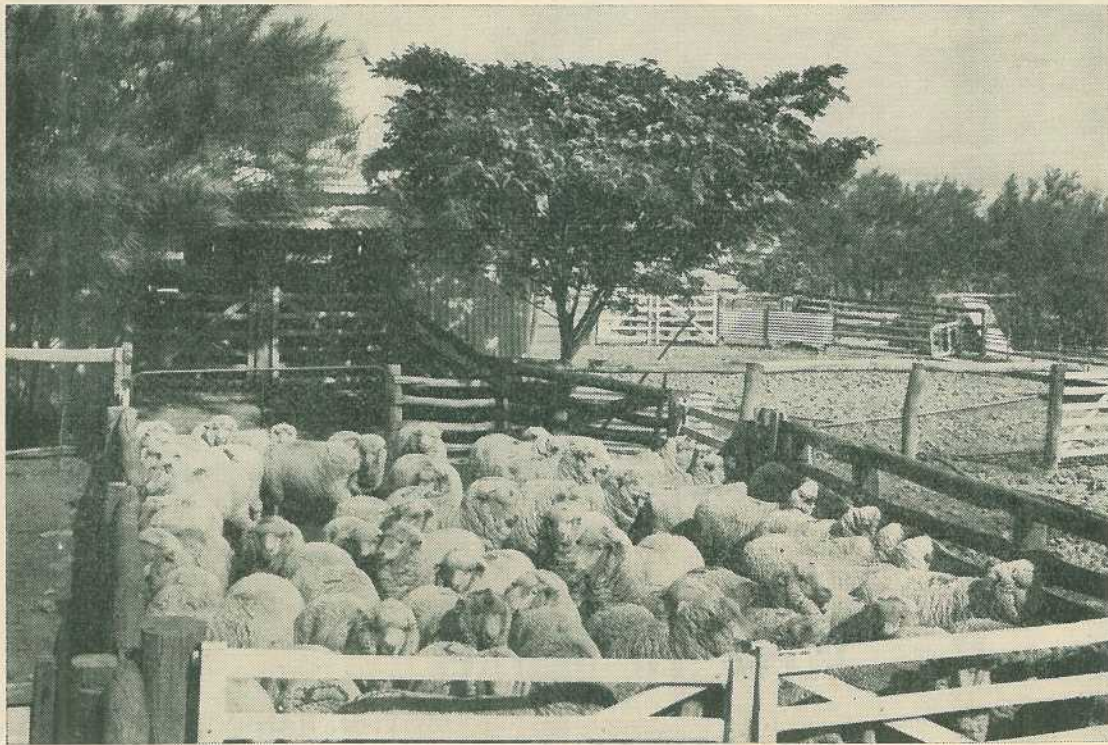
Stretching of the stomach wall, as in these cases, produces a nervous reflex action on the heart, in addition to pain. Such a reflex action results in heart "flutter" and then failure.

There is no doubt that these pigs were overfed on sorghum meal during the night before they were loaded on the truck; another example of deaths from trucking overfed pigs.

The position with rail transport is rather different from trucking by road. Pigs transported in rail waggons seem much more relaxed; the slower and more gentle movement of these waggons does not seem to cause nervous stress. The moving train keeps the pigs cool but with long stops in hot weather there may be a risk of heat stroke.



## Before and After



Top Photo Shows Woollies Going Up for Shearing and at the Bottom, the Shorn Sheep.



# Feeding Pullets From Day-Old To Maturity

By F. N. J. MILNE, Senior Poultry Husbandry Officer.

The first four weeks of life is a critical period in feeding chickens, because this is the brief space in which the chick (*a*) is dependent on yolk sac reserve (for the first week), (*b*) can only eat a limited amount of food, and (*c*) grows at a relatively faster rate than at any other time.

It is during, and generally towards the end of, this period that vitamin and mineral deficiencies appear surprisingly quickly and sometimes with disastrous results.

Such rapid growth calls for rapid assimilation of all food constituents, whether they be protein, carbohydrate, fat, vitamins or minerals. Rapid assimilation therefore requires a special type of ration—a chick starter mash which should have the following characteristics:

- (1) high protein content (a minimum of 18 per cent.);
- (2) low fibre content (4 to 5 per cent. is a good level);
- (3) adequate supplies of vitamins A, D3, and riboflavin, and
- (4) minerals such as calcium, phosphorus and manganese.

## Protein

A high protein mash with a minimum level of 18 per cent. is needed. If vegetable proteins such as peanut meal, soybean meal and cottonseed meal are used, at least 10 lb. of meat and bone meal would have to be added to supply sufficient of the "animal protein factor", the most important constituent of which is vitamin B12. If vegetable proteins were freely

available in Australia, then such a ration would still need a riboflavin and vitamin B12 rich supplement such as liver meal to ensure a full supply of vitamins.

## Fibre

Chickens cannot digest fibre to any extent. For this reason, mill-offals, barley meal or crushed oats should not be used to the same extent in starter rations as in rations for older birds.

Lucerne meal or fine chaff could be fed at the rate of 2 per cent. to supply the chick's requirements of vitamin K (the anti-haemorrhagic vitamin) but research has shown that lucerne meal or chaff has a growth-depressing effect on chickens, not related to its high fibre content, when fed at levels of 5 per cent. or more.

*Vitamin A:* Because chickens do not eat a lot of food during the first few weeks of life, it is questionable whether they can get sufficient green feed to supply their wants; also it is not certain how much "carry-over" of vitamin A there has been from the parent birds. It is therefore a wise precaution to *always* include cod-liver oil, fish-oil emulsion or stabilized vitamin A in powder form in chick starter rations. It may increase the cost of feeding slightly, but it is better to be sure than sorry.

*Vitamin D3:* Vitamin D3 is present in cod liver oil and is added to fish oil emulsions and the stabilized forms of vitamin A. It can also be synthesised by the chick through the action of the ultra-violet rays of sunlight on certain



fatty substances in the skin. Vitamin D3 promotes absorption of calcium and phosphorus and helps in their combination and deposition as bone.

Rickets in young chickens is easily detected by the presence of soft, rubbery beaks, "beaded" ribs, ragged-looking feathering and a desire by the chicks to squat down as often as possible. It is caused by a lack of vitamin D3, calcium or phosphorus or too much calcium or phosphorus in the ration. Generally the most frequent cause is brooding chickens in the absence of sunlight without a vitamin D3 rich supplement being added to the mash.

It is essential therefore to supply cod liver oil, fish oil emulsion with vitamins A and D3 or the powder form of stabilized vitamins A and D3 for battery brooded chickens.

This recommendation could be carried further to include *all chickens irrespective of how they are brooded*, because there are many occasions during the early rearing period when a farmer would not expose very young chickens to cold westerly winds or bleak overcast days encountered in outside runs.

It is possible to induce rickets in young chickens when liver meal is the sole source of animal protein. This is due to the fact that liver meal is poor in calcium but very rich in phosphorus leading to an imbalance. The addition of 3 per cent. ground limestone in this type of ration will prevent rickets. However, as liver meal is far more expensive than meat and bone meal, a safe limit would be 5 per cent.

**Riboflavin:** A deficiency of this vitamin produces "curled toe" paralysis in chickens. Just as riboflavin deficiency, affecting hatchability, will occur in breeding birds fed a laying mash instead of a suitable breeder's mash, so in young chickens this deficiency generally occurs when laying or growing mashers are fed to chickens in place of a good chick starter ration.

As the chickens grow older, their requirements of riboflavin decrease. Liver meal (5 per cent.), buttermilk powder (7 per cent.) and whey powder (7 per cent.) will ensure adequate amounts of riboflavin in the ration. In their place, synthetic riboflavin may be used. In experimental work carried out by the Poultry Section at the Kairi Regional Experiment Station

in north Queensland over the past five years, synthetic riboflavin has been used exclusively in chick rations because the riboflavin rich foods mentioned are often unobtainable there. However, it must be kept in mind that synthetic riboflavin supplies only one vitamin, whereas liver meal, for example, supplies highly valuable protein and a whole range of B-complex vitamins, including riboflavin.

**Vitamin B12:** The quantity of vitamin B12 inherited from the hen depends (as with, for example, vitamin A) on the amount present in the breeder's ration. Vitamin B12 is essential for growth and, provided good quality chick starter mashers with the protein supplied by animal protein are fed, a deficiency should never be encountered.

**Calcium:** This is not a real problem in chick feeding, for the demands for calcium are easily met from the meat and bone meal used in the ration. A small amount of finely crushed shell grit or ground limestone up to 1 per cent. of the ration can be given.

**Phosphorus:** The quantity of meat meal or other animal proteins used in chick starter mashers in Queensland to give a minimum protein level of 18 per cent. will ensure an ample supply of phosphorus.

**Manganese:** Some cases of perosis or slipped tendon have been diagnosed by the Animal Research Institute, Yeerongpilly. Because they are few, it does not mean that there may not be marginal deficiencies in some of our rations. A ration in which bran and pollard are not present or where they are used in limited quantities (under 40 per cent.) has a borderline manganese content. To offset a possible manganese deficiency, 6 oz. of commercial grade manganese sulphate should be added to every ton of mash.

Of the grains, wheat is the best source of manganese, but the manganese content of any grain is insufficient for the birds' needs. Maize has the lowest manganese content of all grains and the addition of manganese sulphate is necessary where maize meal forms 50 per cent. or more of an all-mash chick starter ration.

### **Weaning Period—4 to 8 weeks**

Although the rate of growth is beginning to slow down, no differentiation is made in the type



of ration required during the brooder and post brooder stage, so the requirements that apply to the first four weeks of life serve equally in the ensuing four weeks.

It is well to bear in mind that although the chicken's capacity for food is increasing, so are its requirements for vitamin A and that it is reaching a stage where it may have to face the hazards of coccidiosis (both caecal and intestinal), fowl pox (if vaccination is not practised) and roundworm infestation. Vitamin A does confer some resistance on the growing chicken to enable it to withstand these troubles. For that reason, it is a wise precaution to continue use of vitamin A supplements for the first eight weeks of life.

### **Weaning to Maturity**

During weaning to maturity, growth decreases while the amount of food eaten increases. A mash and grain system or an all-mash system of feeding may be adopted, but in either case, the protein content of mash or mash and grain should be 16 per cent. More fibrous feeds may be used in greater quantities.

Growing stock after weaning do not require the previous high levels of riboflavin and thus the amounts of such costly riboflavin-rich foods as liver meal, buttermilk powder and whey powder may be reduced or deleted from the ration. If an adequate supply of succulent green feed (5 lb. for 100 birds a day) is available, vitamin A supplements could be deleted at the discretion of the farmer. It must be stressed again that a shortage of vitamin A during this period can undo all the care and attention given to young pullets during the brooder and weaning periods and that the continual use of a vitamin A supplement would be a good insurance.

As the pullets approach maturity their calcium requirements increase in anticipation of their natural function, which is egg production. Most of the calcium is deposited as extra bone in the skeleton, to be used from this "bank" when production commences. During this stage the growing pullets should have shell grit or non-dolomitic limestone grit before them at all times. Should the pullets be housed intensively, proper absorption and utilisation of calcium and phosphorus cannot take place unless cod liver oil or a fish oil emulsion or other preparation containing vitamin D3 is added to the ration.

### **Adequate Feeding Space**

Unless chickens have enough room at the feed hopper, the full beneficial effect of a correct feeding programme and brooder and weaning technique cannot be realised. Too little feeding space results in an unruly, heaving mass of jostling chickens. The bigger ones, by virtue of their size and aggressiveness, are "first in and first served." The smaller chickens, when they do manage to get to the hopper, may only have sufficient time for a few beakfuls of mash which has been picked over by the stronger chickens, before they are chased away by the bullies.

Over a period of time, inadequate feeding space can cause much unevenness in size and development of a growing flock.

The following amounts of feeding space for various age groups of 100 chickens are necessary: day-old to three weeks of age, 10 linear feet; four weeks to six weeks of age, 20 linear feet (or 10 ft. of a double-sided hopper length), and seven weeks onwards, 30 linear feet (or 15 ft. of a double-sided hopper length).

### **Does and Don'ts**

(1) If liver meal, buttermilk powder or whey powder is in short supply, it will be necessary to use vitamin supplements containing riboflavin, pantothenic acid and vitamin K. A number of these in the form of premixes are now available from poultry feed and veterinary distributors.

(2) Restrict the amounts of crushed oats and barley meal to 10 per cent. of the ration.

(3) Linseed meal can be used in small amounts, but because of a toxic factor which may be present it should be used at no more than 5 per cent. of the ration.

(4) White French millet has been found to be a very satisfactory substitute for other grains. It may be fed whole without pre-crushing in the mash. The cheaper it is in relation to other grains, the more you should use.

(5) Don't feed liver meal as the sole source of animal protein. It may induce rickets unless ground limestone is added.

(6) If signs of crazy chick disease (nutritional encephalomalacia) are noted, the addition of 5 lb. to 10 lb. of wheat germ (a potent source of vitamin E) may help to curb the trouble.



# stock and station

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**Homemade Saddler's Clamps.** Horses are still much in demand on stations and anything that helps to keep saddlery in good repair and is at the same time economical is valuable to the stockowner. Amongst such gear that it is important to have always handy are saddler's clamps, awl, assorted saddler's needles, twine, and beeswax. With this should be an assortment of buckles, hobbles and chains, rings, and D's, of the miscellaneous kind saved thriftily by the "bower bird" type of stockman who treasures any useful odds and ends.

Saddler's clamps, generally referred to as "clams" by the old type stockman, are mostly of the homemade type. These are made from two well-matched staves from a discarded or fallen-to-pieces barrel, or fat tierce. The clamps are very simply constructed by putting a cup head nut and bolt through the bottom ends of the opposing staves. The clamps are used in the sitting position, straight upright between your knees. Insert the straps or leather to be sewn between the top inverted V of the clamps and get to work with awl, needle, and waxed twine. Sewn harness, girths, surcingles, and so on, are always more reliable than rivetted harness, and if you do your own repairs on convenient wet days or odd times you can feel when you do go to ride that lively colt that if you don't stay on top at least it isn't your gear that has let you down.

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

**Winter Feed Priority to Breeders.** The main purpose of feeding a supplement to beef cattle during winter is to prevent irrevocable loss of weight and condition. Cows close to calving or with young calves at foot should have first priority, with weaners and yearlings next in line.

At times, pastoral conditions in many districts are not good, although there is a fair body of standing native grass. The quality of this feed is not high enough to ensure that breeders and perhaps weaners will come through the winter in reasonable condition. A trend is springing up in the beef industry towards feeding supplements to at least part of the herd in the winter.

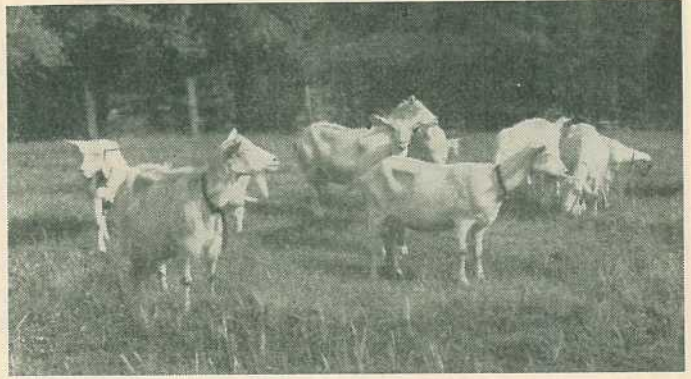
Graziers who decide to feed supplements to breeders should first draft off empty cows because these should still be in good condition. Where cows have calves about six months old, supplementary feed will be used most efficiently if the calves are weaned and given the extra food. Calves born in spring and summer are, in early winter, getting very little milk from their mothers. A small quantity of supplement fed to the cows would not increase the milk supply at this stage.

It is always difficult to decide just when to commence supplementary feeding. There is always a chance that the season may break and feeding will not be necessary. On the other hand, a little feed to breeders in fair condition is far more effective and economical than a lot of feed to breeders in very poor condition. There is a good deal in favour of starting to feed before the cows lose too much condition and vitality. Breeders often bring high prices in the early part of winter and replacement after a dry spell could be expected to be very expensive.

The three months, July, August and September, are the hardest of the year for cattle. If breeders are losing condition rapidly in June, losses are likely before the end of winter. Graziers in a position to give supplementary feed to selected cattle would do well to survey the position so they may act while there is still time.

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





# Milch Goats In Queensland—!

By G. I. ALEXANDER, Senior Cattle Husbandry Officer.

In many countries, goats represent a high proportion of the livestock population. In Australia, they have not yet attained the popularity reached overseas, this being due largely to the spaciousness of our country. Goats are most popular where the little land available must be utilized to its fullest capacity. There is a steadily increasing demand for goats in Australia from people living in the towns and cities who are not in a position to keep a cow. A cow costs about as much to feed as six or eight goats and she grazes over a correspondingly larger area. Goats have a further advantage over the cow as they are by nature browsing animals and will readily eat shrubs and bushes (Plates 1 and 2).

In inland Queensland, large numbers of goats are found but they are generally inferior as milkers. Much can be done to improve the standard of these animals by the continued use of only purebred bucks. This is a matter which is receiving the attention of some local authorities and much good has been done in grading up "town-bred" goats. In inland areas, goat's milk is often the only milk available, so an improvement in production is a worthwhile step.

## BREEDS OF MILCH GOATS

The most common breed of goats seen in Queensland is the Saanen (Plates 3-5), but other breeds will be described also so that goat breeders may compare their different characters.

*The Saanen.*—The points of a British Saanen are—A long head; facial line straight or dished with a coarse muzzle, with or without a beard; and hornless. Ears erect or pointing slightly forward but never broken or pendant; neck long and slender, with or without tassels. White, pale cream, or very pale biscuit colour is accepted, but white goats are preferred. Coats should be short, with or without a fringe down the back or down the hindquarters.

The following points are allowed but not regarded as necessary for an ideal goat: (1) horns; (2) black spots on the nose, eyelids, ears, and udder; and (3) slightly raised bridge to the nose.

The British Saanen is usually a larger animal with a shorter, sleeker coat and longer legs than the pure Saanen.

*The Toggenburg.*—The Toggenburg (Plate 6) is fairly popular in the southern States.

The British Toggenburg has the following characteristics: A long lean head, with or without a beard; horned or hornless. Facial line straight and muzzle somewhat coarse. Ears erect or pointing forward, but never broken or pendant. Neck long and slender, with or without tassels. Colour may be from fawn to dark chocolate with white facial lines along face, white legs from the knees and hocks downwards, white on the belly and on or about the tail. The coat should





Plate 1

Goats Browsing in North-western Queensland.

be short, with or without a fringe down the back and down the hindquarters.

The pure Toggenburg is very similar, with the colour being fawn and the markings cream or white.

The Toggenburg is quite a good milker.

*The Anglo-Nubian.*—The points of a typical Anglo-Nubian (Plate 7) are—Coat short with no fringe or long hair. Colour preferably black and tan, or reddish brown, with or without black or black and white markings but free from white streaks on the side of the face. The horns, if any, should be small and curve down and out. The ears must be long, wide and pendulous but not broken or twisted. The facial line should be plainly arched and the head neat, with a slight taper towards the muzzle, which should be small. The female has no beard.

The Anglo-Nubian yields rich milk, with a high butterfat content. They are quite large animals.

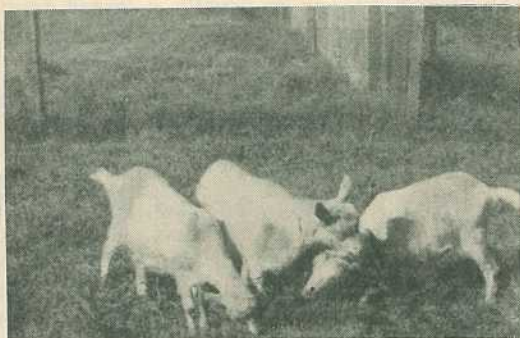


Plate 2

Kids Eating Leaves from a Branch Plucked from a Tree.

## GOAT'S MILK

Goat's milk is almost pure white in colour and is comparatively rich, with a fat content of about 5 per cent. The fat globules are small and, being in a more perfect state of emulsion than in cow's milk, do not come to the surface of the milk on standing as readily as those of cow's milk. The curd forms into very small flakes which, being soluble, are readily digestible. The features allied with the goat's freedom from tuberculosis make goat's milk valuable for infants and invalids. It has been used for infantile eczema.

*The Angora.*—The Angora goat (Plate 8) is noted for its fleece, which is known commercially as mohair. The average weight of fleece in a herd is about 2½ lb., ranging from 10-12 lb. from bucks to ½ lb. from kids. Castrated males between two and four years of age produce the best quality fleece.

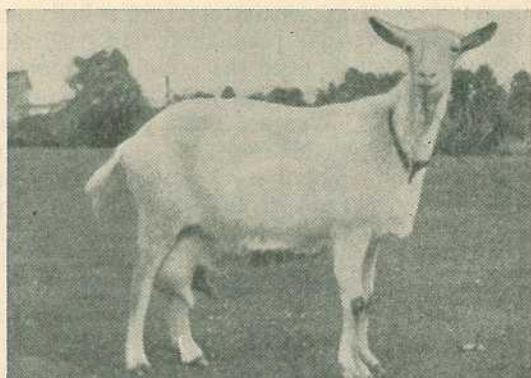


Plate 3

A Saanen Doe.

[Photo. by British Goat Society.]

