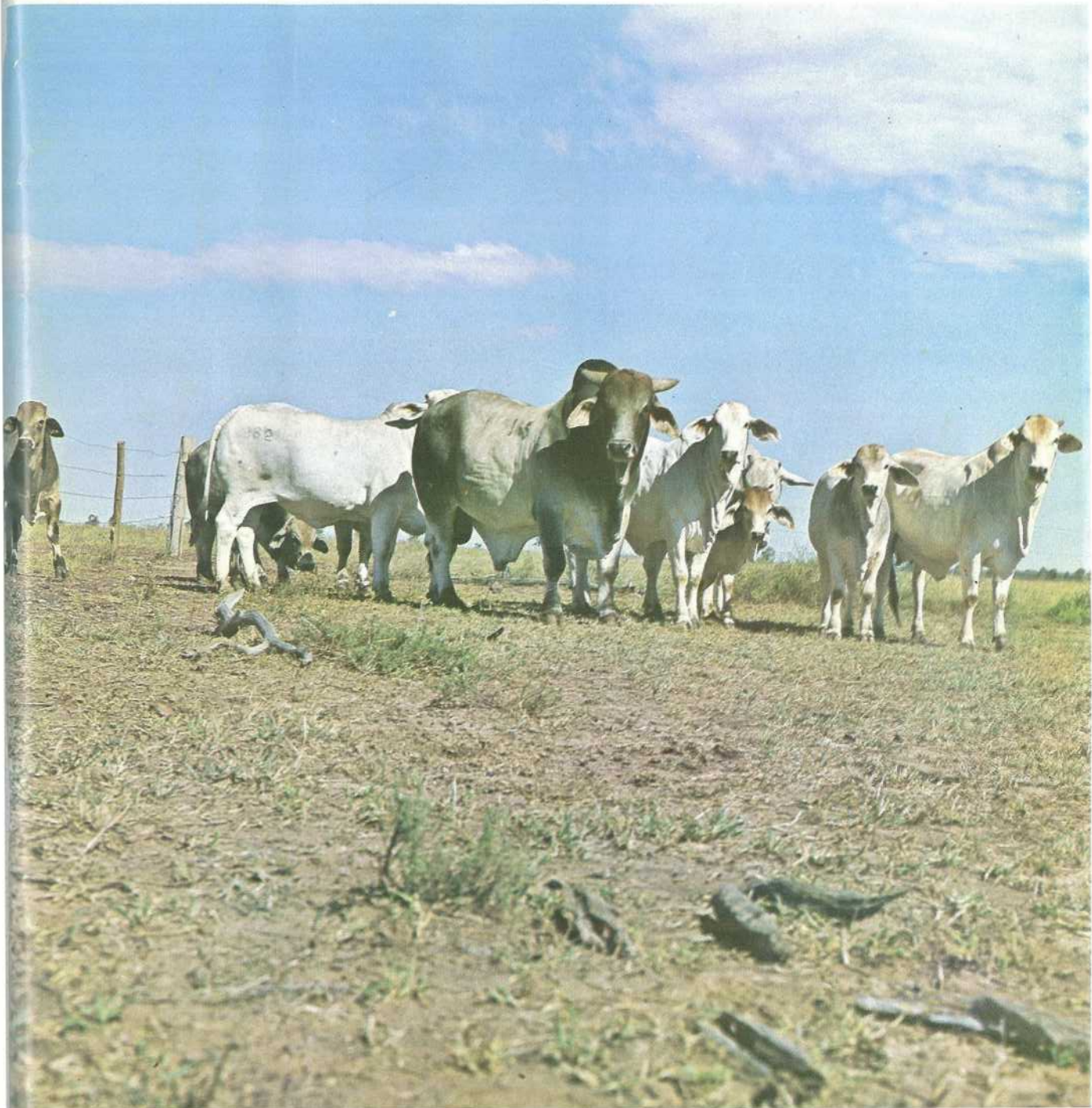


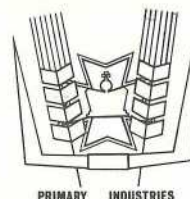
*Queensland*  
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JANUARY-FEBRUARY 1975  
Vol. 101 No. 1,





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*Part of a Brahman herd on a Central Queensland property. Although only 8.5% of Queensland's cattle are pure Zebu or tropical breeds, 42.7% have some Zebu blood in them.*

Editor: A. E. FISHER

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# QUEENSLAND AGRICULTURAL JOURNAL

## Contents

JANUARY-FEBRUARY

1975

Changes in marketing wool	K. H. McIntyre	..	..	..	..	..	2
Feeding horses	M. A. Burns	..	..	..	..	..	9
Insect pest control in citrus	Entomology Branch	..	..	..	..	..	22
Dairy pastures for Atherton Tableland	T. J. Quinlan and others	..	..	..	..	..	28
Lablab bean for autumn grazing	G. J. Cassidy	..	..	..	..	..	37
Queensland's beef industry	C. W. Roberts	..	..	..	..	..	41
Stock Fund aids animal disease control	Division of Animal Industry	..	..	..	..