The points are: Head fine, with fleece growing well over the forehead; ears wide, thin and semi-pendant, standing out and then lopping over. The horns are flat shaped, set far apart on the head, taper towards the tip, and have a slight twist which is accentuated in the female. The chief feature is the quality of the fleece, due to its length, texture, character, and freedom from hair.

*Composition.*—This varies considerably between individual animals. The following table gives a comparison between an average sample



of goat's milk with other milks of average quality:

| —                  | Goat      | Ewe       | Cow       | Human     |
|--------------------|-----------|-----------|-----------|-----------|
|                    | Per cent. | Per cent. | Per cent. | Per cent. |
| Protein .. ..      | 4.06      | 5.37      | 3.3       | 1.60      |
| Butterfat .. ..    | 5.14      | 3.65      | 4.0       | 4.4       |
| Sugar .. ..        | 5.28      | 5.46      | 5.0       | 6.9       |
| Salts .. ..        | 0.58      | 0.79      | 0.60      | 0.45      |
| Total Solids .. .. | 15.06     | 15.27     | 13.18     | 12.02     |
| Water .. ..        | 84.94     | 84.73     | 86.82     | 87.98     |

Goat's milk contains more total solids than cow's milk and only slightly less than ewe's milk.

**Yield.**—Good goats can give over a gallon a day and some goats produce far beyond this. The average goat kept under good conditions should yield about two quarts of milk daily over a period of seven to 10 months. Three pints a day is considered a fair production. A study of the official test records compiled under the British Official Pure-Bred Milch Goat Production Recording Scheme shows that, over a lactation period of 273 days, the average goat under test gave a total of about 2,000 lb. of milk and about 80 lb.

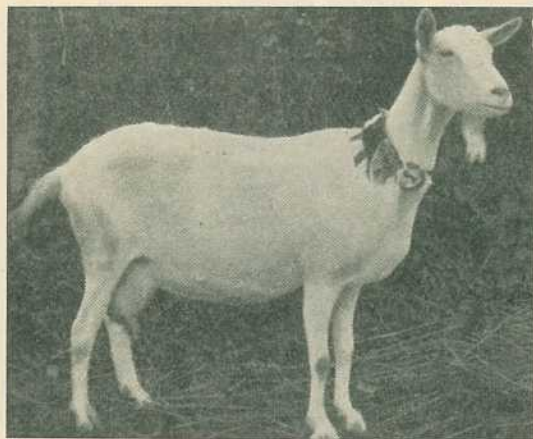


Plate 4  
The British Saanen.

[Photo. by British Goat Society.]

butterfat. This means a daily average of about six pints of milk. These are purebred goats, and grade animals may not achieve such high production figures. For the householder a good goat is one which will give 800-1,000 lb. (400 quarts) in one lactation.

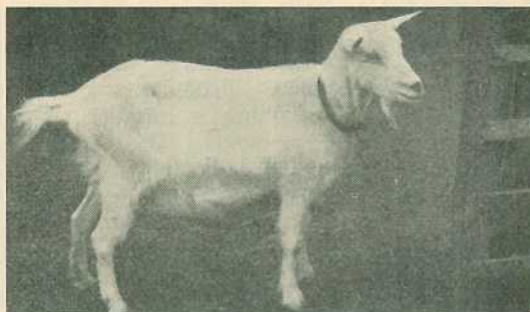


Plate 5  
A Saanen Doe.

### FEEDING OF MILCH GOATS

Milch goats require good feed and management, as do other types of farm animals. They are selective feeders and require good quality feed for maximum growth and production.

The most economical feed is good quality pasture. A good pasture is a young leafy growth of grass and legume. As pasture matures, its feeding value decreases and when fed alone it provides a ration of low food value. If goats are not fed supplementary food while pastures are deficient they will drop in production, lose condition, and ultimately dry off prematurely. Then even when the pasture does improve, it may be a matter of weeks before the does respond, if at all, to the improved feed. Supplementary feeding is therefore essential to maintain milk production.

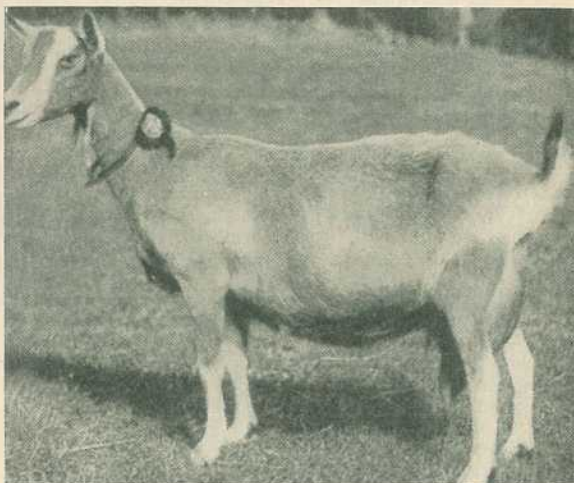


Plate 6  
A Toggenburg Doe.

[Photo. by British Goat Society.]



## Constituents of Feed

**Protein.**—The protein content of rations is of supreme importance. Proteins are complex chemical groups containing a number of substances known as amino-acids. The proteins fed in the diet are broken down by the digestive processes and by the action of bacteria in the rumen.

In the process they are reduced to their component amino-acids and these are then converted into other amino-acids and proteins which go to build up body tissues and muscle and produce milk.

Milking goats and growing kids require more protein in their diet than do bucks and dry stock.

## THE STANDARD IN AUSTRALIA

The current standard for the milch goat set out in the Goat Herd Book of Australia, is:—

|  | Doe | Buck | Perfect Score |      |
|--|-----|------|---------------|------|
|  |     |      | Doe           | Buck |
| General Appearance—<br>(Attractive individuality revealing vigour, feminity or masculinity with a harmonious blending and correlation of parts)  |     |      |               |      |
| Form, colour of hair and skin .. .. .  | 5   | 5    | ..            | ..   |
| Style and Quality—<br>Active and vigorous, showing breed character and vitality. Quality of hair, soft fine and glossy. Skin, loose and pliable ..   | 8   | 10   | ..            | ..   |
| Temperament—<br>Alert yet docile .. .. .   | 3   | 5    | 16            | 20   |
| Head—<br>Head medium length, fine, feminine in doe and masculine in buck. Forehead broad between eyes. Face—straight preferred—slightly dished—clean. Muzzle—broad strong lips not undershot, wide open nostril. Ears—upright, high on head, fine. Eyes—large, full and bright, amber colour preferred .. .. .   |     |      | 6             | 10   |
| Neck—<br>Long, fine, clean at junction with head evenly set into shoulders, no dewlap. Stronger and thicker in the buck. Ewe neck discouraged .. .. .  |     |      | 3             | 3    |
| Forequarters—<br>Withers lean and sharp. Shoulders—sloping, blending smoothly into body. Chine straight and strong, well developed vertebrae .. .. .   |     |      | 10            | 15   |
| Body—<br>Barrel long. Back straight and strong to hips, wedge shaped, well rounded large and deep abdomen, well sprung ribs. Bones of ribs broad, flat, long, wide apart. Chest fairly deep and full between and back of forelegs. No depression behind shoulder blades. Loins broad level, bones prominent, slightly wider across thurls than hips. Milk veins, prominent. Rudimentary teats on buck well developed .. .. . |     |      | 13            | 15   |
| Hindquarters—<br>Clean and strong, not cow hocked. Pins wide, thighs thin, wide and deep—rump high and broad, level laterally, well carried out .. .. .  |     |      | 10            | 15   |
| Legs—<br>Clean, strong and straight, feet apart giving a well poised body, pastern medium and springy  |     |      | 5             | 5    |
| Udder (Plates 9 and 10)—<br>Well developed according to age, nor pendulous nor unduly divided, carrying up well behind broadly attached with good fore development. Free from fleshiness, soft fine texture .. .. .  |     |      | 25            | ..   |
| Teats—<br>Well shaped, well placed (not too close or too far apart); well attached to udder—large enough to be grasped easily—2½–3 in. long .. .. .  |     |      | 5             | ..   |
| Bucks—<br>Genital organs, well developed, evenly balanced and not divided .. .. .  |     |      | ..            | 12   |
| Size and Weight (height taken at withers)—<br>Saanen—Buck, 35 in. and up, 180 lb. .. .. .<br>Doe, 30 in. and up, 135 lb. .. .. .<br>Toggenburg—Buck, 33–36 in., 150–175 lb. .. .. .<br>Does, 26–28 in., 100–135 lb. .. .. .  |     |      | 5             | 5    |
| Polled (naturally) .. .. .   |     |      | 2             | ..   |
|  |     |      | 100           | 100  |

(Twenty points should be deducted for horned bucks, and 10 points for neatly disbudded bucks).



**Carbohydrates and Fats.**—Carbohydrates and fats form the bulk of the food. They are the energy-producing constituents; they supply energy for movement and maintenance of body heat, and form body fats. They are also responsible for the butterfat and milk sugar (lactose) in the milk of the milch goat.

Fats yield about twice as much energy as carbohydrates. This accounts for the high energy value of foodstuffs, such as peanut meal and linseed meal, which contain relatively high proportions of fat. There is a minimum requirement of fat in the diet below which milk production will fall even though the energy requirements of the animal are met.

**Fibre.**—This is the coarse, less digestible part of the plant, the percentage of which increases as the plant matures. Young green plants are low in fibre, while old mature and dry plants contain a high percentage. Fibre has the important function of adding bulk to the diet. The normal processes of digestion in the animal are hindered if there is insufficient fibre. Some fibre is broken down in the rumen or paunch to supply a small part of the energy requirements of the goat.

**Minerals.**—Minerals are essential for normal growth and development. They are needed for the formation of bone, blood and other body tissues. Many minerals are essential to the goat but only a few are of general importance. These are phosphates, lime, and salt. Many soils, especially in the coastal areas, are deficient in phosphates, and so a deficiency of phosphates may occur in the stock on these areas. Salt and lime deficiencies may occur in hand-fed goats and it may be necessary to add supplements of salt and finely ground limestone or bonemeal.

High producing goats secrete more minerals in the milk at the peak of their production than they are able to absorb from the feed. During the latter part of their lactation and in the dry period, the depleted mineral resources are replenished. Good feeding must be continued during the dry period to make available minerals to replenish body stores depleted during the previous lactation.

**Vitamins.**—Goats, being ruminants, are less likely to suffer from vitamin deficiency than many other animals. Vitamin A is essential to goats and a deficiency may

occur in kids if they are deprived of the colostrum or first milk from their dam. Adults rarely suffer a vitamin A deficiency as they can store enough of the vitamin to tide them over any period of the year when it may be deficient or low in their diet. This is the only vitamin likely to be deficient under Queensland conditions.

### Classification of Fodders

Fodders are broadly classified into roughages and concentrates. Roughages are those foods, such as silage, hay, and mature pastures, which contain a relatively low percentage of energy food. There is no sharp dividing line between roughages and concentrates. Important fodders such as mill offals and feeds such as young green crops and pasture occupy intermediate positions between the two. However, when rationing, it is convenient to consider fodders as either roughages or concentrates.

### Roughages

**Pasture.**—Good pasture is the cheapest and best feed for goats. Paspalum is of higher food value than most Australian summer species, but, as it is affected by frosts, is particularly deficient during winter. Winter-growing species such as the rye-grasses, Toowoomba canary grass (*Phalaris tuberosa*), cocksfoot and white clover

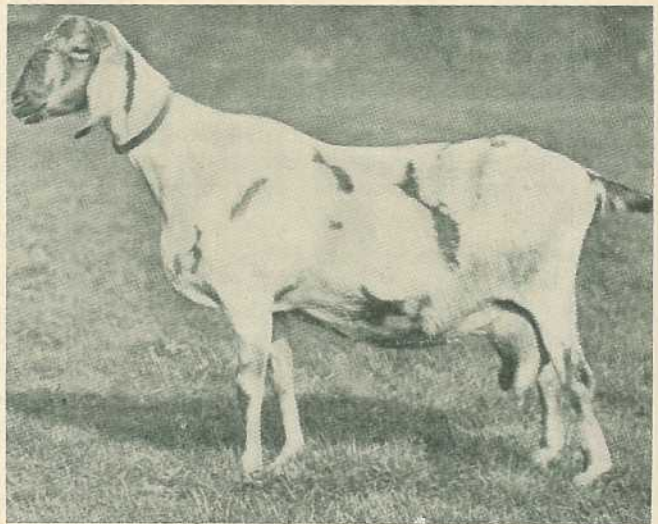


Plate 7

An Anglo-Nubian Doe.

[Photo. by British Goat Society.]





Plate 8

**An Angora Buck.**

[Photo. by British Goat Society.]

are suited for winter grazing. Grasses are constantly changing in chemical composition and so in food value. Young leafy grasses have a much higher food value than those with much stem and those which have commenced to flower or seed.

*Lucerne hay.*—Lucerne hay varies enormously in food value. As the main protein content of the feed is in the leaves, the amount of leaf is a good indication of the protein content. Good green colour also is an indication of high vitamin A content.

*Pasture hay.*—This varies widely in food value. First-class hay is obtained from young leafy stands containing a high proportion of clovers and in which the grasses have not fully flowered or seeded.

*Oaten and wheaten hay.*—These are low in protein when cut at the usual haying stage of "early milk" for wheat and "late dough" for oats, but are equal to lucerne hay in energy value.

**Concentrates**

*Maize.*—Although goats are capable of grinding maize grain, it is better to feed it crushed. Yellow maize is high in vitamin A and fat.

*Sorghum.*—Sorghum grain is equal to maize in feeding value. It is rich in carbohydrate and relatively low in fibre. The seed is small and hard and should be fed crushed or cracked.

*Oats.*—With fewer food units per 100 lb. than wheat, maize, barley, or sorghum, bulkiness is the great advantage of oats and crushed oats help to make the concentrate mixture more "open" and attractive to the animal.

*Wheat.*—Wheat should be fed coarsely ground or crushed. It should be fed mixed with other grains as excessive quantities without other grains may cause bloat or scouring.

*Peanut meal.*—Peanut meal is high in protein and fairly high in fat and minerals. It is a very useful concentrate. In addition, its palatability makes it a very useful ingredient of a concentrate mixture.

*Linseed meal.*—Linseed meal is rich in fat and high in protein content. It may be used up to 25 per cent. of the concentrate mixture. It should be fed dry to prevent prussic acid formation.

*Cottonseed meal.*—This meal is rich in fat, protein, and food units and is highly palatable. It has a similar protein content to peanut meal.

*Coconut meal.*—High in fat, and moderately high in protein, coconut meal is another very palatable meal.

*Meatmeal and blood meal.*—These high-protein feeds can be very satisfactory but their lack of palatability presents a problem, especially with some brands of meatmeal. If the goats can be induced to eat them, they are a very useful source of the protein necessary for milk production.

*Pollard.*—Pollard is about one and a-half times as rich in protein as grain, but the food unit value is slightly lower. A palatable concentrate, it is quite satisfactory in mixtures or alone.

*Bran.*—Bran has about the same protein content as pollard, but is slightly lower in food units. The advantages of bran are its palatability, its beneficial "leavening" effect on the texture of the concentrated mixtures in which it is used, and its laxative effect.

*Molasses.*—This feed is fairly high in food unit value, being a concentrated solution of sugars, but has no digestible protein. It is of value in increasing the palatability of feed and may be used to render rather unpalatable mixtures more acceptable to the animal.



Two Views of a Well-formed Udder.



Plate 9

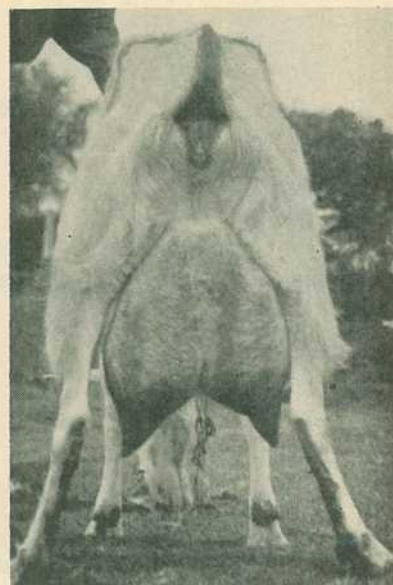


Plate 10

FODDER VALUES OF COMMONLY USED FODDERS

|  | Food Units<br>(Starch<br>Equivalent) | Digestible<br>Crude<br>Protein |
|--|--------------------------------------|--------------------------------|
|  | Per 100 lb.                          | Per 100 lb.                    |
| <b>Hay—</b>                            |                                      |                                |
| Lucerne .. .. .                        | 35                                   | 12.0                           |
| Cereal .. .. .                         | 35                                   | 2.0                            |
| <b>Protein-rich Concentrates—</b>      |                                      |                                |
| Blood Meal .. .. .                     | 60—70                                | 65—70                          |
| Meatmeal .. .. .                       | 75—80                                | 50—60                          |
| Peanut Meal .. .. .                    | 75—80                                | 40                             |
| Cottonseed Meal .. .. .                | 65—70                                | 40                             |
| Linseed Meal .. .. .                   | 65—70                                | 30                             |
| Coconut Meal .. .. .                   | 75                                   | 16                             |
| <b>Carbohydrate-rich Concentrates—</b> |                                      |                                |
| Maize Grain .. .. .                    | 75                                   | 10                             |
| Wheat Grain .. .. .                    | 70                                   | 10                             |
| Oat Grain .. .. .                      | 60                                   | 10                             |
| Sorghum Grain .. .. .                  | 75                                   | 10                             |
| Bran .. .. .                           | 55                                   | 12                             |
| Pollard .. .. .                        | 65                                   | 14                             |
| Molasses .. .. .                       | 50                                   | ..                             |

**Roughage Feeding**

The first essential in feeding the goat is to make sure that it gets adequate roughage. This means that it should have access to all the pasture it can eat. If the pasture is insufficient, other roughages should be allowed. Hay may be used; good quality legume hay is best, but cereals hays are quite suitable if supplemented by the right

type of concentrate. If available, silage is an excellent roughage feed. Free access to hay is probably the easiest way of giving the goat adequate roughage.

The usual amount of dry roughage supplied is about 3-6 lb. daily, but an increased weight is required when feeding silage or green crops because of the water content of these feeds.

**Concentrate Feeding**

When the roughage requirement of the milking goat has been satisfied, the concentrates to be fed must be considered. The type of concentrate to be fed is determined by a number of factors, of which the three important ones are—kind and quality of roughage; milk production of each goat; and cost of the various concentrate feeds.

The type of roughage fed governs the protein content of the concentrate mixture. If the roughage is good quality lucerne hay, lucerne chaff, young crops or young pasture, the concentrate mixture need only have 10-12 per cent. protein. This may be provided by grain alone or grain plus mill offals (bran and pollard). When the roughage is mixed with legume and cereal hay, mature green crops or good pasture, the concentrate mixture must have 14-16 per cent. protein. If the pasture is mature or cereal hay is provided, from 20-24 per cent. protein is required.



A mixture containing 10-12 per cent. protein is—

|                         |         |
|-------------------------|---------|
| Crushed grain .. .. .   | 1 part  |
| Pollard or bran .. .. . | 3 parts |

A mixture containing 14-16 per cent. protein is—

|                       |         |
|-----------------------|---------|
| Crushed grain .. .. . | 3 parts |
| Pollard .. .. .       | 1 part  |
| Bran .. .. .          | 1 part  |
| Linseed meal .. .. .  | 1 part  |

A mixture containing 20-24 per cent. protein is—

|                       |         |
|-----------------------|---------|
| Crushed grain .. .. . | 3 parts |
| Bran .. .. .          | 2 parts |
| Linseed meal .. .. .  | 4 parts |

or—

|                  |         |
|------------------|---------|
| Meatmeal .. .. . | 2 parts |
|------------------|---------|

If full hand-feeding is being carried out, the matter is simplified. Lucerne hay or chaff requires grain alone or grain plus mill offals. Cereal hay or chaff requires the mixture containing 20 per cent. protein.

Alternative rations are—

(a) For lucerne hay or chaff—

|                              |         |
|------------------------------|---------|
| (i.) Crushed grains .. .. .  | 1 part  |
| Bran or pollard .. .. .      | 3 parts |
| (ii.) Crushed grain .. .. .  | 4 parts |
| Linseed meal .. .. .         | 1 part  |
| (iii.) Crushed grain .. .. . | 9 parts |
| Peanut meal .. .. .          | 1 part  |

(b) For cereal hay or chaff (oaten or wheaten)—

|                              |         |
|------------------------------|---------|
| (i.) Crushed grain .. .. .   | 3 parts |
| Linseed meal .. .. .         | 2 parts |
| (ii.) Crushed grain .. .. .  | 3 parts |
| Peanut meal .. .. .          | 1 part  |
| (iii.) Crushed grain .. .. . | 3 parts |
| Bran .. .. .                 | 1 part  |
| Pollard .. .. .              | 1 part  |
| Linseed meal .. .. .         | 4 parts |
| (iv.) Crushed grain .. .. .  | 3 parts |
| Meatmeal .. .. .             | 1 part  |

The amount of concentrate to be fed to a milking doe depends on the amount of milk she produces. A pound of concentrate to each 4 lb. of milk produced is a good basis for feeding a milking goat. A close approximation of this is to feed 1 lb. of mixture per day for every three pints

of milk produced. A minimum ration of 1 lb. of concentrate per head is desirable.

If good pasture is not available, dry and pregnant does may be fed about 1 to 1½ lb. daily of a ration such as—

|                       |        |
|-----------------------|--------|
| Crushed grain .. .. . | 1 part |
| Crushed oats .. .. .  | 1 part |

or—

|                         |        |
|-------------------------|--------|
| Cracked grain .. .. .   | 1 part |
| Bran or pollard .. .. . | 1 part |

They should be maintained in a thrifty condition and not allowed to become too fat or to fall away excessively. Pasture or good quality hay may make up all the diet of dry animals, with grain fed just prior to parturition in order to prepare the doe for the following lactation.

The buck may be maintained in good thrifty condition on adequate good quality pasture. If there is insufficient, up to a pound daily of a concentrate mixture may be fed. Suitable concentrate mixtures would be:—

|                       |         |
|-----------------------|---------|
| Cracked grain .. .. . | 8 parts |
| Bran .. .. .          | 2 parts |
| Linseed meal .. .. .  | 1 part  |

or—

|                       |         |
|-----------------------|---------|
| Cracked grain .. .. . | 7 parts |
| Pollard .. .. .       | 3 parts |

## REARING THE KID

If the full supply of goat's milk is not required, the kid may be reared on the goat, allowing the kid the milk in one side of the udder or slightly less, depending on the production of the goat.

If the maximum of milk is required, the kid should be left on the doe for the first two or three days only in order to obtain the colostrum. Alternatively, the kid may be removed from the doe at kidding and fed the warm colostrum four times daily for the first two or three days. This may be done with an infant's feeding bottle. The kid may then be reared on ordinary warmed milk by bottle and gradually taught to drink from a dish. The milk should be warmed to body temperature and fed four times daily for the first three or four weeks, after which the number of feedings may be cut down to twice daily.

If maximum growth is desired, the kid should be fed as much milk as it will consume until about three months of age. Kids may be reared satisfactorily on separated cows' milk after about a fortnight. The change-over from whole to skim-



milk should be made gradually over about a week. The amount of milk required by a kid is about 1½ pints to 2 pints daily.

Kids should be encouraged to eat grain as early as possible and some whole grain or a mixture such as a calf meal should be made available after the first week to encourage the kid to nibble the grain. If the maximum amount of milk is required for domestic use, the kid may be weaned at about eight to 10 weeks provided it is fed some grain or meal. After about 3-4 months of age the feeding of the meal may be discontinued if good pasture is available.

### MANAGEMENT OF THE BUCK

The buck requires careful management. He should not be mated too soon or too frequently. With adequate feeding a buck can be used at 10 months without fear of stunting his growth. The buck becomes sexually active at about six to seven months and should be segregated from the females before that age. A separate yard should be provided for the buck, and the does in season should be brought in to him and removed after service.

Although the buck will not give very much trouble when running with the herd, this practice nevertheless has great disadvantages in contamination of milk. The buck contaminates the doe with the odour associated with him at mating time and the milk may be tainted at milking time.

The yard in which the buck is run should be large enough to allow him plenty of exercise. If kept clean by fairly frequent washing, the buck will not have any objectionable odour. It is desirable that he be taught to lead and tie up so as to be handled easily.

### MANAGEMENT OF THE DOE

Goats may breed throughout the year but usually they come in season only during the period February-March to September. During this period they will come in season every two to three weeks if not mated. They usually stay in season for two to three days.

Goats will mate at six to seven months, but unless the young doe is well grown it is preferable not to mate it until 12-18 months of age. As the gestation period or duration of pregnancy is approximately 150 days, the doe will then be 1½-2 years old when her first kids are born.

When a doe comes in season, she becomes very restless and will go off her feed. She will bleat persistently and frequently shake her tail rapidly. Usually the vulva swells considerably and becomes reddened.

Although goats usually come in oestrus for two to three days, the period of oestrus may sometimes be quite short and last only a few hours, so careful attention must be paid to the doe when considering mating her.

The surest sign of pregnancy is absence of oestrus subsequent to service. If a doe is carefully watched for two or three weeks after mating and no sign of oestrus is seen, it may be assumed that she is pregnant.

The condition of the pregnant doe exerts a great influence on the weight of the kids at birth and also on the subsequent lactation. She should be fed well and allowed plenty of exercise.

The signs of approaching parturition are enlargement of the vulva, hollowing of the flanks, restlessness, and continual bleating. The udder usually hardens and springs before kidding.

At parturition there should be as little outside interference as possible. As goats are relatively free from trouble at kidding, assistance is seldom required.

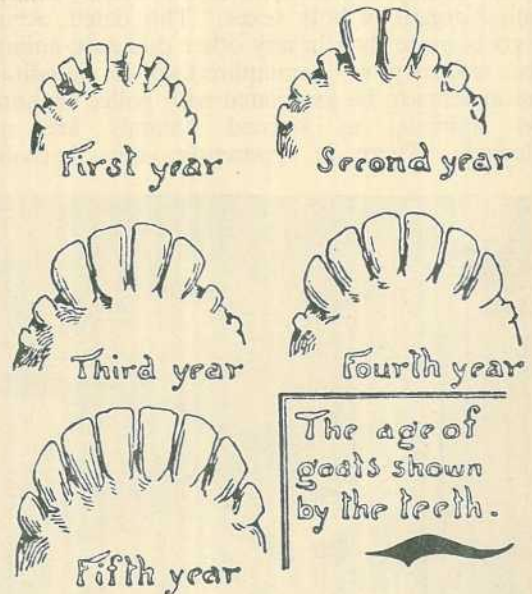


Plate 11  
Dentition of the Goat.

[Diagram by Hook.]



The usual number of kids is two, but frequently there are three, and occasionally four kids.

After kidding, the doe immediately licks the kid dry and usually the kid will then begin to suckle the udder. The afterbirth usually comes away within one or two hours; should it be retained for more than 24 hours, a veterinary surgeon should be consulted.

The doe may be fed a bran mash after kidding. This has a laxative effect and to some extent assists the animal to clean. The bran mash may be prepared as follows: To half a pound of bran and one teaspoonful of salt, add half a pint of boiling water. Cover the mixture with dry bran and then cover with a lid or cloth. The mash should be fed when cool. As mash sours readily, it should always be freshly prepared.

For the first three to five days after kidding, the milk, called colostrum or beastings, is unsuitable for human consumption. However, it is essential for the kids as it contains a high proportion of plasma proteins and vitamins which give the kids some measure of resistance to the diseases associated with young animals.

### HERMAPHRODISM

An hermaphrodite is an animal which has the genital organs of both sexes. This defect occurs in goats more than in any other domestic animal. The tendency to hermaphrodisism is hereditary and appears to be associated with polled or hornless animals, as horned animals are not affected. There is apparently some heritable

linkage between the polled character and hermaphrodisism. This is more noticeable the more closely the animals are bred. If possible, one of the parents in breeding goats should have (or have had) horns.

### MILKING

Milking may be done either from the side or from behind, depending on the milker's choice. However, it is preferable to milk from the side.

Before milking, the udder and teats should be thoroughly cleaned with a damp cloth, and it is of advantage to give the animal a quick groom to prevent hairs from falling into the bucket and causing odours in the milk. When milked out, the udder should be small and elastic with no appearance of flabbiness. A big disability with "town-bred" goats is the small size of the teats. This does not occur with Saanen goats. Frequent milking tends to increase the yield, but two milkings in 24 hours spaced as evenly as possible are sufficient for average goats. Regularity and completeness of milking are big factors in keeping up the milk flow. A long lactation period is more important than the amount produced per day, and in purchasing animals this point should be borne in mind.

Care is necessary in milking, as rough handling may predispose to mastitis.

Machines for milking goats (Plate 14) are available and are particularly useful where a number are milked daily. Using machines, it takes about two minutes to milk each goat. The machines must be carefully cleaned and tended

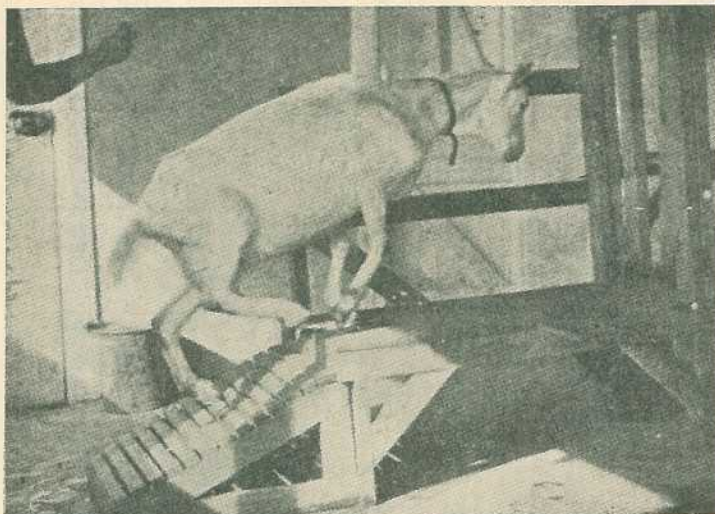


Plate 12

#### Goat Mounting a Milking Platform to Enter the Bail.

[Photo. by "New Zealand Farmer."]



and should be looked after in the same manner as milking machines for cows.

## DEHORNING OR DISBUDDING

There are two common methods of dehorning kids, namely chemical and cautery or hot iron.

### Chemical Dehorning

*Caustic Sticks.*—Kids up to 10 days old can be treated with caustic soda or caustic potash. Caustic soda has a tendency to spread and cause injury to surrounding tissues, so caustic potash is preferred.

Each "button" or horn bud is clipped to the size of a one shilling piece and then petroleum jelly is smeared outside the horn bud to check the caustic from running into the kid's eyes. The caustic stick is moistened and rubbed over the horn but with a circular motion until blood just starts to seep through the spot.

The caustic should only be applied to the area of skin covering the horn bud. Too much caustic may cause excessive burning and scarring of the head; too little rubbing will leave unsightly scars.

Care should be taken not to get any caustic on clothing or skin, as it is very injurious.

Afterwards the kid should be tied up for at least six hours in a place where it cannot get wet. This is to prevent scratching, rubbing or wetting, which may spread the caustic.

*Antimony Trichloride.*—This product has been incorporated in a solution of flexible collodion to form a very satisfactory dehorning agent.

The solution can be made up by a chemist according to the following formula:

|                              | per cent. |
|------------------------------|-----------|
| Antimony trichloride .. .. . | 28        |
| Salicylic acid .. .. .       | 7         |
| Flexible collodion .. .. .   | 65        |

The material is easy to apply and dries readily. There is much less pain associated with this than with caustic sticks and no danger of fluid running into the eyes. The solution is painted on after the area of application has been cleaned with methylated spirits. The animal need not be tied up or kept out of the rain.

### Cautery or Hot Iron

The cautery or hot iron method of dehorning is simple, efficient, safe and only slightly painful. A special debudding iron is used for the operation. The iron consists of a solid cylinder of iron or copper five-eighths of an inch in diameter, one end of which is hollowed to form a depression three-eighths of an inch in diameter and half an inch deep. This makes the end of the cylinder a metal ring one-eighth of an inch thick with five-eighths of an inch external diameter and three-eighths of an inch internal diameter. The iron is mounted in a wooden handle for convenient use. The iron may be made smaller if required as it is intended to give a snug fit over the horns to be removed. A soldering iron may be converted fairly readily into an efficient dehorning iron.

The iron is heated to a cherry-red colour and placed over the horn. It is then turned completely around several times until the base of the horn is completely covered by a copper-coloured ring. This indicates that the circulation of blood

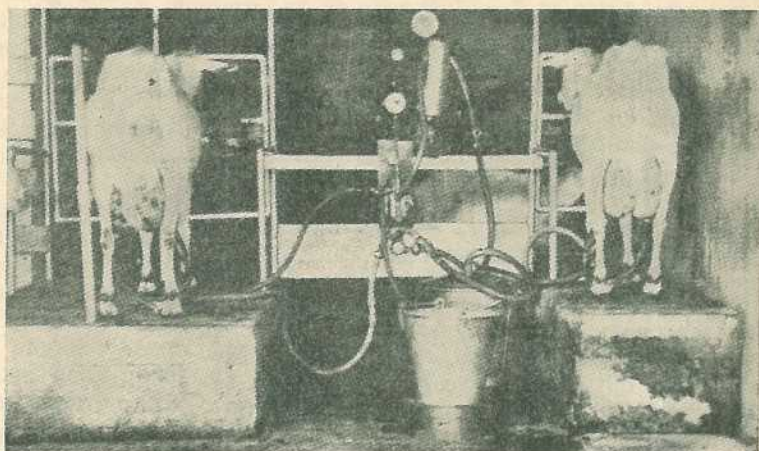


Plate 13

### Machine Milking of Goats on Milking Platforms.

[Photo. by "New Zealand Farmer."]



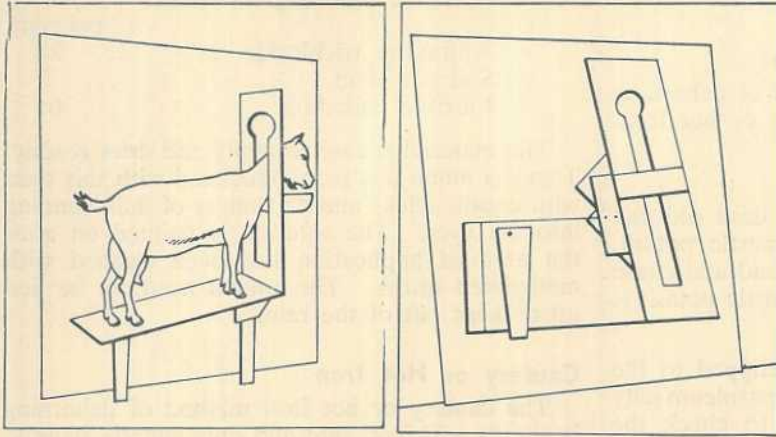


Plate 14  
**Sketches of a Folding Milking Stand.**

[From "Australian Goat World."]

to the horn has been destroyed. The operation takes 10-30 seconds and the horns drop off by themselves three to six weeks later. There is no haemorrhage, as the vessels are sealed by heat, and the wound produced is dry and clean, heals quickly and completely and cannot burn the dam's udder as caustic may do.

An electric soldering iron with a copper tip containing a hollow cone point similar to that described for the ordinary iron may be used if desired.

Older goats may be dehorned with cup dehorning as used for cattle. This operation is described in a leaflet on dehorning of cattle issued by the Department.

If goats are reared on country where their feet are not worn down as fast as they grow, the feet must be trimmed regularly every four to six weeks. If the feet are not trimmed the horn becomes long and distorted and the goat may become lame.

The wall or thick outside horn of the hoof should be pared level with the sole and the heel should be trimmed to remove any excess growth. The goat's hoof should be supported on a block of wood or box about 10-12 in. high and the wall pared, working from heel to toe.

If the male kids are not to be kept for stud purposes or for meat they should be killed at birth. If intended for meat, they should be castrated at 10 days to three weeks and killed at 3-6 months. At this stage, they are excellent eating, resembling lamb in flavour.

The teeth may be used as a basis for estimating the age of a goat, as shown in Plate 12.

The goat shed need not be elaborate. The minimum requirement is a shelter shed of 4 ft. x 5 ft. x 5 ft. high with a yard 15 ft. x 8 ft. In addition, the animal should be tethered outside this area to feed.

Inside the shelter shed should be a milking stand, which for ease of milking should be about 18 in. off the ground (Plates 13-15). The bench described and shown in Plate 15 is quite useful and can be kept on one side of the goat shed. For compactness, it may be hinged to the wall with two legs which are in turn hinged to the bench. When the bench is not in use, the legs may be folded under the bench and the bench folded down against the wall. Alternatively, a permanent bench may be erected.

While goats can be readily taught to stand while being milked, especially if being fed at the same time, some type of stall may be used to keep the animal under control. Two types are shown, one being a hinged type and the other resembling a keyhole. In the hinged type, the essential feature is that the hole be 3 in. wide, 1 ft. long and 20 in. from the level of the bench. Both are useful when feeding as they prevent the goat from scattering its food over the floor. The keyhole type is particularly useful when feeding hay from a rack, as it prevents the animal from pulling back from the hay and so scattering it on the floor. Goats are very particular about their food and will seldom eat hay which has been dropped on the floor.

(TO BE CONTINUED)



# pasture and crop

**What About These Summer Crops?** The crops in the news at the moment are tobacco, cotton, hybrid sorghum and soybeans.

Tobacco is a good crop and there's profit in good quality leaf. It's a bit expensive to get started and there's a good deal of know-how involved in its successful production. Don't rush into tobacco growing if you've never grown it before. Check first with someone who has.

Cotton, while not giving anything like the returns per acre of tobacco, has an unsaturated market. Cotton needs to be looked after carefully. You can't plant it and come back at picking time. It needs attention throughout the growing period. If you're prepared to give it close attention cotton could be a useful summer crop for you to grow.

If you've been used to growing grain sorghum then there is considerable evidence to show that hybrid sorghum will suit you better than the present commercial varieties like Alpha and Early Kalo. But there isn't a great deal of seed about as yet. Mr. Ron. Moore, the plant breeder on the job, is pushing ahead and this seed should soon be available generally.

Soybeans have been grown commercially for years in the South Burnett, and Mr. Arthur Kerr, the plant breeder at Kingaroy, has some good grazing and grain varieties. We'll certainly hear and see much more of this crop in the future. For the present, check on your market before you grow a large area and if you haven't grown them before, try a small area of a few acres and see what results you get.

For further details about these crops, and others, too, see your local officer from the Department of Agriculture and Stock.

—V. J. WAGNER, *Chief Agronomist.*

**Pure Seed Scheme for Cotton.** A scheme to produce pure seed of seven commercial cotton varieties has been announced by the Minister for Agriculture and Forestry (Hon. O. O. Madsen, M.L.A.). Pure seed will help Queensland farmers to improve the quality of their lint.

He said there was at present a lack of uniformity in much of the lint produced in Queensland, especially in strength and staple length. This may lower the grade and reduce the return to the grower. Improved seed will correct this wide variation.

The pure seed scheme is supervised by the Cotton Marketing Board and the Agriculture Department. Under the scheme, approved farmers will each grow one variety in isolation.

At all stages of growing and harvesting, the crop will be inspected by field officers of the scheme. Strict rules designed to preserve the purity of the seed and freedom from weed seeds and burr have been laid down. The Cotton Marketing Board will pay a bonus of £3 an acre to approved pure seed producers whose crops are grown in accordance with the rules.

Controls in the ginney will prevent the seed of different varieties from being mixed. Delinted seed will be tested for germination. The minimum germination permitted is 70 per cent.

Commercial varieties that will be grown are: Miller, Empire, Triumph, Lone Star, Arkot, New Mexico Acala, and Rowden. The Department is also building up stocks of at least a dozen new varieties. If tests prove any of these to be satisfactory, pure seed supplies will be increased for general distribution.

First plantings under the pure seed scheme will be made this spring and early summer, and fresh plantings will be made each year. For commercial crops, pure seed will be available from the 1961 planting season onwards.



A committee consisting of officers of the Department and the Cotton Marketing Board has been appointed to administer the scheme. One of the duties of this committee will be to select approved pure seed growers.

Mr. Madsen said setting up the pure seed scheme was a heartening example of self-help within the cotton industry. In the long term it would raise the standard of Queensland lint and increase the security of cotton growing as a farming venture.

**Extricating a Bogged Tractor.** If ever you bog a tractor, here is an easy way of getting out of the mire. First of all disconnect any implement attached to the tractor.

The equipment you will need will be a fairly substantial piece of wood about 7 ft. or 8 ft. in length, two lengths of chains with some bolts or joiners and, of course, a spade.

There is no need to be fussy about the piece of wood so long as it is strong enough and long enough to come outside the two rear wheels of the tractor. Even a piece of angle iron, pipe or anything available will do just as well providing it will support the weight of the tractor and will take the strain of the chains and wheels as they begin to go forward.

Get busy with the spade and dig in front of the two rear wheels and also under the sump.

Now lay the piece of wood, as far down under the two driving wheels as you can possibly get it.

With the wood in position fix it to the rear wheels by means of the two lengths of chain making quite sure, of course, that the chains do not foul the valves.

If the front wheels are on sound ground, well and good, but if they have sunk in, dig a shallow slope in front of each wheel.

Now start up the tractor and put it in low gear—the lowest possible—and this is very important, be sure to open the throttle only a fraction of the way. On no account rev the engine at full throttle. Let in the clutch gently and directly the tractor climbs out of the hole and over the piece of wood stop the tractor, otherwise the piece of wood will be taken up under the rear wings or catch up in the hydraulic linkage.

Always remember that labour is expensive, tractors are valuable and time is precious. So to avoid getting bogged observe the golden rules directly excessive wheel spin is experienced by lifting implements out if tractor mounted, or tripping out if of the trailing type. If this has no effect within split seconds, stop and unhitch.

Another golden rule to remember is to use a higher gear and lower engine revs under soft ground conditions. To use higher engine revs in a low gear is the surest formula for getting bogged on soft ground.

—C. G. WRAGGE, *Agricultural Engineer.*



## Atlas of Australian Resources

The latest batch of maps in the series making up the "Atlas of Australian Resources" contains two of special interest to primary producers.

The "Croplands" sheet shows by means of four maps the location of the areas used for the production of wheat and other important crops. The "Geology" map shows Australia's surface geology. A booklet of commentary is supplied with each map.

Other sheets and commentaries just issued deal with Mineral Industry, Manufacturing Industries, and Immigration.

Earlier maps in the series include Physical Features; Climatic Regions; Temperatures; Rain-fall; Drainage Systems; Conservation of Surface Water; Underground Water; Soils; Vegetation Regions; Dominant Land Use; Agricultural Production; Distribution of Stock; and a number of others.

The maps have been prepared by the Department of National Development and are distributed by Angus and Robertson Ltd., Sydney, to whom enquiries regarding availability and price should be directed.



# TOMATO DISEASES

## And How To Control Them—II

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

### Leaf Shrivel

Leaf shrivel, first recognised in Queensland in 1953, is the most recently detected disease of major importance which affects the tomato crop. Symptoms are not conspicuous, and it is possible that the disorder went unrecognised for many years prior to that time. It is caused by a virus known as potato virus Y.

The most serious effect upon the plant is loss of vigour, which is associated with loss of fruitfulness. Symptoms on the leaves consist of curling and slight mottling with occasional dark grey or brown spotting of the undersides (Plate 15).

The crops most affected are those planted in the autumn which have to set fruit in winter months. Here new infections are indicated by a slowing down in growth, and a slight yellowing of the tops. The new foliage appears somewhat more crinkled than normal, and does not mature to the smooth dark-green pattern of a healthy plant. Instead it remains pale and crinkled, bent slightly more downwards than normal, and becomes harsh and brittle with age. The premature loss of the older leaves gives this trouble the name of leaf shrivel (Plates 16 and 17).

In one controlled experiment where the variety Grosse Lisse (Q2) was tested, diseased plants yielded only 30 per cent. of the crop produced by healthy plants. This experiment was carried

out in a glasshouse, without which it would have been impossible to keep the uninfected check plants healthy. In the field, actual yield depression may be much greater, as affected plants are turgid and brittle and the foliage is greatly damaged by wind and rain.

The virus is introduced to tomato plantings by aphids. The rate at which infection occurs is often very rapid, and it is not unusual for a whole planting to be infected by the time that the first fruits have begun to set. A winter seedbed which is not protected from aphids may be totally infected with the virus before the seedlings are removed to the field. Wild gooseberries, apple of Peru, and the black-berried nightshade are weed hosts, and tobacco, capsicum and petunia are susceptible among the cultivated plants other than tomato.

Mosaic is a virus disease of tomatoes which is readily recognised by growers. Leaf shrivel is not so easy to recognise but is probably more widespread. Where both diseases occur simultaneously in a planting there is an almost complete collapse of the crop.

### Control

From what is known of leaf shrivel, it would appear that one possible means of control might be the eradication of aphids which transmit the virus. It has been shown, however, that even bi-weekly applications of parathion have failed to prevent the spread of the disease. Such treatments cannot be expected to kill incoming infective aphids before they feed on the plants,

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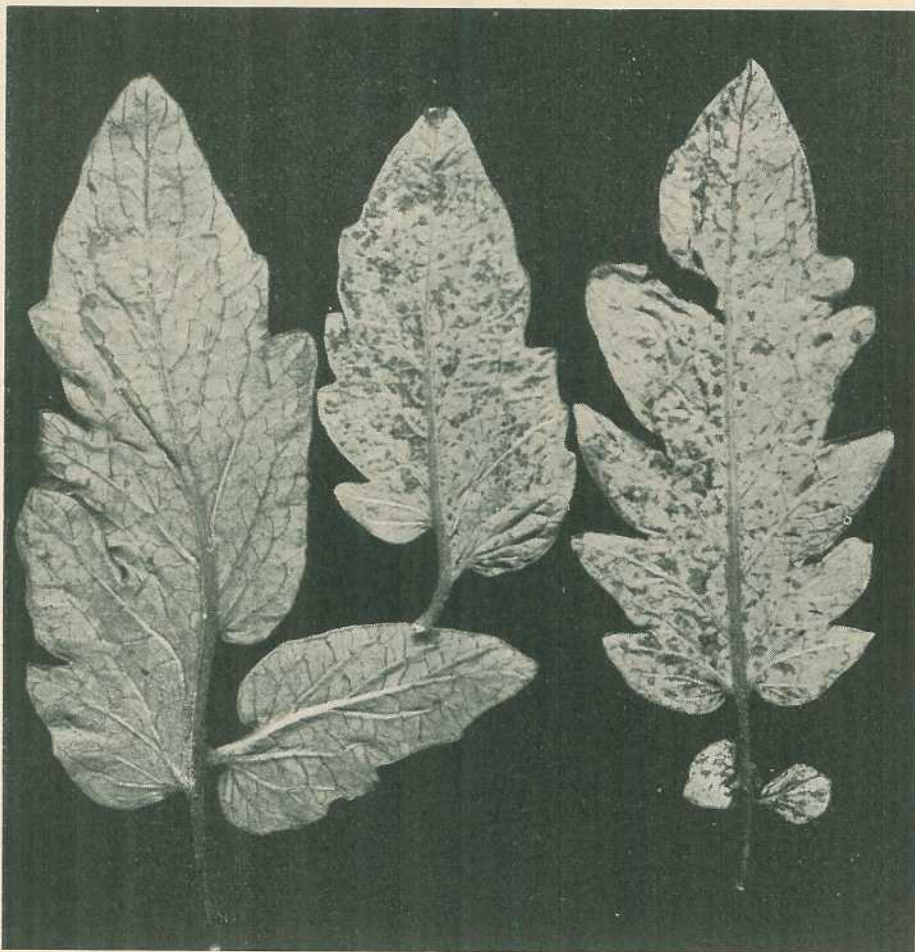


Plate 15

Leaf Shrivel Symptoms on the Under Side of the Leaf (right and centre). Healthy leaf at left.

and it is apparent that secondary spread is not necessary for total infection. Nevertheless the eradication of aphids from winter tomato crops should always be attempted, as this will certainly retard the disease.

Because leaf shrivel does not appear before the end of May, metropolitan growers can set out early enough to permit the plants to make size and set quite a lot of fruit before becoming infected. Crops set out in March are more successful than those set out in April for this reason. Later plantings often fail completely

because of the disease. Some excellent late-planted crops have been grown in isolated areas where the virus has failed to appear, but in all the long-established tomato-growing areas, the disease will probably continue to occur with the strict regularity that it has shown since 1953.

Seedlings which are raised in the open at any time during the winter should be protected from aphids. There is no great prospect for spring plantings when the seedlings used are infected with leaf shrivel before they leave the seedbed. The best method of protecting the young plants





Plate 16

Comparison of Healthy (left) and Leaf Shrivell Infected (right) Plants.

from aphids would be to raise them in a glass-house. This facility would seldom be available to commercial growers, but a suitable glasshouse substitute which would be much less costly would probably serve the same purpose. (See final section on seedbed management.)

### Mosaic

Mosaic of the tomato is identical with the virus disease of the same name which occurs on tobacco and may infect a large number of plants in the same family—for example, wild gooseberry, wild chili and black-berried nightshade—and is intertransmissible with these hosts. Affected plants in general are lighter green in colour than is normally the case in healthy tomatoes, and their foliage is slightly crinkled (Plate 18). A close examination of infected plants also shows their leaves to be mottled with indefinite light and dark-green areas. Fruiting on such plants may not be appreciably affected by the presence of the disease when it is acquired late in the life of

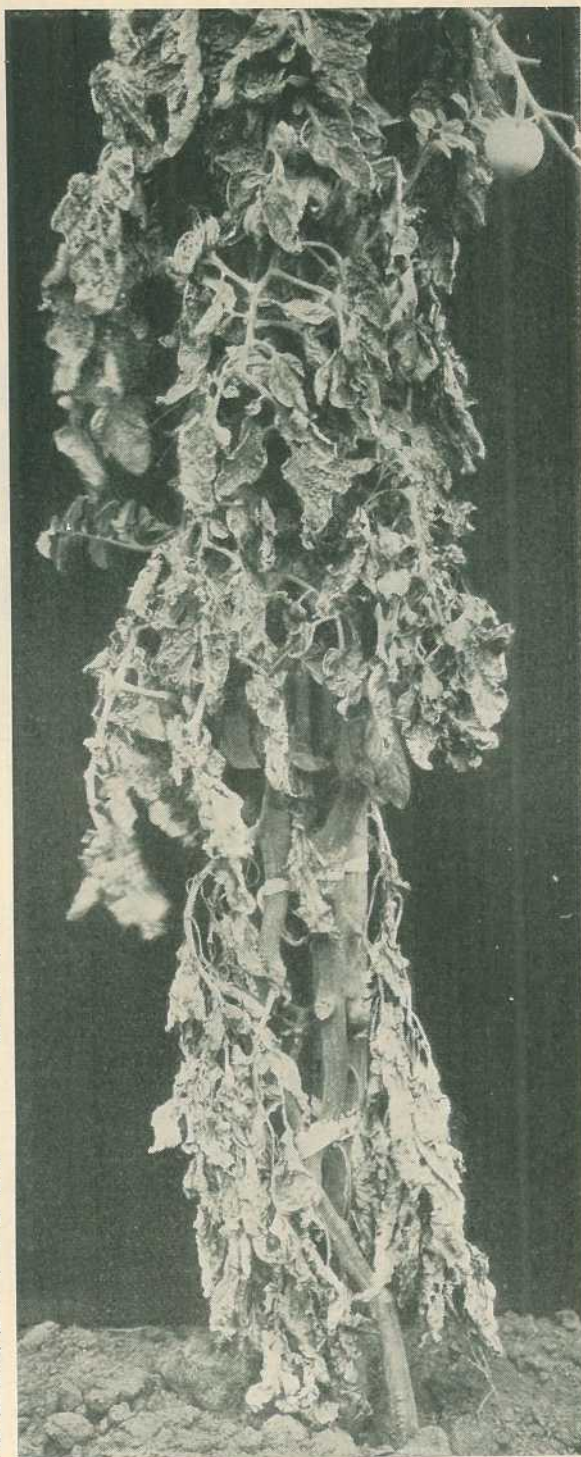


Plate 17

Older Plant Showing Shrivelling of Lower Leaves Due to Leaf Shrivelling Virus.



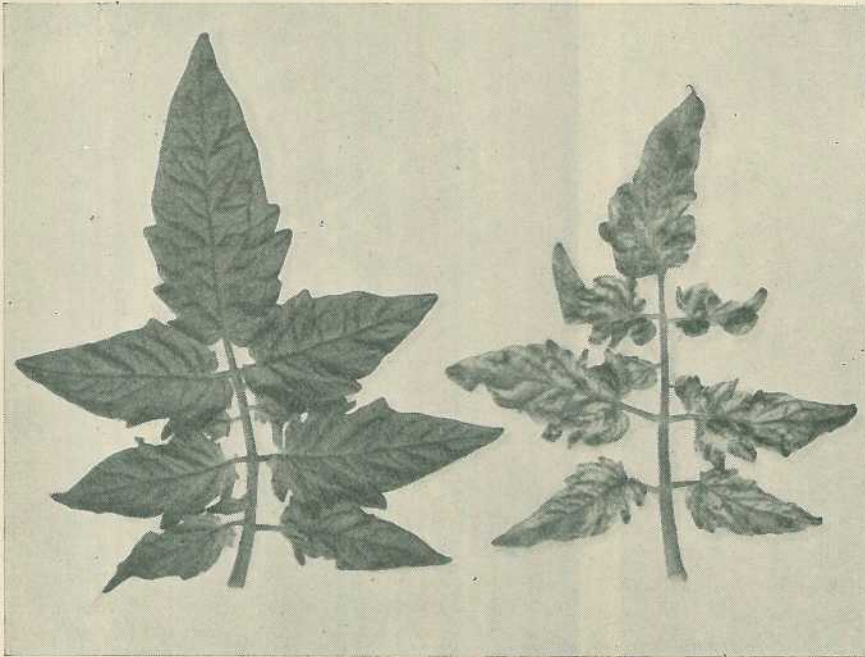


Plate 18

**Aucuba Mosaic.** The mottling and distortion of the affected leaf on the right is seen in comparison with a healthy leaf on the left.

the plant, but if the plant is infected early the yield loss from mosaic can be very serious.

Fruit which matures on mosaic-infected plants is often blotchy. These blotches are more noticeable after the fruit colours.

Mosaic is extremely infectious and is readily spread by the hands and by pruning knives, and implements used in cultivation. Infection from the hands of tobacco smokers, from seed from an infected crop, from the soil and from old trellis wire have all been reported, but these factors are not so important as the handling of infected plants which accounts for nearly all of the spread.

### Fern-Leaf

After a tomato plant has become infected with the virus causing fern-leaf, the first symptoms to appear are thickening and rolling of the leaf edges. At a later stage the terminal shoots become a mass of very narrow, distorted leaflets, all with thickened and curled edges, and if any fruit is borne by such plants it is malformed (Plate 19). The virus causing this disease can infect a very wide range of plants, including many common garden and crop species. In this

respect it has much in common with the mosaic virus.

### Control of Mosaic and Fern-leaf

Frequent inspections of the crop in the field are desirable, particularly while the plants are young. Any abnormal plants observed during these inspections should be removed and burned in order to prevent their acting as a source from which the virus can be spread to other and, as yet, unaffected plants. If the number of infected plants is relatively high—say greater than 10 per cent.—this measure may prove of little benefit.

After touching diseased plants, the hands and pruning knives should be washed in soap and running water so as to minimise the possibility of transmitting disease to healthy plants.

Smokers should also thoroughly wash their hands before handling a tomato crop.

The remains of the crop should be cleaned up and burned as soon as it has ceased to be profitable and volunteer tomato and potato plants, solanaceous weeds and other host plants which are likely to carry these diseases into the following crop should be eradicated. The excessive



use of nitrogenous manures appears to increase the severity of the disease.

### Big Bud

The disorder big bud is one in which the normal development of the plant is suddenly arrested, and is replaced by the development of very characteristic deformities (Plate 20) which affect particularly the reproductive behaviour—that is, the production of flowers and fruits.

One type of symptom seen is that known as "rosetting". In this case, shoots normally produced in the leaf axil appear as a bunched mass of small narrow leaves. Prior to these rather obvious symptoms there is actually a cessation in growth of the stem, which is often followed by a blueing of the growing tip, and the flower hands instead of curving downwards tend to point upwards. The bizarre forms leading to the name "big bud" are malformed flowers in which the stalks have thickened considerably and the flower

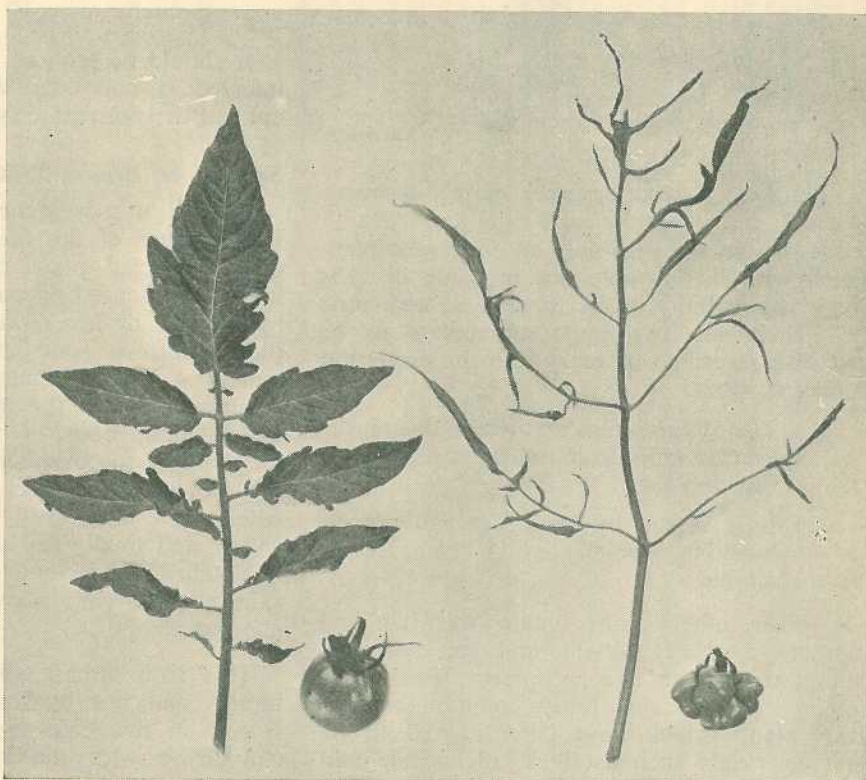
itself becomes grossly distorted by an enlargement of the floral parts, while the petals assume a green colour.

Malformed flowers are not always present. Of recent years it has been the practice to ascribe any condition which presents one or more of the important features of this trouble to the same cause. Purpling of the top of the plant, accompanied by cessation of flower production, is a common condition which appears to be a form of the big bud disease.

The disease is due to a virus infection, and while only one insect has been proved to spread the disease there may be others. The incriminated carrier is one of the leafhoppers. It is a small sucking insect approximately  $\frac{1}{8}$  in. long, of a grey-brown colour with speckled wings. The presence of leafhoppers generally is readily discerned by disturbing the bushes, which causes them to dart out for a short distance and then either return or lodge in the next bush.

Plate 19

**Fern Leaf.** Showing affected leaf and fruit in comparison with healthy leaf and fruit.





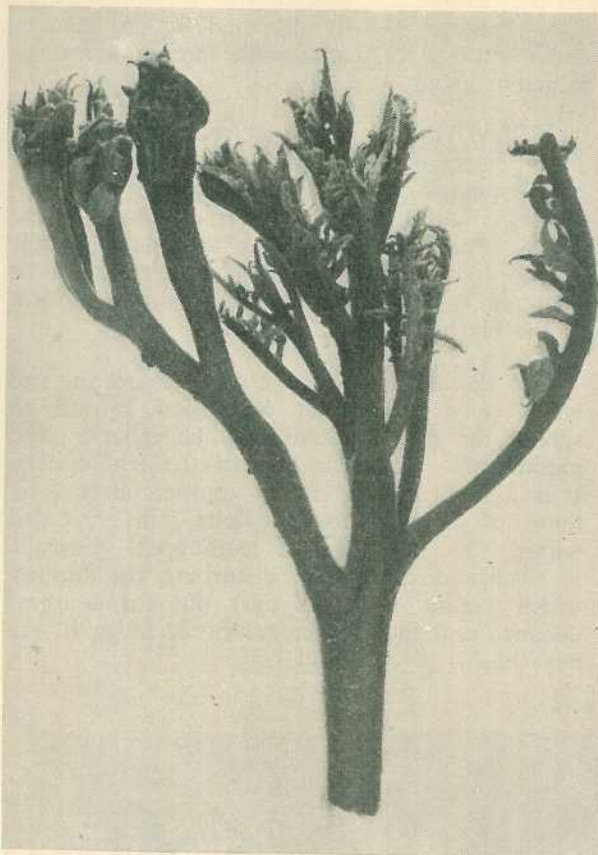


Plate 20

**Big Bud.** Typical Symptom of the disease.

Usually a grower sees only an occasional plant affected with this trouble but in some districts there is a possibility of an appreciable economic loss. There are two important points to be noted with regard to its entry into the crop, and subsequent spread:

- (1) The disease almost always enters the tomato crop from other hosts outside the crop itself.
- (2) It is spread by an insect and not by handling, which is in contrast to mosaic.

On hosts other than tomato the big bud symptom is usually absent and the symptom common to most is that of green flowers. A rosetting effect is also fairly common. Well-known plants which have been proved to be hosts are weeds such as dock, nightshade and

sow thistle; and garden plants such as antirrhinum, gerbera, petunia, nasturtium, chrysanthemum, dahlia, geranium and phlox.

### Control

It is apparent that the leafhoppers normally prefer to feed on their weed hosts, and reach the tomato crop either by accident or because their weed hosts are being eliminated by drought or some other cause. When the advent of big populations of infective leafhoppers coincides with a particular circumstance which causes them to abandon their normal feeding grounds, high rates of infection are recorded on tomatoes.

It is recommended that the grower take good note of the leafhopper population in the adjacent weed areas. If this is high and there are indications that the weed growth may die off, then dusting or spraying of the tomato crop will need to commence.

For control of the leafhopper within the crop either 0.1 per cent. DDT spray or 2 per cent. DDT dust may be used. While the insect is prevalent, treatments will need to be repeated approximately every 10 days.

It should be realised that the plant is actually infected at least three weeks before the appearance of the noticeable symptoms.

### Spotted or Bronze Wilt

Spotted wilt is sometimes known as bronze wilt because of the fact that the young shoots of an infected plant develop a dark reddish-brown or bronzed appearance. This is produced by a more or less close aggregation of circular purplish-brown spots each measuring approximately  $\frac{1}{8}$  in. in diameter (Plate 21). Other symptoms include the stoppage of active growth, the bending back of the leaf stalk, and the incurving of the blades of the leaflets, thus giving a drooping appearance to the plant. Leaves which have developed the bronzed appearance wither and finally dry up. Bronze markings or a blotched yellow and green appearance of the skin may develop occasionally on the fruit of affected plants.

This virus disease, like big bud, is spread by insects and not by handling the plants. The insects in this case are two species of thrips. Coinciding with the rapid increase in thrips



population in early spring, that period is usually the main one for the incidence of spotted wilt. It also tends to be more prevalent in backyard gardens than in commercial vegetable areas. This is due to the number of ornamentals that may carry this same virus—for example, Iceland poppy, nasturtium and dahlia.

This disease cannot be called a major problem in the main tomato-growing areas of Queensland, as the infection is usually less than 1 per cent. There are, however, some areas, such as the dairying areas west of Brisbane where tomatoes are frequently grown as a side-line, which have recorded relatively high infection percentages of up to 40 per cent., and that for a large proportion of the seasons.

### Control

The measures outlined under mosaic control are sufficient for most districts. Where the disease appears regularly each spring, definite preventive measures will be necessary. DDT dust or spray as used for corn ear worm control may incidentally give sufficient control of the thrips. Treatment will need to commence in the very early spring months and carry on into early summer.

### Blossom-end Rot

Blossom-end rot is characterised by the appearance of a light-brown to black, roughly circular area at the blossom end of young green fruit (Plate 22). The tissue of this discoloured region is firm and may be shrunken to form a slight impression or flattening of the apex. A soft rot may appear in it, but such a development is due to the invasion of secondary organisms. The early symptoms of the trouble take the form of small light-brown stains on the apex of the fruit.

This trouble is a physiological one and is not due to the attack of any plant parasite. It is considered that blossom-end rot incidence is associated with differences in the rate of water uptake and transpiration by the plant. When the temperature is high and the amount of water vapour in the atmosphere is very low, the quantity of water transpired by the foliage of a plant may be so high that the uptake of water by the roots is unable to keep pace with the loss of water from the leaves. This disturb-

ance of the water balance in the plant reacts severely on the fruit and the cells at the apex collapse, causing the typical firm lesion to develop. A dry soil, by limiting the uptake of water by the roots, is conducive to the development of the trouble, but, on the other hand, plants growing in a soil which has dried gradually do not develop blossom-end rot so seriously as those which have experienced a period of heavy rain prior to the hot, dry weather. Infestation of the roots by nematodes, which reduce the efficiency of the roots as water absorbers, aggravates the trouble.

Blossom-end rot is a disease of tomatoes which is usually prevalent during hot, dry periods in summer and spring.



Plate 21

**Spotted or Bronze Wilt.** Note the close aggregation of spots, causing mottling.



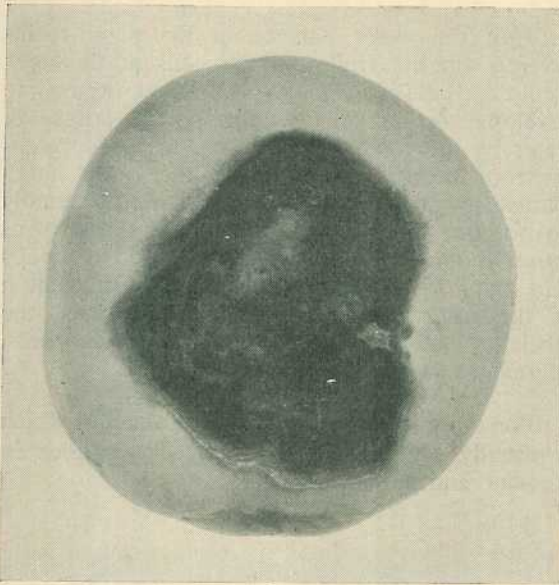


Plate 22  
Blossom End Rot.

### Control

The control of this disease is, to some extent, beyond the power of the grower. However, he can help by providing an even supply of moisture throughout the growth of the crop by means of appropriate cultural practices and prudent irrigation. Heavy applications of fertilizers rich in nitrogen are undesirable, as these tend to produce abundant foliage, a condition which is conducive to the development of the trouble. When planning a crop it is well to remember that plants grown on the ground are less susceptible to the disease than are staked or trellised crops. If irrigation is not available the grower is strongly recommended to avoid staking or trellising his crop.

Soil conditions have a definite bearing on the incidence of this trouble. In some localities it appears regularly and in others rarely.

### Combined Spray for Tomatoes

For general use, apply fortnightly a treatment of a DDT-sulphur-copper oxychloride spray. It should contain 2½ lb. copper oxychloride to 50 gal. of water and the other constituents as recommended on the label. If weather conditions are such as to require more frequent application of copper for fungus and

bacterial diseases, the treatment can be interspersed by a copper plus sulphur spray, as it is unnecessary to use DDT more frequently than once a fortnight. In recent years the use of zineb as a substitute for the copper component has considerably increased. This fungicide is slightly superior to copper compounds in controlling target spot, and it is for this reason that its use has grown. If zineb is substituted, intervals between sprays should definitely be shortened to 7 to 10 days.

Cuprous oxide is now available and may also be used as the fungicide component in these mixtures.

Dusting mixtures containing the same active ingredients may be substituted for the spray if this method of application is preferred. In general, dusting is not so efficient as spraying and must be done more regularly. However, many experienced growers hold that dusting is preferable from the point of view of overall economy.

### Seed Treatment

Should the grower purchase seed and there be any doubt as to its origin it should be disinfected with corrosive sublimate in the following manner:

The tomato seed is placed in a piece of mosquito netting and suspended for 5 min. in a solution of corrosive sublimate (mercuric chloride) used at a strength of one part of the chemical in 3,000 parts of water. The seed mass is stirred occasionally with a wooden stick during the period of suspension in order to remove any air bubbles which may be present. After immersion it is thoroughly washed in four or five changes of water, dried and then sown immediately.

Corrosive sublimate tablets, with directions for the preparation of the solution, may be obtained from a pharmaceutical chemist.

### Seedbed Management

The seedbed should be located as far as possible from likely sources of tomato disease. Obviously it should be well clear of any growing tomato crop which is likely to become neglected, and therefore heavily diseased. A situation near the house is often undesirable as household refuse, especially from tomatoes and potatoes,



can initiate infection, and some ornamental plants carry and act as reservoirs of tomato diseases. Some diseases are carried along in surface run-off water during storms, and for this reason it is desirable to select a high position unlikely to be flooded. Too much shade should also be avoided.

Soil should be fertile, friable and should not have recently grown a crop of tomatoes or potatoes. If any fumigation or sterilization treatment has been carried out, care should be taken not to contaminate the seedbed again with untreated soil or boots, implements, and so on. Animal manure mulches have often been associated with severe bacterial wilt infection, and are not necessary. If mulching is desired, then sawdust, shavings, oak needles or other similar materials are safer.

Soil steaming, either with a steam harrow or by the brushwood fire method is the most satisfactory form of sterilization. Soil sterilization by this and other means is discussed in another pamphlet which is available, on request, from the Department of Agriculture and Stock.

Plants should be raised in rows, and thinned if necessary to permit good air circulation and efficient cover spraying and weeding. Control of leaf spot diseases should be complete and carried out as described under the heading "Target Spot". Insect pests should also be kept strictly under control.

Winter seedlings can be exceptionally well grown with little need for disease control measures if raised in steamed soil in flats under cover of a glasshouse or glasshouse substitute. The same method can be applied to the raising of summer seedlings, but care must be taken to avoid overheating of the glasshouse atmosphere.

Briefly, the method is as follows: A suitable soil mixture is placed in wooden flats (sound cases are satisfactory) and steamed in a 44 gal. drum for 3-4 hours. Extra soil to cover the seeds is also included in the steaming. The flats are stacked up on a platform support to keep

them clear of the water layer in the bottom of the drum. This water should be approximately 6 in. deep, to permit the necessary period of slow boiling. A piece of flat asbestos cement sheeting provides a suitable cover, although any material which will permit the steady escape of steam would suffice. The drum is supported over a fire by means of six or eight bricks, and the heating should be steady to provide continuous steaming.

The steamed soil must be protected from recontamination as in the case of externally situated beds which have been sterilized. The boxes can be left in the drum until they can be planted, or, if they have to be removed, placed somewhere where unsterilized soil will not reach them, such as on a bench or in a shed. If a glasshouse is available they could be placed inside immediately. It is usual to allow steamed soil to stand for a week before sowing, although this cannot be regarded as essential. Steamed soil is sometimes hard to wet, and it is advisable to thoroughly water the boxes some hours before sowing. Otherwise an uneven stand of seedlings will result. A high proportion of sand in the mixture will overcome this problem.

Glasshouse structures in our climate need to be provided with more ventilation than do those in the cooler climates. Their chief purpose is to protect the plants from the vicissitudes of the weather, from insect pests, and diseases. Only in winter is the warming effect required. At this time they should be so designed that tight closing-up is possible.

Horticultural glass is the best material to use, although a much cheaper design using clear or white polythene film can be quite successful. Growers desirous of constructing a glasshouse should discuss the project with an officer of the Department of Agriculture and Stock, or someone experienced in this field.

Glasshouse-grown plants should be hardened-off outside for about 10 days before transplanting. During this period they should receive their first combined spray for pest and disease control.



# Tuberculosis-Free Cattle Herds

(As at 1st October, 1960)

## Aberdeen Angus

Crothers, G. H. & H. J., "Moorenbah", Dirranbandi  
Elliott, A. G., "Ooraine", Dirranbandi

Mayne, W. H. C., "Gibraltar", Texas

## A.I.S.

Cox, T. L. & L. M. J., Seafeld Farm, Wallumbilla  
Crooke, J., Arolla A.I.S. Stud, Fairview, Allora  
Davis, W. D., "Wamba", Chinchilla  
Dennis, L. R., Diamondvale A.I.S. Stud, Mundubbera  
Edwards Bros., "Spring Valley" A.I.S. Stud, Kingaroy  
Evans, E. G., Lauraven A.I.S. Stud, Maleny  
Green, D. B., Deloraine A.I.S. Stud, Fairdale  
Heading, C. A., "Wilga Plains", Maleny  
Henry, Mrs. K., Greenmount  
Henschell, W., "Yarranvale", Yarranlea  
H. M. State Farm, Numinbah  
Littleton, H. V., "Wongalea", Bowenville  
Marquardt, A. C. & C. R., "Cedar Valley", Wondai  
McShane, A. H., Handford Road, Zillmere  
Mears, G. S. & E., "Morden", M. S. 755 Toogoolawah  
Moore, S. R., "Sunnyside", West Wooroolin  
Neale, D. G., "Groveley", Greenmount  
O'Sullivan, Con., "Navillus", Greenmount  
Pinwill, A. A., Gaylands A.I.S. Stud, Gayndah

Power, M. F., "Barfield", Kapaldo  
Messrs. Mitchell and Mulcahy, Rosenthal  
Queensland Agricultural High School & College, Lawes  
Radel, R. R. & Sons, "Happy Valley", Coalstoun Lakes  
Roche, C. K., Freestone, Warwick  
Sanderson, W. H., "Sunlit Farm", Mulgildie  
Schloss, C. J., "Shady Glen", Rocky Ck., Yarraman  
Scott, M. E. & E., "Wattlebrae" A.I.S. Stud, Kingaroy  
Scott, W. & A. G., "Walena" A.I.S. Stud, Blackbutt  
Shelton, R. A. & N. K., "Vuegon" A.I.S. Stud, Hivesville, Murgon  
Estate Sokoll, A. H., "Sunny Crest", Wondai  
Sperling, G., "Kooravale", Kooralgin, Cooyar  
Sullivan Bros., "Valera", Pittsworth  
Sullivan, D., "Bantry", Pittsworth  
Sullivan, F. B., "Fermanagh", Pittsworth  
Thompson, W. H., "Alfavale", Nanango  
Webster, A. H., "Millievale", Sabine, via Oakey  
Wieland, A. W., "Milhaven", A.I.S. Stud, Milford, via Boonah

## Ayrshire

Dudgeon, C. E. R., Marionville Ayrshire Stud, Landsborough  
Dunn, T. F., "Alanbank", Gleneagle  
Goddard, B., Inverell, Mt. Tyson, via Oakey  
Holmes, J. L., "Benbecula", Yarranlea

Mathie, E. & Son, "Ainsie", Maleny  
Scott, J. N., "Auchen Eden", Camp Mountain  
Zerner, G. F. H., "Pineville", Pie Creek, Box 5, Post Office, Gympie

## Friesian

Behrendorff, E. C., Inavale Friesian Stud, M.S. 786, Boonah  
Macdonald, S. E. G., "Freshfields", Marburg  
Morrison, E. J., Cedar Creek, via Closeburn  
Naumann, C. H., "Yarrabine", Yarraman

Paech, P. B., Grasmere, M.S. 544, Clifton  
Pender, D. J., Lytton Road, Lindum  
Stumer, A. O., Brigalow, Boonah

## Guernsey

Doss, W. H., Degilbo, via Biggenden  
Fletcher, A. B., "Cossart Vale", Boonah  
Holmes, C. D. (owner Holmes L. L.), "Springview", Yarraman  
Johnson, G. L., "Old Cannindah", Monto  
Miller, G., "Armagh Guernsey Stud", Armagh, M.S. 428, Grantham

Ruge, A. & Sons, "Woowoonga", via Biggenden  
Scott, C., "Coralgrae", Din Din Rd., Nanango  
Swendson, A. C., Coolabunia, Box 26, Kingaroy  
Wisemann, R. J., "Robnea", Headington Hill, Clifton

## Jersey

Beckingham, C., Trout's Rd., Everton Park  
Birt, W. C. M., Pine Hill Jersey Stud, Gundiah  
Borchert, Mrs. I. L. M., "Willowbank" Jersey Stud, Kingaroy  
Burrows, R. N., Box 23, Wondai  
Bygrave, P. J. L., The Craigan Farm, Aspley  
Carpenter, J. W., Flagstone Ck., Helidon  
Conochie, W. S. & Sons, "Brookland", Sherwood Rd., Sherwood  
Crawford, R. J., Inverlaw, Kingaroy  
Farm Home For Boys, Westbrook  
Fowler, P. & Sons, "Northlea", Coalstoun Lakes  
Harley, G., "Hopewell", East Nanango  
H.M. State Farm, Palen Creek  
Hutton, D. R., "Bellgrath", Cunningham, via Warwick  
Johnson, H. G., Windsor Jersey Stud, Beaudesert  
Lau, J. F., "Rosallen", Goombungee, Toowoomba

Matthews, E. A., "Yarradale", Yarraman  
McCarthy, J. S., "Glen Erin", Greenmount, Toowoomba  
Meier, L. E., "Ardath Stud", Boonah  
Noone, A. M. & L. J., "Winbirra", Mt. Esk Pocket  
Porter, F., Conondale  
Q.A.H.S. & College, Lawes  
Ralph, G. H., "Ryecombe", Ravensbourne  
Scott, Est. J. A., "Kiaora", Manumbar Rd., Nanango  
Semgreen, A. L., "Tecoma", Coolabunia  
Seymour, B. T., "Upwell" Jersey Stud, Mulgildie  
Smith, J. A. & E. E., "Heatherlea" Jersey Stud, Chinchilla  
Tatnell, W. T., Cedar Pocket, via Gympie  
Toowoomba Mental Hospital, Willowburn  
Verrall, F. W., "Coleburn", Walloon  
Weldon Brothers, "Gleneden" Jersey Stud, Upper Yarraman

## Poll Hereford

Anderson, J. H. & Sons, "Inverary", Yandilla  
Hill, W. W., Mathalla  
Hutton, D. R. & M. E., "Bellgrath", Cunningham, via Warwick  
Maller, W., "Bore View", Pickanjinnee

Maller, W., "Bore View", Gowrie Junction  
McCambley, E. W. G., "Eulogie Park", Dululu  
Wilson & McDouall, Calliope Station, Calliope

## Poll Shorthorn

Leonard, W. & Sons, Welltown, Goondiwindi

Yamburgan Pastoral Company, Noondoo



# Pineapple Research; What's In Store For The Grower

By R. C. CANNON, Senior Horticulturist.

*In the past five years considerable progress has been made in research into many phases of pineapple growing in Queensland. The field is by no means exhausted, and there are still problems to be tackled. However, to obtain the right perspective for future planning, it will be profitable to review what has been achieved, and to examine the work still in progress.*

Much of the pineapple research is concentrated in southern Queensland, and based on the Maroochy Experiment Station. In many cases, results obtained are applicable to other parts of the State with only slight modification. However, this is not always so, and work has been undertaken in central and north Queensland to adapt methods to local conditions. Similarly, problems peculiar to individual districts have been investigated in the areas concerned.

## Land Management

In the older established pineapple growing areas steady decline in productivity over the years is a problem of major importance. Although at present largely confined to the Near North Coast, the same state of affairs could arise in other districts in the course of time. It is basically a question of land management, involving soil conservation, drainage, and crop rotation and green manuring.

*Soil Conservation.*—On the Near North Coast irreparable damage has already been caused by soil erosion, and it is a matter of attempting to arrest further soil losses. With this in view, contour planting was introduced some 10 years ago and since then efforts have been made to effect improvements and to develop a system best suited for pineapples. Trials have been carried out at

the Maroochy Experiment Station, using equipment designed by the Engineering Department of the University of Queensland to measure surface run-off and soil losses.

As a result of this work it has been found that gradients of 2 to 4 per cent., varying with soil type and slope, are required.

An integral feature of any contour layout for pineapples is the provision of interrow drains, with protective contour drains and banks at regular intervals down the slope. The most recent results have shown that, under some circumstances at least, run-off and soil loss can both be reduced by restricting the interrow drains to one every third row instead of every row, as originally provided. Because of variations in topography and local factors, no hard and fast recommendation is possible, and each contour layout has to be treated on its own merits and modified accordingly.

However, the information now available is considered sufficient for all practical requirements and no further work along these lines is contemplated for the present.

The critical part of any contour system is the safe disposal of run-off in the main drains, which are called on to carry large volumes of water



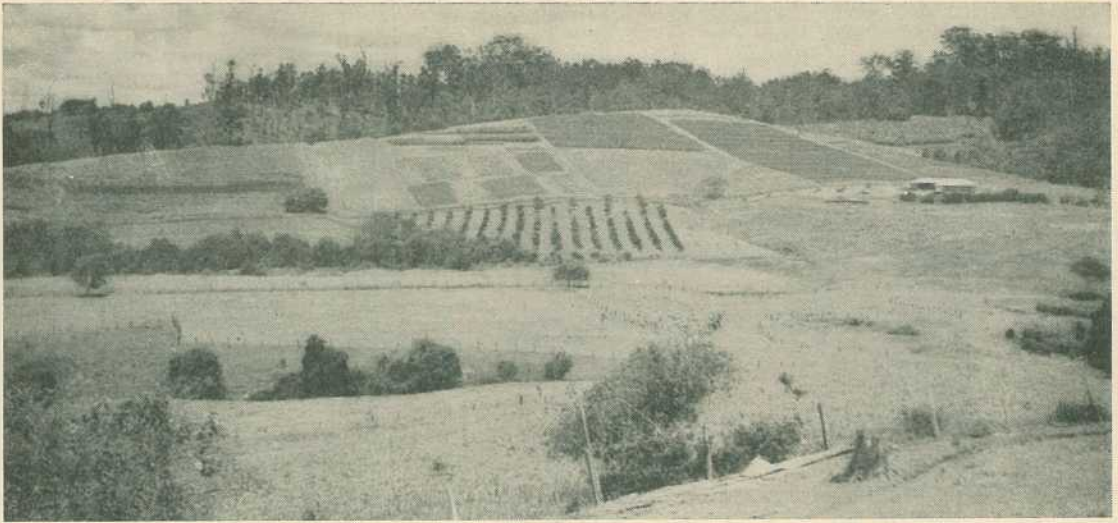


Plate 1

**Maroochy Experiment Station, Nambour; the Main Centre for Pineapple Research.**

down steep slopes. Grassing, originally recommended, is probably the best method of all for stabilizing these waterways. Its main disadvantage in pineapple plantations is that the grass tends to encroach on cultivated areas. A more recent development is the use of coal tar, which was pioneered on a private farm. Because of its cheapness and simplicity this method was welcomed and quickly adopted as an alternative to grassing.

*Drainage.*—Poor drainage on many pineapple soils is responsible for variable losses caused by root rot and allied diseases. In many cases the affected areas are limited in extent and irregularly distributed and, up till recently, little had been done to overcome the problem. A few years ago it was tackled at Maroochy Experiment Station and some success has been achieved.

Mole drains and agricultural pipes have both been tried, the pipes having proved in many respects more reliable. No formal trials have been laid down, but exploratory work has demonstrated the practicability of both methods.

*Crop Rotation and Green Manuring.*—Work was initiated in 1946, and continued through to 1956, to determine the value of green manuring as a means of restoring fertility and maintaining

satisfactory yields of pineapples. The combined results of these trials have shown:

- (1) That the inclusion of an inter-cycle green manure in the rotation prevents a serious decline in yield with successive crops of pineapples. Total plant and ratoon crop yields after green manure were 10 to 13 tons an acre higher than with continuous pineapples.
- (2) That nothing is gained by extending the inter-cycle period beyond about a year or, to fit in with normal planting seasons, 18 months.
- (3) That the effects of an annual legume (Poona pea), a perennial legume (pigeon pea), or a grass (sudan grass) are essentially the same.
- (4) That the effect of green manure on yield, even in the case of a legume, is not related to the nitrogen contributed by it.

These results provide a basis for crop rotation in pineapples, with a fairly wide choice of green manure crops. It is, therefore, largely a matter of using a green manure that is cheap and easy to handle and suits local conditions. The principles should be applicable equally to all parts of the State.



In view of the generally satisfactory outcome of these investigations, and the fact that they extended over a period of 10 years and encountered a range of seasonal conditions, no further work along these lines has been undertaken. There is, perhaps, some scope for testing a range of green manures in different districts to assess their suitability for the local conditions.

### Plant Improvement

In 1950 and 1951, a number of selections were made at Maroochy Experiment Station in the hope of isolating superior strains, assuming some do exist. The progeny of these single plant selections, termed clones, have been in process of multiplication since then, and sufficient plants of 14 of them had been produced by 1958 to commence field trials. The 1958 trial was followed by a second series in 1959, which included one or two additional clones. The remainder should be available in sufficient numbers for field trial within a year or two.

With the 1960 summer crop the first set of data has been obtained, and further results will be coming available each year from now onwards. Results to date show up to 25 per cent. variation in fruit size, some clones being superior to mass-selected material, while others are inferior. In addition, the fruit quality varies, the sugar content ranging from 14.5 to 16.8 per cent., and acid from 0.37 to 0.46 per cent. citric acid equivalent. There is also considerable variation in agronomic characters, such as slip and sucker production, which all have to be taken into account in assessing the relative merits of pineapple types for commercial use.

It will take some years before a proper evaluation of these clones is possible. Seasonal conditions may have an appreciable effect, and it is their average performance over a period that will determine their commercial value. The final evaluation of the clones will present some problems because of the variation in fruit quality. For instance, in the 1958 trial, the clone producing the best quality fruit happens to be the lowest yielder. Admittedly, quality is of some importance to the consumer and, presumably, also to the canner. However, the present price structure takes no account of quality, other than size, and from the individual grower's point of view yield is paramount.

### Nutrition

Trials completed in 1957 clarified the basic fertilizer requirements of pineapples in relation to soil type, particularly with regard to their potash content. It was found that most soils, being low in potash, required considerably more than that provided by previous schedules. It was also evident that unnecessarily large amounts of nitrogen were being used and that some economy could be effected. The result was the formulation of a new fertilizing schedule based on a 10 : 2 : 20 mixture.

Subsequent investigations have been concerned with the more efficient use of fertilizer as influenced by placement, forms of potash, and foliage sprays. Some progress has been made and tentative recommendations have been put forward that will effect considerable economy in fertilizer and labour. Further work along these lines is necessary and some has already been undertaken.

*Placement of Fertilizer.*—In 1957 a trial was laid down at Maroochy Experiment Station to investigate, among other things, the efficiency of soil dressings of potash fertilizer. Applications of sulphate of potash direct to the soil before planting proved considerably more efficient than applying it into the base leaves every six months. Plant growth was better and the plant crop yield was slightly higher, even though the amount applied in the base leaves exceeded that of the soil dressing. Complete data for the ratoon crop are not yet available to determine the total amount required for a full cycle. On present indications, however, it seems that the amount required as a soil dressing will be about half that normally used in base leaf applications.

Further trials will be necessary to confirm these results. The relation between the potash status of the soil and the amount to be applied has yet to be investigated over a range of soil types. In addition, the effect of plant density on fertilizer requirements has also to be examined. Work along these lines has already been commenced and will be extended.

The matter of phosphorus fertilizing has still to be investigated along similar lines. In previous trials, using base leaf fertilizing, no response to this element was obtained, but there has been some doubt as to whether these results may have been affected by phosphorus "fixation". In other





Plate 2

**Contour-Planted Pineapples at Woombye.** Inter-row drain gradients vary from 2 to 4 per cent., depending on soil type and slope.

crops, responses have been obtained to phosphorus applied in the soil, whereas no such response was obtainable from side-dressings.

*Urea Foliage Sprays.*—Since 1952, urea foliage sprays have been under investigation because of several advantages, such as their ease of application, and the fact that they do not acidify the soil like sulphate of ammonia. Having previously established the effectiveness of this source of nitrogen for pineapples, trials have since been concerned with rates and frequency of application.

In conjunction with the trial of potash placement, urea sprays were compared with sulphate of ammonia base leaf applications. On the basis of equal units of nitrogen, urea proved equally as effective as sulphate of ammonia, but there was evidence that it must be applied more often than three-monthly for most favourable results. A trial recently established includes a wider range of rates and frequencies, and should supply the

requisite information for a satisfactory spraying schedule. The question of urea concentration is also being considered to determine the safe upper limits. It may be possible to apply urea less often if a concentration above 10 per cent. could be used.

*Forms of Potassium.*—From work done in 1936, it has been accepted that sulphate of potash is superior to muriate of potash for pineapples. However, the price differential between these two forms of potassium is appreciable and prompted a re-examination of the question.

Two trials have been undertaken to determine the effects of these two materials on yield and quality, when applied over the whole or part of the cropping cycle. The results reveal some difference in yield, but in view of the generally poor growths of all plants in this trial, it would be unwise to attempt to draw conclusions at this stage. The second trial, which will crop in 1961, may help to clear up the point.



## Plant Spacing

Since closer planting than that adopted in Queensland is employed in some other countries with apparent success, a trial was commenced in 1953 with a view to increasing yields by closer spacing. For a number of reasons it was considered preferable to first vary the distance between plants in the rows, leaving the row spacing at 2 ft. between rows and the double rows 6 ft. apart centre to centre. In this trial, reducing the spacing from 12 in. to 9 in. increased the acre yield from 22.3 tons to 29.0 tons, without reducing the size of individual fruits. Almost identical results were obtained in a second trial planted in 1957, which is now in the ratoon stage. In both cases, closer spacing did not affect sucker production or subsequent growth of the ratoon. It is of interest to note that similar work carried out in Taiwan (Formosa) has given almost identical results, according to a published report.

This is an important advance in that it enables growers to increase their yield per acre without a proportionate increase in cost. By planting 19,000 plants to the acre instead of 14,000, an increase of up to 30 per cent. in yield may be obtained, the main extra cost being a corresponding increase in the amount of fertilizer used. It has yet to be determined whether this is directly proportional to the increase in number of plants.

## Weedicides

The most drastic change in cultural methods in recent years has been the use of chemical weed control in pineapples. As a pre-emergence spray, PCP has been used consistently over the past 10 years. From time to time other weedicides have become available and have been tested for use in pineapples.

In 1952, the first trials with CMU, now known as monuron, were carried out at Maroochy Experiment Station. These were followed by a series of field trials in most of the pineapple growing districts. At 4 lb. to the acre, this gave better control of grasses and was effective for a longer period than PCP, but its higher cost has so far limited its general use.

Recent trials include diuron (related to monuron) simazine and atrazine, in addition to monuron and PCP for comparison. Results to date indicate that diuron and atrazine have some

promise, and may prove superior to monuron and PCP.

## Crop Management

Successful crop management depends primarily on effective flower induction and the ability to adjust planting times to have plants sufficiently well advanced at the time of forcing to produce commercial yields. The technique of flower induction is fairly well established, except that there are certain periods of the year when treatment is not reliable. In recent years this question has received more attention with the object of elucidating the factors affecting induction of flowering. The possibility of spreading the harvest by varying planting times is also being investigated.

*Flower Induction with Hormones.*—Trials have been carried out in central and north Queensland over the past three years in view of doubts which have arisen as to the effectiveness of techniques used in southern Queensland. Trials at Yeppoon have established that ANA and acetylene are both effective when applied in April or May, and that natural flowering is initiated in June. In a trial at Ayr Regional Experiment Station forcing treatments applied during the period from August to December were also effective.

In the Yeppoon trial it was found that April forcing advanced the flowering date by about a month. The earlier flowering did not reach as sharp a peak as later flowering and, therefore, tended to give a greater spread of harvest. The most interesting effect of early treatment was that it promoted earlier suckering and resulted in a shorter interval between plant and ratoon crops. It has still to be established that the same result can be achieved in southern Queensland, and a trial at present in progress is designed to clear up this point. Advancing the summer crop and producing a quick ratoon achieves an important objective, namely, increasing the annual yield per acre by reducing the duration of the cropping cycle.

In the Ayr trial the results indicate:

- (1) That a wet season summer crop can be avoided by planting in December to January and forcing in September or October of successive years for both plant and ratoon crops.



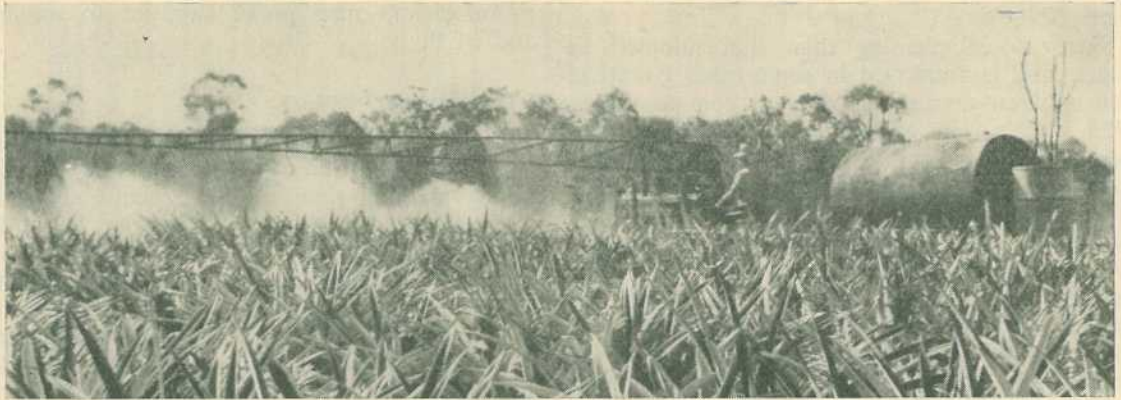


Plate 3

**Fertilizing Pineapples with a Foliage Spray at Yeppoon.** Where the topography permits, boom sprayers of this type may be used to save time and labour in fertilizing.

- (2) That the full cropping cycle can be reduced to a period of about  $2\frac{1}{2}$  years, as compared with a  $3\frac{1}{2}$ -year period normally taken in southern Queensland.

Although forcing with hormones or acetylene is effective at most periods of the year, summer is the critical period when results are variable and unpredictable. The weight of evidence both here and overseas suggests that some environmental influences are responsible. The problem has been to determine which factors are involved. Some work has been undertaken over the past two years but has so far not provided the answer.

In 1959, a survey was made in the Maroochy district based on a total of 57 sets of data on such factors as material used, aspect, amount of sunlight, time of day and nutrient status. Apart from an apparent influence of aspect no correlation was obtained between the various factors examined and the percentage "take".

An extension of this work was carried on in central and north Queensland. Trials at Yeppoon in 1960 investigated, amongst other things, the possible influence of diurnal variations in sunlight at the time of treatment. There was a general tendency for treatment to be more effective when applied in the morning than in the afternoon, but within the limits tested, artificially varied incidence of sunlight did not appear to influence the effectiveness of treatment.

The possibilities in this field will need to be further examined.

*Control of Fruiting with Hormones.*—Investigations carried out several years ago showed that fruit maturity may be delayed up to 10 days by treating with ANA at 100 p.p.m. 8 weeks in advance of normal maturity. The more valuable result of this treatment is an increase in fruit weight of 20 per cent. in a summer crop and 12 per cent. in a winter crop. This work has been extended over a period of years and original results have been confirmed.

So far no method has been evolved whereby flowering may be delayed. Various hormone treatments investigated have failed to achieve the desired result. In 1957, a trial was laid down at Maroochy Experiment Station to investigate the effect of high nitrogen fertilizing on flowering. There are indications that this line of attack may give some results, but further work will be required.

*Plant Size in Relation to Fruit Size.*—It is generally accepted that small plants produce small fruit, but the exact relationship between plant and fruit size has not been determined under varying Queensland conditions. Investigations are now in progress at Maroochy Experiment Station and Yeppoon to correlate plant size at forcing with resultant fruit weight. It is hoped by this means to establish a standard of plant size to serve as



a guide in applying forcing treatments which will eliminate the production of under-sized fruit in a controlled cropping programme.

*Planting Schedules.*—Since 1957, trials have been in progress at Maroochy Experiment Station and at Yeppoon investigating the influence of type of planting material, size of plants and planting time on cropping behaviour. When planted at the same time (March in southern Queensland) the larger the planting material the earlier the crop flowered and matured its fruit. In central Queensland, using slips only and with a greater size range, the differences were much more marked. In this case both 16 oz. and 24 oz. slips cropped much sooner than 8 oz. slips. Here also, an increased plane of nutrition favoured more rapid growth and the production of larger plants.

Where tops, slips and suckers of equal size were compared, suckers were slightly more advanced than slips, and slips more advanced than tops. Neither size nor type of planting material had any significant effect on yield in the plant crop.

A more recent trial, planted in 1959, follows on from these results and includes a range of planting times and times of forcing as well as size and type of plant. The primary object is to determine the extent to which cropping can be spread in spite of the seasonal limitations operating in southern Queensland.

### **Fruit Quality**

Over the past 5 years in particular, fruit quality has been investigated in relation to a number of factors, particularly nutrition. While it is possible to determine sugar and acid content, internal colour estimation presents major difficulties.

*Nutrition and Fruit Quality.*—In conjunction with fertilizer trials it has been possible to determine nutrient effects on quality. Results have shown that increasing nitrogen tends to decrease both the sugar and the acid content of the fruit. Potassium, on the other hand, had the opposite effect and increased both sugar and acid. In the case of phosphorus, results obtained were not consistent. One of the faults of fruit produced in north Queensland has been its low acid content. Results obtained in southern Queensland, and confirmed in north Queensland, indicate that this

condition may be improved by the use of a higher level of potash in the fertilizer schedule.

Attempts have also been made to determine the extent to which nutritional factors influence internal fruit colour. Results so far obtained have failed to establish any correlation whatever. An examination of fruit from certain pineapple clones showed marked variability in internal colour within the one clone. The experience in this work confirms the original fear that techniques used for estimating colour are inadequate. Therefore, before any further work along these lines can be carried out it will be necessary to assess the relative importance of juice pigment and translucence in determining fruit colour.

*Blackheart.*—Investigations into the disorder known as blackheart have been carried out over a long period and have as yet failed to establish the precise cause or the factors involved in its incidence. It is quite evident that it is a winter disorder, apparently rather more prevalent in wet winters than in dry ones. If it can be assumed, as seems most likely, that it is induced by seasonal factors as yet unspecified, the only practical solution is to avoid cropping during the critical period. It then becomes a question of crop management to avoid winter cropping.

### **Economic Importance of Results**

Two major factors threaten the stability, and possibly even the survival, of the Queensland pineapple industry. They are declining soil fertility in the older established areas and decreasing margins between crop returns and production costs. The situation is aggravated by the relatively small size of farm units necessitating a high profit margin.

The effects of a decline in soil fertility, since it is a gradual process, are less obvious than a sudden drop in fruit prices, and are often overlooked. Contour planting, which is now a regular practice, can do little to repair the damage already caused by soil erosion, but does minimise further loss of fertile surface soil. As the trials have shown, fertility of the remaining soil can be maintained, and perhaps to some extent restored, by green manuring. This entails a longer cycle and, where there is limited suitable land on the farm, necessitates a reduction in the acreage



under crop at any one time. However, the yield difference of 10 to 13 tons to the acre over a 2-crop cycle is more than sufficient to compensate for this.

The fundamental requirement of profitable production is maximum annual yield per acre. With closer planting, the same number of plants and quantity of fertilizer are required to produce a ton of fruit as with normal spacing, but the yield from an acre is increased by 30 per cent. This involves no increase in capital cost or in the cost of cultural operations, and represents a net gain of some magnitude. Control of fruiting with hormones, used judiciously, provides a means of reducing the length of the crop cycle and thereby increasing the annual yield. At the present time this system has its limitations and breaks down unless the plants to be forced are of adequate size at the time of treatment.

The work on planting schedules aims at determining the influence of varying planting times and different types of material on time of harvest. To provide a basis for crop management along these lines, data are being obtained on the relation between size of plant at forcing and resultant fruit size. When completed, this work should provide a better basis for effective control of cropping than is possible at present.

Nutritional investigations have aimed at reducing production costs by more efficient fertilizer

usage. The economy effected with a pre-planting application supplemented by foliage sprays amounts to about £50 per acre over the 2-crop cycle, which is about half the cost of fertilizer normally applied to the base leaves. This system of fertilizing also entails less labour and the speed of applying the foliage sprays enables this operation to be carried out promptly on schedule.

Fruit quality investigations, though necessary from several points of view, have limited practical application at the present time, as no premium is paid for internal fruit quality in the price structure. Although the cause of blackheart has not yet been satisfactorily established, the problem cannot be regarded as of major importance. Although losses may be heavy during a limited period in the winter, statistics show that to date they have not exceeded 1 per cent. of the total crop in any year.

The recession in prices sustained by the pineapple industry over the past two years has forced growers to seek ways and means of reducing costs. Advances made in the past five years by way of increased yields and lowered production costs have helped the industry and a wider application of the results of this research should improve the position.

*[This review covers work in all parts of the State carried out by or under the supervision of Messrs. H. M. Groszmann, F. W. Berrill, W. V. Mungomery, S. E. Stephens and the author.]*



## It's Net Returns That Count!

Gross returns can be very unreliable guides to the productivity of a farm, or the profitability of a management practice. The only worthwhile yardstick is the net return, which is the difference between gross returns and costs.

Despite this, we frequently hear of management practices being praised because they have increased production. Next time you hear this, find out what the extra costs were. It's quite possible that the net income has increased, too, but it doesn't necessarily follow.

More serious is the widespread practice of buying and selling farms on the basis of gross returns. A prospective buyer should insist on the full disclosure of all the costs that have been incurred in obtaining these returns.

We have heard lately of two farm sales where the purchasers were satisfied to pay on the basis

of gross returns. In both cases, the sellers decided more than a year in advance that they were going to sell their farms, and set out deliberately to inflate their returns.

One, a dairy farmer, culled and replaced the bottom 25 per cent. of his milkers each month for one year. He also bought heavy supplies of supplementary feed. This gave a terrific boost to his production. It also cost him a pretty penny, but he had no difficulty finding a buyer who looked no further than gross returns.

The other farmer spent his year in buying up pigs in advanced stages of growth. He got his price, too. He found a buyer who was most impressed by the turnoff of pigs and didn't think of looking any further than gross returns.

—E. O. BURNS, Senior Agricultural Economist.



# Sources Of Milk Contamination On Farms

By V. R. SMYTHE, Senior Bacteriologist, Dairy Research Branch.

A study of the sources of milk contamination on Queensland farms has been found necessary in order to correct quality problems which occur from time to time in milk and cream.

The results set out have been obtained on analysis of samples taken at dairy farms in Queensland. These results show the relative amounts of bacterial contamination which originate from various sources on the farm and the influence of the contamination on the methylene blue test. The bacterial counts after pasteurisation show the numbers of heat-resistant (thermoduric) organisms present.

It will be seen that in the case of farm 1, a hand milker, that a kerosene tin misused as a milk receptacle imparted large numbers of bacteria to the milk as did an improperly cleansed can and the hands of the milkers.

In the case of farms 2 and 3 the milking machines were obviously at fault; while in the case of farms 4 and 5, milk cans and milkers' hands gave contamination.

For this work it was necessary to draw milk aseptically. This was done in the following manner:

After the teats were thoroughly washed with strong chlorine solution and dried, the cows were milked by hand taking care not to allow the fingers to touch the end of the teat. The first 8 to 10 streams of milk were drawn to flush out the teat canal and this first milk discarded. Milk was then drawn into a sterile narrow-necked vessel without including the strippings.

Milk obtained in this way carries a very low bacterial population and may for convenience be referred to as aseptically-drawn or near-sterile milk. When this milk is used to rinse equipment any added bacterial contamination can be discerned simply by comparison with the near-sterile control.

In obtaining the test results, the aseptically-drawn milk from the udders of several healthy cows was used to rinse the various items of equipment. In the case of the milkers' hands the milk was used as a hand wash while in the case of the water supply a portion of water was mixed with a measured portion of the near-sterile milk.



DATA FROM FIVE FARMS

| Surface, &c., Sampled                                       | Sampling Treatment   | Methylene Blue Test (hours) | Bacterial Count per ml. |   |
|---|--|-----------------------------|-------------------------|---|
|   |  |                             | Raw                     | After Laboratory Pasteurization 63°C. for 30 min. |
| FARM No. 1  |  |                             |                         |   |
| Control milk, drawn aseptically                             | .. .. .  | 9½                          | 30                      | 4   |
| Kerosene tin  | .. .. . Milk rinse, 100 ml. .. .. .                                  | 4½                          | 32,000                  | 800   |
| Can A   | .. .. . Milk rinse, 200 ml. .. .. .                                  | 4½                          | 33,000                  | 500   |
| Can B   | .. .. . Milk rinse, 200 ml. .. .. .                                  | 5½                          | 5,000                   | 600   |
| Can C   | .. .. . Milk rinse, 200 ml. .. .. .                                  | 6½                          | ..                      | 1,900   |
| Cooler  | .. .. . Milk rinse, 200 ml. .. .. .                                  | 7½                          | 300                     | 25  |
| Udder cloth   | .. .. . Sterile tin wiped with cloth, then rinsed with 50 ml. milk   | 5½                          | 4,500                   | 20  |
| Utensil brush   | .. .. . Milk rinse, 50 ml. .. .. .                                   | 6½                          | 12,000                  | 700   |
| Milker A's hands immediately after washing udder            | .. .. . Milk rinse, 200 ml. .. .. .                                  | 5½                          | 9,000                   | 100   |
| Milker A's hands half-way through milking one cow           | .. .. . Milk rinse, 200 ml. .. .. .                                  | 5                           | 46,000                  | 130   |
| Milker B's hands immediately after washing mud-coated udder | .. .. . Milk rinse, 200 ml. .. .. .                                  | 5½                          | 5,000                   | 180   |
| Air on feed platform  | .. .. . 50 ml. milk exposed for 5 min. ..                            | 7½                          | 400                     | 6   |
| Air under cow being milked                                  | .. .. . 50 ml. milk exposed for 4 min. ..                            | 7½                          | 1,500                   | 4   |
| Air in bails  | .. .. . 50 ml. milk exposed for 5 min. ..                            | 6½                          | 730                     | 20  |
| FARM No. 2  |  |                             |                         |   |
| Control milk A, drawn aseptically                           | .. .. .  | 9                           | 1,000                   | 0   |
| Control milk B, drawn aseptically                           | .. .. .  | 9+                          | 1,000                   | 0   |
| Milking machine   | .. .. . Milk A rinse, 1,700 ml. .. .. .                              | 3½                          | 216,000                 | 43,000  |
| Can   | .. .. . Milk B rinse, 200 ml. .. .. .                                | 6½                          | 47,000                  | 8,000   |
| Strainer  | .. .. . Milk B rinse, 100 ml. .. .. .                                | 7½                          | 20,000                  | 5,000   |
| Vat   | .. .. . Milk B rinse, 200 ml. .. .. .                                | 9+                          | 5,700                   | 0   |
| Cooler  | .. .. . Milk B rinse, 100 ml. .. .. .                                | 8½                          | 84,000                  | 6,500   |
| Udder cloth   | .. .. . Sterile tin wiped with cloth, then rinsed with 50 ml. milk B | 8½                          | 336,000                 | 5,500   |
| Milker A's hands  | .. .. . Milk B rinse, 200 ml. .. .. .                                | 6½                          | 260,000                 | 1,400   |
| Milker B's hands  | .. .. . Milk B rinse, 200 ml. .. .. .                                | 7½                          | 184,000                 | 5,000   |
| Tank water  | .. .. . 1/10 ml. in 10 ml. milk B .. .. .                            | 9+                          | 3,000                   | ..  |
| Air under cow being milked                                  | .. .. . 50 ml. milk B exposed for 5 min. ..                          | 9+                          | 1,000                   | 5   |
| Air in bails  | .. .. . 50 ml. milk B exposed for 5 min. ..                          | 9+                          | 1,700                   | 0   |
| Feed dust   | .. .. . 50 ml. milk B exposed for 5 min. ..                          | 9+                          | 1,200                   | 5   |
| FARM No. 3  |  |                             |                         |   |
| Control milk A, drawn aseptically                           | .. .. .  | 9+                          | 350                     | 5   |
| Control milk B, drawn aseptically                           | .. .. .  | 8½                          | 550                     | 5   |
| Milking machine   | .. .. . Milk A rinse, 1,700 ml. .. .. .                              | 2½                          | 2,000,000               | 58,000  |
| Can   | .. .. . Milk B rinse, 200 ml. .. .. .                                | 7¼                          | 53,000                  | 20,000  |
| Strainer  | .. .. . Milk B rinse, 100 ml. .. .. .                                | 9                           | 1,500                   | 150   |
| Vat   | .. .. . Milk B rinse, 200 ml. .. .. .                                | 8                           | 8,800                   | 50  |
| Cooler  | .. .. . Milk B rinse, 100 ml. .. .. .                                | 8½                          | 3,000                   | 20  |
| Udder cloth   | .. .. . Sterile tin wiped with cloth, then rinsed with 50 ml. milk B | 7¾                          | 900                     | 25  |
| Vat rag   | .. .. . Sterile tin wiped with cloth, then rinsed with 50 ml. milk B | 8½                          | 900                     | 35  |
| Milker's hands  | .. .. . Milk B rinse, 200 ml. .. .. .                                | 5½                          | 25,000                  | 750   |
| Tank water  | .. .. . 1/10 ml. in 10 ml. milk B .. .. .                            | 9                           | 1,400                   | ..  |
| Air under cow being milked                                  | .. .. . 50 ml. milk B exposed for 5 min. ..                          | 8½                          | 580                     | 10  |
| Air in bails  | .. .. . 50 ml. milk B exposed for 5 min. ..                          | 9                           | 750                     | 5   |
| FARM No. 4  |  |                             |                         |   |
| Control milk A, drawn aseptically                           | .. .. .  | ..                          | 55                      | ..  |
| Control milk B, drawn aseptically                           | .. .. .  | 9½+                         | 100                     | 5   |
| Milking machine   | .. .. . Milk A rinse, 1,500 ml. .. .. .                              | 8                           | 3,200                   | 2,000   |
| Can A   | .. .. . Milk B rinse, 200 ml. .. .. .                                | 6½                          | 28,000                  | 24,000  |



DATA FROM FIVE FARMS—continued

| Surface, &c., Sampled   | Sampling Treatment   | Methylene Blue Test (hours) | Bacterial Count per ml. |   |
|---|--|-----------------------------|-------------------------|---|
|   |  |                             | Raw                     | After Laboratory Pasteurization 63°C. for 30 min. |
| FARM NO. 4—continued  |  |                             |                         |   |
| Can B .. .. .   | Milk B rinse, 200 ml. .. .. .                                | 5½                          | 200,000                 | 21,000  |
| Udder cloth A .. .. .   | Sterile tin wiped with cloth, then rinsed with 50 ml. milk B | 9½                          | 300                     | 0   |
| Udder cloth B .. .. .   | Sterile tin wiped with cloth, then rinsed with 50 ml. milk B | 9½+                         | 370                     | 10  |
| Milker A's hands .. .. .                                      | Milk B rinse, 200 ml. .. .. .                                | 5½                          | 32,000                  | 3,400   |
| Milker B's hands .. .. .                                      | Milk B rinse, 200 ml. .. .. .                                | 5½                          | 37,000                  | ..  |
| Tank water .. .. .  | 1/10 ml. in 10 ml. milk B .. .. .                            | 9                           | 1,400                   | ..  |
| Air under cow being milked .. .. .                            | 50 ml. milk B exposed for 5 min. .. .. .                     | 8½                          | 4,500                   | 500   |
| Air in bails .. .. .  | 50 ml. milk B exposed for 5 min. .. .. .                     | 9                           | 140                     | 0   |
| Bulk milk entering can .. .. .                                | .. .. .  | 6½                          | 45,000                  | 7,000   |
| FARM NO. 5  |  |                             |                         |   |
| Control milk drawn aseptically .. .. .                        | .. .. .  | 9+                          | 45                      | 0   |
| Can A .. .. .   | Milk rinse, 200 ml. .. .. .                                  | 7½                          | 84,000                  | 33,000  |
| Can B .. .. .   | Milk rinse, 200 ml. .. .. .                                  | 6½                          | 81,000                  | 20,000  |
| Bucket .. .. .  | Milk rinse, 100 ml. .. .. .                                  | 6½                          | 11,400                  | 100   |
| Vat and cooler .. .. .  | Milk rinse, 200 ml. .. .. .                                  | 9+                          | 400                     | 20  |
| Udder cloth .. .. .   | Sterile tin wiped with cloth, then rinsed with 50 ml. milk   | 5½                          | 7,000                   | 150   |
| Milker's hands immediately prior to beginning milking .. .. . | Milk rinse, 200 ml. .. .. .                                  | 5                           | 52,000                  | 150   |
| Tank water .. .. .  | 1/10 ml. in 10 ml. milk .. .. .                              | 9+                          | 10,000                  | ..  |
| Air under cow being milked .. .. .                            | 50 ml. milk exposed for 5 min. .. .. .                       | 8                           | 250                     | 20  |
| Air in bails .. .. .  | 50 ml. milk exposed for 5 min. .. .. .                       | 7                           | 9,000                   | 10  |



## Queensland Pocket Year Book, 1960

*The eleventh (1960) issue of the Queensland Pocket Year Book will be of value to all persons interested in the political, business, and social life of the State. The new issue follows the pattern of the 10 previous issues as a small reference book of Queensland statistics. It provides the latest available statistical information on all the matters included in the earlier issues, including in most cases the financial year 1958-59 or the calendar year 1959.*

*Copies may be obtained from the Office of the Deputy Commonwealth Statistician at a cost of 1s. 6d. each, or 1s. 11d. when posted.*



# Brucellosis-Tested Swine Herds

(As at 1st October, 1960)

## Berkshire

Bernoth, B., Wyreema  
Clarke, E. J., Mt. Alford, via Boonah  
Cochrane, S., "Stanroy", Felton  
Cook, F. R. J., Middle Creek, Pomona  
Crawley, R. A., Rockthorpe, Linthorpe  
Edwards, C. E., "Spring Valley" Stud, Kingaroy  
Farm Home For Boys, Westbrook  
Fletcher, A. C., "Myola" Stud, Jimbour  
French, A., "Wilson Park", Pittsworth  
H. M. State Farm, Numinbah  
H. M. State Farm, "Palen" Stud, Palen Creek  
Handley, J. L., "Meadow Vale", Lockyer  
Handley, G. R., "Lochlyn" Stud, Lockyer  
James, I. M. (Mrs.), "Kenmore" Stud, Cambooya  
Kath, E. E., "Topcamp", via Toowoomba  
Kimber, E. R., Block 11, Mundubbera  
Law, D. T., "Rossvill" Stud, Aspley  
Lees, J. C., "Bridge View" Stud, Yandina

Ludwig & Sons, A. R., "Beau View" Stud, Beaudesert  
O'Brien & Hickey, J., "Kildurham" Stud, Jandowae East  
Orange, L. P., "Eula", Flagstone Creek  
Pfrunder, P. L., Pozieres  
Potter, A. J., Ascot, via Greenmount  
"Tayfield" Stud, Taylor  
Q.A.H.S. & College, Lawes  
Regional Experimental Station, Hermitage  
Rosenberger, N., "Nevrose", Wyreema  
Rosenblatt, G., Roseville, Biloela  
Schellback, B. A., "Redvilla" Stud, Kingaroy  
Smyth, E. F., "Grandmere" Stud, Manyung, Murgon  
Stark, H. L., "Florida" Stud, Kalbar  
Thomas & Sons, F., "Rosevale" Stud, Laravale  
Traves, G., "Wynwood" Stud, Oakley  
Weier, V. F., "La Crescent", Clifton  
Wolski, A., "Carramana", Warra  
Young (Jnr.), W., Kybong, via Gympie

## Large White

Assenbruck, C., Mundubbera  
Barron Bros., "Chiltern Hill", Cooyar  
Bell & Son, E. J., "Dorne", Chinchilla  
Behm, A. M., "Aleun", Wondai  
Bishop, C. E., Beerwah  
Butcher, Dr. B. J. & Parnwell, A. J., Plunkett, via Tamborine  
Clark, L. D., Greens Creek, Gympie  
Coller, R. H., "Relloc", Tallegalla, via Rosewood  
Duncan, C. P., "Colley", Flagstone Creek  
Fowler, S., "Kenstan", Pittsworth  
Franke, H. J., "Delvue" Stud, Cawdor  
Garwin Stud Farm Pty. Ltd., 657 Sandgate Rd., Clayfield  
Gibbons, A. E. H., Mt. Glorious  
Gibson, H., "Thistleton" Stud, Maleny  
H. M. State Farm, Numinbah  
Hall, M., "Milena" Stud, D'Aguiar  
Heading, J. A., "Highfields", Murgon  
Hickson, K. L., "Warra", Calliope  
Horton, C. J., "Mannuem Brae" Stud, Mannuem, Kingaroy  
Hutton, G., "Grajae" Stud, Cabarlah  
Jensen, S., Rosevale, via Rosewood  
Jones, K. B., "Cefn" Stud, Clifton  
Kahler, J. & S., "Karajoy", East Nanango  
Kanowski, A., "Exton", Pechey  
Kennard, R. B., "Collar" Stud, Warwick  
Larsen, H. L., "Oakway" Stud, Kingaroy  
Law, D. T., "Rossvill" Stud, Aspley

Lees, J. C., "Bridge View", Yandina  
Lobegeiger, L. C., "Bremer Valley" Stud, Moorang, via Rosewood  
Mack, A. J., Mundubbera  
"Marcliff", Wecker Rd., Mt. Gravatt  
Neilsen, L. R., "Sunny Hill", Ascot, via Greenmount  
Neilsen, A. R., Ascot, via Greenmount  
Palmer, V. P. & Son, "Remlap", Greenmount  
Pampling, G., Watch Box Rd., Goomeri  
Port Curtis Co-operative Dairy Association Ltd., Stud Piggery, Biloela  
Postle, R., "Yaralla" Stud, Pittsworth  
Powell, R. S., "Kybong", Gympie  
Q.A.H.S. & College, Lawes  
Radel, V. V., Coalstoun Lakes  
Radel, R. M., Coalstoun Lakes  
Regional Experimental Station, Biloela  
Robinson, O. R. & O. J., "Linvale", Argoon, Biloela  
Rosenblatt, G., Roseville, Biloela  
Skyring, G. I., "Bellwood" Stud, via Goomeri  
Stanton, H. R., "Lanherne" Stud, Tansey, via Goomeri  
Stehn, L. W., "Hodgson Vale", via Toowoomba  
Stewart, L., Mulgowie, via Laidley  
Stumer, K. F., French's Creek, Boonah  
Wharton, C. A., "Central Burnett" Stud, Gayndah  
Wieland, L. C. & E., Lower Cressbrook, Toogoolawah  
Zahnow, W., Rosevale, via Rosewood

## Tamworth

Armstrong, H. J., "Alhambra", Crownthorpe, Murgon  
Booth, J. D., Swan Creek, Warwick  
Campbell, P. V., "Lawnhill" Stud, Lamington  
Fletcher, A. C., "Myola" Stud, Jimbour  
Herbst, L., "Hillbanside", Bahr Scrub, Beenleigh  
Kanowski, S. E., "Miccho", Pinealands  
Potter, N. R., "Actonvale" Stud, Wellcamp

Regional Experimental Station, Kairi  
Salvation Army Training Home For Boys, "Canaan" Stud, Riverview  
Skerman, D. F. L., "Waverley", Kaimkillenbun  
Stephen, T., "Withcott" Stud, Helidon  
Thomas & Sons, F., "Rosevale" Stud, Laravale  
Wieland, L. C. & E., Lower Cressbrook, Toogoolawah

## Wessex Saddleback

Ashwell, J., "Green Hill", Felton South  
Cooper, G. J., Neungua  
Douglas, W., "Greylight" Stud, Goombungee  
Dunlop, J. B., "Kunawyn", Acacia Rd., Kuraby  
Kingsford, D., "San Antone", Toowoomba  
Kruger & Sons, "Greyhurst" Stud, Goombungee

Lau, D. E., "Homevale", Goombungee  
Law, D. T., "Rossvill" Stud, Aspley  
Mack, A. J., Mundubbera  
Scott, A., Wanstead Stud, Grantham  
Smith, C. R., "Belton Park", Nara  
"Wattledale" Stud, 432 Beenleigh Rd., Sunnybank

## Landrace

Ashwell, J., "Greenhill", Felton South  
Behm, A. M., "Aleun", Wondai  
Crawford, G. L., "Glenvillan", Manneum  
Crothers, B. M., "Booiglar", Clifton  
Duncan, C. P., "Colley", Flagstone Creek  
Fowler, K. P., "Northlea", Coalstoun Lakes  
Grayson, D. G., Killarney  
Itzstein, R. A., "Hyde Park", Gooroolba  
Jensen, A. P., & Grace, V. S., Theodore  
Kath, E. E., "Topcamp", via Toowoomba

Kingsford, D., "San Antone", Toowoomba  
Law, D. J., Rossville Stud, Aspley  
Lusk, P. B. and I., Westbrook  
Neilsen, A. R., Ascot, via Greenmount  
Neilsen, L. R., "Sunny Hill", Ascot, via Greenmount  
Orange, L. P., "Eula", Flagstone Creek  
Semgreen, A. L. & D. T., "Tecoma", Kingaroy  
Stehn, L. W., "Hodgson Vale", via Toowoomba  
Stummer, K. F., French's Creek, Boonah

## Large Black

Pointon, E., Goomburra



# orchard and garden

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**Control of Macadamia Pests.**—Pests of macadamia nuts are attracting more attention because of an increase in commercial production. Records of minor pests are accumulating but only three species have so far been troublesome. These are the macadamia flower caterpillar, the fruit spotting bug and the macadamia nut borer.

The flower caterpillars are small pale-brown grubs which feed on the flowers and web dead fragments along the flower stalks.

The fruit spotting bugs are orange and black when small; pale-brownish-green and half an inch long when full-grown. They attack young to well-developed nuts and by piercing them to the kernels cause many to fall prematurely, others are malformed.

The nut borers are small brownish-coloured grubs which eat neat round holes through the shells of well-developed nuts and then devour the kernels.

Each of these pests can be controlled by a 0.1 per cent. DDT spray. In each instance one thorough application should be effective. Observations will then determine the need for repeat treatments.

—Dr. A. R. BRIMBLECOMBE,  
*Senior Entomologist.*

**Grape Varieties on the Coast.**—Despite climatic conditions which are not entirely satisfactory an appreciable commercial acreage of grapes is grown in coastal Queensland.

Expert vineyard management and a sound knowledge of the vagaries of the vine are essential for economic success!

But there are compensations if you produce the crop, for coastal grapes mature early and

arrive on a high-priced market from Christmas through January.

Choice of variety is important. Not all do well; only very few are worth consideration. Happily, two excellent black European varieties—namely Muscat Hamburg and Black Hamburg—have proved suitable for the coast and should comprise the bulk of coastal vineyard plantings. The Black Hamburg is the heavier cropper; Muscat yields are normally lower but this variety produces a superior berry of higher market value. For a very early lead-up harvest, many growers plant a white grape such as Chaouch, which is quite saleable on a bare market prior to Christmas.

On light sandy soils, it is advisable to graft the Hamburg types on to vigorous Phylloxera-resistant rootstocks. On their own roots in such soils, vine growth is rather weak but rootstocks such as *Rupestris du Lot* will impart vigour to the vine. On heavier, fertile soils, the Hamburgs grow well on their own roots and grafting is considered unnecessary.

—D. DOWDLES, *Adviser in Horticulture.*

**Marketing Tomatoes.**—The general marketing and presentation of tomatoes plays an ever-increasing part in determining the financial result growers will receive for their hours of arduous toil, and money invested, to produce crops. Grade standards have been defined by the Standards Branch of the Department of Agriculture and Stock in order to maintain that standardisation of quality which is vital to the stability of the industry.

In short the grade standards for tomatoes provide that the fruit shall be graded as A or B grade quality and be properly packed in even sizes. Cases are to be clean and packing paper



shall be clean and new. Cases shall be branded with grower's name and address and marked with the size and grade of fruit contained in each case.

There are still growers who market tomatoes in unbranded cases, cases showing old brands and cases which have not been marked with the grade or size. These factors only cause confusion and delay as market inspectors withhold these consignments from sale until the cases are correctly branded and marked. Good growers are invariably proud of their produce and prominently mark and brand their packages.

Copies of the grade standards for tomatoes are available on request from the Department of Agriculture and Stock.

—C. M. APPS, *Market Inspector.*

**Banana Fertilizing in the North.**—Recent work in banana nutrition in North Queensland has produced evidence that the potassium requirements of the plant are often inadequately provided for.

This is particularly the case on old land that has been under pasture or weed growth or that has been heavily cropped for some years without adequate replenishment of plant nutrients. It also occurs, however, on comparatively new land that is naturally deficient in potassium.

In past years banana growing in North Queensland has been an itinerant industry. With plenty of rich scrub land available it was the custom to clear a piece of virgin scrub and grow two or three crops of bananas, then, when the quality of the fruit began to deteriorate, to move to a new piece of scrub and repeat the process. With the rich alluvial lands then available this method of culture was quite satisfactory, even without the use of fertilizers. However, in the past decade the availability of new scrub land has become less and less so the industry has had to become a static one with the soil deficiencies being made good by fertilizing.

A fertilizer mixture commonly used by commercial banana growers in the wet tropics has a formula of 7:10:10 and this has been generally used at the rate of up to 3 lb. per stool per year to produce fruit of satisfactory quality. However, in some instances results have been far from satisfactory on this programme. Plant

growth in the early stages has been good on many of the affected plantations, and then at the end of the wet season when the plants have almost reached the stage of bunching the leaves have started to turn yellow. Bunches of good size may be thrown but it is obvious right from the start that the fruit is pinched and will not develop. Practically no fruit has been harvested from these plantations.

In trials carried out by the Department of Agriculture it has been found that even 5 to 6 lb. of fertilizer with 7:10:10 formula has not corrected the trouble. But when the amount of potassium was increased so that the ratio between potassium and nitrogen was of the order of three or four to one then the symptoms of failure of the plants did not appear. This follows the experience in overseas banana countries where mixtures of the order of 8:8:24 are commonly used.

On the evidence of our recent trials it seems likely that banana growers in North Queensland would be wise to change over from 7:10:10 to mixtures such as 5:9:17 or 5:8:23. Both of these are commercial mixtures and should be readily available.

—S. E. STEPHENS, *Horticulturist.*

**Studies on Fruit Juice Flavour.**—Studies aimed at retaining all the flavour of farm-fresh fruit in pineapple juice sold in Queensland have begun at the Agriculture Department's new Hamilton Food Preservation Laboratory. These investigations are the start of a plan to increase the consumption of pure fruit juice.

The Minister for Agriculture and Forestry (Hon. O. O. Madsen, M.L.A.) said there is evidence that markets for pure fruit juice can be expanded. However, expansion of markets would require the juice to be of good quality and the price within the reach of the consumer.

In overseas countries, these conditions are being met by concentrating the juice to reduce freight costs and using methods to retain the flavour.

At Hamilton, a special evaporator capable of converting five gallons of juice into one gallon of concentrate is now being built. The evaporator has extra equipment to recover any flavouring substances lost in concentration.



These substances are then returned to the concentrated juice.

It is known that the flavour of pineapple juice varies according to the season. There is a greater concentration of flavouring substances in summer pineapples than in the winter crop.

As a preliminary step in the concentration process, a detailed study is being made of the flavouring substances in pineapple juice. During the 1960-61 summer crop, fruit sent to the Northgate Cannery will be sampled and tested at regular intervals.

Mr. Madsen said although the studies are being made on pineapples, the basic information obtained could be used in concentrating the juice of any fruit. As a demand for concentrated fruit juices develops, citrus, grape, passion fruit, apple and tomato juices would also be prepared.

**Fertilizing of Strawberries.** Work on strawberry nutrition has been in progress at the Redlands Experiment Station since 1955. Initially, the aim was to determine the responses, if any, to applied nitrogen, potassium and trace elements, molybdenum, copper, zinc and boron. Trials in 1955 indicated that high levels of potassium increased the number of berries but reduced berry size and overall yields were not affected. In addition, high levels of nitrogen reduced yields which suggests that some care is necessary in using nitrogenous fertilizers. No response was obtained from any of the trace elements even though some, such as molybdenum, are in short supply in the soils at the Station.

In the following year, rates and times of application for side dressings were investigated. All plots receive a basal application of 4-12-12 mixture at a rate of 15 cwt./acre before planting. Side dressings ranged up to luxury levels of a soluble 4.5-12-6 mixture with successive applications at 2, 4 and 8 week intervals. Yields were approximately 20,000 lb. per acre and

95 per cent. of the berries harvested were marketable. It was concluded that side dressing schedules based on application of 4 cwt./acre at intervals of 4 weeks from the commencement of flowering are suitable for commercial production. Quantities in excess of these amounts are probably wasted.

In 1959, the nutritional trial was designed to check the influence of superphosphate in both basal and side dressing fertilizers (the soil is well supplied with phosphate by analysis) and also the influence of nitrogen and potassium in side dressing fertilizers. Marked responses were obtained to applied superphosphate and this was due to the increased number of berries harvested rather than any increase in berry size. The response to superphosphate in the side dressing was rather unexpected as this nutrient is normally "fixed" near the surface of the soil. The crop, however, was mulched and root development close to the surface probably enabled the plants to use it. Nitrogen in side dressings increased yields, but applications at rates in excess of 20 lb. of nitrogen per acre were wasteful. Yield increases due to side dressings of nitrogen amounted to 27 per cent. of the harvested crop.

It is concluded that:—

- (a) Moderate quantities of nitrogen and large amounts of superphosphate are required in the basal fertilizer; the potassium requirement is small in a soil already well supplied with this element;
- (b) Frequent light applications of nitrogen are needed in side dressing fertilizers;
- (c) The current recommendation of 15 cwt. 5-13-5 for the basal dressing and side dressings of 5-13-5 (soluble) at 4 cwt. per acre (2 lb. per chain-row) every 4 weeks from the commencement of flowering should be adequate on most soil types.
- (d) The response to superphosphate should be further investigated. It may, in part, be due to elements such as sulphur or calcium in the fertilizer.

K. M. WARD, Senior Horticulturist.



# For Country Cooks

Notes from the **JUDITH MAY TEST KITCHEN**, directed by Ruby Borrowdale for the Butter Marketing Board.



## A Meal On Toast

Hot buttered toast is a food everybody enjoys and when you combine toast with tasty sandwich fillings you really have something. You can serve a meal after the evening's entertainment by using toast and sandwich fillings and find that economy and variety can be combined in a really enjoyable snack. Leftovers of chicken, pork, lamb, beef and fish will lend themselves admirably to this form of serving and the addition

of a touch of chutney, mushrooms, cheese, onions, olives, capsicum, and so on, will provide all the glamour needed to transform an ordinary sandwich supper into a delightful meal.

When sandwiches are to be dry-fried, place the prepared filling between unbuttered bread and then melt the butter in the frypan; fry sandwiches till golden on both sides, turning with spatula or egg slice. Serve hot from the pan.



Toast 3 slices of bread, and butter one side of each piece. Cover 1 slice with crisp lettuce, letting it extend beyond the edges. Arrange slices of left-over chicken, duck, pork or any desired meat on top of lettuce; spread with garden vegetable sauce (recipe follows) and cover with second piece of toast; place slices of onion, tomato and hard-cooked egg on this, season to taste and cover with third piece. Press together and cut into triangles and serve while toast is hot. If filling is plentiful and bulky, it may be necessary to fasten the triangles with toothpicks.

### GARDEN-VEGETABLE SAUCE

Two tablespoons butter, 2 tablespoons finely chopped celery, 2 tablespoons grated onion, 2 tablespoons chopped green capsicum and 1 cup tomato sauce. Melt the butter in a small saucepan. Add celery, onion, and capsicum. Cook until soft, but not browned. Add tomato sauce; and heat. Turn into glass jar, cover when cold.

*Note:* This sauce can be used in place of mayonnaise for binding all sandwich fillings. It is especially good with canned fish. When serving hamburgers on toasted buns, serve this sauce hot over the hamburgers.

### OLIVE CLUB SANDWICH

Substitute sliced hard-cooked eggs for the meat or poultry in the olive club sandwich; sprinkle chopped ripe olives over thinly sliced tomatoes on the second layer.

### ASPARAGUS THREE-DECKER

Heat asparagus tips in their own liquid then drain well. Spread 6 tips between 2 slices of buttered toast, smear lightly with prepared mayonnaise. Spread top of sandwich with mayonnaise and cover with chopped tomatoes, pearl pickled onions and 2 slices of crisp bacon. Cover with third piece of toast and serve with a garnish of mustard pickles or sliced gherkins.

### SPANISH SANDWICHES

Six slices buttered toast, 1 tablespoon butter, 1 cup grated tasty cheese, 2 tablespoons chopped green capsicum, 2 tablespoons chopped onion, 1 cup thick tomato pulp,  $\frac{1}{2}$  teaspoon salt, dash

of paprika, 1 beaten egg. Fry the capsicum and onion in the butter for 5 min.; add tomato pulp, cheese, salt and paprika and cook 5 min. longer, or until cheese is just melted. Stir a small amount of this mixture into beaten egg; return to hot mixture and cook 2 min. longer; serve on hot toast. Makes about 6 servings.

*Note:* To make the thick tomato pulp from fresh home-grown tomatoes, place the required number of ripe tomatoes in a large bowl and cover with boiling water. Cover and let stand about 3 min. Drain water off and remove skins with sharp knife. Cut peeled tomatoes into halves and squeeze gently to remove seeds. Then chop flesh and measure. When tomatoes are prepared this way they impart brighter colour, better flavour and thicker consistency to all savoury sauces and fillings.

### CHEESE DREAMS

Spread 6 slices of bread with peanut paste; top each with a slice of cheddar cheese, then with another slice of bread. Press well together, trim crusts and cut into triangles. At serving-time melt some butter in a heavy frypan and fry the sandwiches until golden brown on both sides; serve immediately.

*Note:* The sandwiches can be prepared well ahead of serving-time, wrapped in aluminium foil or waxed paper and then cooked when required. During the colder months it is not necessary to refrigerate them.

### OPEN-FACE SANDWICH

Four slices bread cut about  $\frac{1}{2}$ -in. thick and crusts removed, 8 teaspoons salad dressing, 1 large tomato (peeled), sliced cheddar cheese. Toast slices of bread on one side only. Spread the untoasted sides with mayonnaise or boiled salad dressing. Place on each a slice of tomato and then cover entire surface with thinly-sliced cheese. Place under medium-hot griller for about 5 min. until cheese melts and starts to brown. Serve immediately. Serves 4.

*Note:* A white or cream sauce to which has been added some cooked cauliflower, cooked green peas, boiled onions or asparagus tips makes an excellent sauce or gravy to serve over these cheese-tomato toasts.



## SWEET TOAST

Use thin slices of bread toasted quickly; remove crusts, cut in strips, triangles or other shapes, and spread with butter. Sprinkle or spread with one of the following mixtures and place under the griller or in a moderate oven to melt the sugar. Serve hot for breakfast or supper snacks.

*Cinnamon Toast:* Add  $\frac{1}{2}$  teaspoon powdered cinnamon to every  $\frac{1}{4}$  cup white or brown sugar. Place in sugar shaker and sprinkle over prepared toast.

*Orange Toast:* Add 2 teaspoons grated orange rind and 2 tablespoons orange juice to every  $\frac{1}{2}$  cup sugar.

*Banana Toast:* Mash 3 ripe bananas, add 1 teaspoon lemon juice, 1 tablespoon sugar and 1 tablespoon softened butter. Mix well and spread over slices of unbuttered toast. Place in hot oven for about 5 min. Serve hot with cream, if desired. This makes a rich, tasty treat for children.

*Honey Cinnamon Toast:* Mix equal amounts of warmed honey and butter and spread on unbuttered toast; sprinkle with cinnamon, if desired. Serve hot.

## FRENCH TOAST

Some people like French toast very soft, as when made with more milk and less egg; others

prefer it rather crisp as made with more egg and less milk. The choice depends on your own taste and the egg supply.

*Soft Style:* Two eggs just slightly beaten with a fork, few grains salt, few grains nutmeg, 1 cup fresh milk and 6 slices of bread (crusts trimmed), butter or Ghee for frying. Mix together the eggs, salt, nutmeg and milk in a deep plate or shallow dish. Heat the frying pan and melt sufficient butter or Ghee in it to cover the bottom, but do not let it brown. Cut slices of bread into halves. With a fork, dip quickly in and out of the egg batter. Drain a moment then fry quickly in the hot butter until golden brown on both sides; turning with egg slice or spatula. Serve plain or with grilled bacon, ham or sausages. Or as a sweet with honey, jam or jelly.

*French Toast Crisp-Style:* Follow the above recipe using 3 slightly beaten eggs to the cup of milk instead of 2 eggs.

## FRENCH TOASTWICHES

Make thin sandwiches of either white or brown bread, using minced cooked poultry, ham, tongue, luncheon meat, peanut paste or tasty cheese as fillings. Dip with fork into the French toast batter and fry quickly until golden. Serve as a hot snack for breakfast, lunch or supper. They are excellent with thin soups or salads.



## The Word "Broiler"

An organisation has been formed in Britain to promote chicken as a food, and to end the confusion in the public's mind over the word "broiler". This word in America describes a plump young chicken.

The Chicken Information Council was set up by the British Broiler Growers' Association, to be responsible for all the Association's publicity activities on behalf of the chicken industry.

In a survey, 160 London housewives were interviewed. One-third of those questioned had no idea what "broiler" meant. When told that

it was a chicken and asked what type, only 21 replied that it was a young chicken. Fifty said it was a boiling bird. Others described it as an old chicken, a steam roaster and a slow roaster. Only one housewife in 10 interviewed knew that a broiler was a young chicken. "We hope to replace the word 'broiler' by something which everyone understands—and enjoys," said Mr. Pendry, chairman of the new Council.

A new slogan for the industry was suggested: "Chicken—the treat you can afford."



## Buying Baby's Clothes

Baby clothes are always pretty—but remember they need to be practical.

With baby-clinics to advise, specially for the first-born, and with today's textiles and fancy-stitching sewing machines, there is no reason why they can't be both pretty and practical.

Here are some reminders for mothers-to-be, mothers and gift givers:

Baby's clothes should be comfortable. Materials should not be harsh, and there should be no lumpy buttons or decorations to hinder comfort when lying down.

Clothes should be warm, but not too warm, therefore material should be porous.

Choose fabrics that are easy to wash, dry and iron. For nightwear try to use flame-resistant fabrics.

They should be easy to put on and take off, especially for small babies. Choose nightgowns, underclothes and dresses that open well down the back or have a good head opening. Crossover styles are best for the new baby.

Avoid tight sleeves. Get raglan or magyar sleeves wherever possible, especially for coats.

Allow for growth. Choose clothes with good hems and side seams; babies grow fast, so do not overburden yourself with first-size garments.

Buy hats or bonnets that cover the ears for really cold weather.

Shoes should be broad enough, as well as long enough, particularly near the toes.

Tight socks and bootees are as bad for the feet as tight shoes.

When you buy brightly-coloured clothes, make sure that the dyes are fast.

See that tape or ribbon fastenings are securely attached to the garment so that they cannot be swallowed.



## Proper Room Lighting

"Can you see, to do more than talk, in your lounge, living, and bedroom? By see, is meant REALLY SEE to read, write, or sew, or to be sure make-up is correct."

The usual central light rarely gives adequate lighting at all points of a room.

This fault can be overcome by installing fluorescent lighting as may be seen now in many kitchens.

Another solution to inadequate lighting is to provide standard or table lamps which can be placed in exactly the right spot to give the extra light so necessary for close work if eyestrain is to be avoided.

General lighting is still essential when working by a lamp, to prevent added strain on the eyes.

If the rest of the room is unlit the eyes have to accommodate themselves to a different set of lighting conditions each time the glance moves



outside the circle of lamp light and again when it returns to it.

Today's lamps are generally both useful and decorative.

Choose a lamp tall enough to spread a generous circle of light on what you wish to see.

The shade should be deep enough to cover the light bulb, and dense enough to conceal its lighted outline.

A light lining to the shade is recommended because a dark-coloured lining absorbs much of the light.

The lamp should be equipped with a translucent reflector bowl under the shade. The bowl provides a combination of upward and downward light that eliminates annoying glare, disturbing shadows, and too-sharp contrasts.

A shade with a wider diameter at the base than at the top is to be preferred as it "spreads" the light.

### **Washing Terylene Curtains**

Washing of terylene curtains should not cause bother or anxiety, for terylene is one of the easiest to care for of the man-made fibres.

The following suggestions for general care and laundering have been provided by Miss Nancy Foskett, Senior Extension Officer, Women's Service, New South Wales Department of Agriculture:

Despite the ease of washing terylene curtains, they should not be allowed to become too soiled.

If they do, soak them in a warm solution of detergent and water. Drain off this water before washing the curtains; squeeze—*do not wring*—excess water from them.

Terylene is a tough fabric and it can be washed in hot water with soap powder or a soapless detergent.

Water temperature of from 140 to 170 deg. F. is recommended.

At temperatures higher than this the material may crease permanently, and for this reason terylene should never be boiled.

If the curtains are washed in a machine, water can be used hotter than the hands could bear, but the curtains will then probably need some ironing.

On no account should they be wrung or spun.

Where the curtains are washed by hand, hotter water can be used if rubber gloves are worn.

Rinse the washed curtains thoroughly, and hang them to drip dry; do not squeeze, spin, or wring them while they are hot and wet.

Some weaves of terylene net look better for a little ironing with a cool iron.

If, despite careful and frequent washing, the curtains become discoloured after a time, one of the special preparations on the market for whitening synthetic fabrics can be used with some success.

Follow the instructions carefully, and use a large tub to keep creasing to a minimum.

The preparation should be used after each wash, as the effect is cumulative.

Do not use a chlorine bleach.

### **Home Fire Drills**

If you awoke to-night to find your house on fire, how would you escape?

If you can't answer that question it's time you did some serious planning. Your own and your family's lives may depend on it.

Here is the plan recommended by the National Safety Council of U.S.A.:

Map out an escape route, and an alternative one from every room in the house.

Set a meeting place for the family outside.

Decide who should help small children, old people and invalids.

Teach the family to notify the fire brigade.

In a two-storey building, or one built up off the ground, escape may be more difficult. There is a good chance that halls and stairways will be unusable for escape from fire. You may be able to escape by a porch roof under a window, or a sturdy trellis.



A rope ladder with a permanently installed hook for fastening inside the window is good for rooms with no other exit. Be sure to practise throwing the ladder out the window, and climbing down.

Teach everyone to test a door before opening it, if fire is suspected. If the panels or knob feel warm, do not open the door. Stuff a small rug or clothing along the bottom door crack to keep out smoke and flames as long as possible. If the door is not hot, open it cautiously. Turn your head away from the opening and brace yourself so you can close the door if hot air rushes in.

After mapping out your plans, practise them until they are second nature to your family. Once or twice is not enough, especially for your children. Remember, home fire drills may save your family.

### Hang a Parsley Basket

These days when so many are interested in indoor gardens and indoor plants, why not include one that is as useful as it is decorative?

What about parsley, in a basket hanging in the kitchen window, or on a nearby porch or verandah, where it will get some sunshine—but not too much, because it likes some shade.

Not only will it look quite attractive, it will have the advantage of being right at hand when you want parsley.

In addition, it's more likely to flourish grown in this way, for you'll remember to keep it moist—and it won't take much in dry times to keep it growing.

Line a not-too-large basket with paper bark—or fresh moss, as some people prefer.

Fill the basket with a mixture of good garden loam, rotted animal manure, and some coarse sand to keep the soil open and well-drained.

Parsley plants don't transplant successfully, so the seeds should be sown in the basket.

Five or six plants will be all the basket can support, but sow a few more seeds to allow for a few "misses", and thin out if necessary.

Water the basket thoroughly, and keep it moist.

As soon as the plants are established and on their way, you can snip some off whenever you require it for soup, salads or savouries, for the more you pick the thicker it will grow.

While you're on the job make up a second basket, or two, for other herbs.

Many cooks also like to have a pot of chives handy—so make it a threesome.

### "What Can I Do Now?"

Mothers of small children, and children home from school during holidays or because of illness, are all too familiar with this cry—repeated at incredibly short intervals.

Children use up play projects fast and mother must be ready to come up with new ones on the spur of a moment.

Provide common, ordinary materials as play-things; give him time and space; cover the floor with newspapers or something washable; cut the sleeves out of an old shirt, put it on him to button down the back, and let him have the fun of learning something new through action by doing.

Provide crayons, coloured chalk, and finger paints with a big roll of shelf paper and let him express himself to his heart's content.

Moulding-clay and dough are other excellent play materials; also provide dull-pointed scissors and scraps of coloured paper and fabric.

You can make finger paint by whipping soap flakes or wall paper paste in water and adding food colouring.

If you haven't an opportunity to buy modelling clay, make up a dough of 1 part flour to  $\frac{1}{2}$  part salt and  $\frac{1}{4}$  part coloured water.

Make it very pliable but not sticky.

### Steps, Stairs, Storage

Falls are among the commonest of home accidents—caused by lack of thought in original planning of steps and stairs; or by untidiness which may be due to lack of storage, or poor arrangement.



Some things to keep in mind regarding steps and stairs when planning a house are listed:

Avoid single steps—small changes in floor levels are dangerous, either inside or outside the house.

A minimum of three steps is desirable—except, possibly, at entrances.

If small changes in a level are necessary, a ramp can be used. Ramps are well worth considering where perambulators or wheel chairs will be used. The desirable rise for a ramp is 1·4 in. in 12—and should, in no case, be greater than 2 in 12. The desirable width is at least 3 ft. 4 in.

Landings for steps outside the house should be on the same level as the inside floor.

Handrails should be provided—at two levels if there are children in the family.

Short flights of stairs with landings are preferable to a single straight flight.

More than sixteen steps in any one straight flight is undesirable.

Height and width of steps should be uniform—6 to 7 in. riser indoors, 5 to 6 in. riser outdoors.

Open risers should be avoided.

Good lighting of stairways is essential—with a two-way switch for night lighting.

Be particular about floor covering used on stairways—do not polish it, and keep it in absolute repair.

Having a place for everything is the first step towards having everything in its place—and if things are where they belong falls will be fewer.

However, storage must be planned carefully if it is to play its part in preventing falls.

Storage should fit the articles to be stored, and be conveniently placed.

It is more likely that articles will be put away if storage for them is near where they are used.

Full-height and full-front openings are desirable

Shelving which may be adjusted to suit changing needs is a good investment, and all shelving should be able to support the weight of objects without sagging or tipping.

Glass shelving should be shatterproof.

See that storage space is well lighted. If internal lighting is necessary, as in a large closet, ensure the bulb is placed so that it cannot come in contact with inflammable material.

—New South Wales Agriculture Department's  
"Press Copy."



## Diet and Health

For perfect health the body must have every day, the foods which (1) supply energy, (2) build, maintain and repair the body structures and (3) regulate body processes. These foods are carbohydrates and fats, proteins, vitamins and minerals.

Carbohydrates and fats, sugars, macaroni, bread and cereals, oils, pastry, butter and lard all assist in providing energy, but overconsumption of any of them induces obesity and reduces the intake of essential proteins, vitamins and minerals. Proteins also supply energy and these are found in the "protective" foods—milk, milk products, eggs, meat, poultry and fish, but they also build and repair tissue and in addition provide some of the essential vitamins and such minerals as calcium (lime) for strong teeth and

bones, phosphorus (body regulating) and iron (for enriching the blood stream).

Vitamins and minerals are among the elements which unfortunately tend to be most neglected. Vegetables and fruits are highly important for supplying vitamins and the minerals mentioned.

Fruit and vegetables should be eaten at every meal, as they aid digestion and assist in regulating body functions.

Citrus fruits, tomatoes, pineapple, lettuce and parsley are rich in vitamin C (Ascorbic acid), Bananas contain vitamins A, B1, C and G, and also minerals; apples and pears contain calcium, iron and phosphorus, also vitamins; dried fruits are rich in iron.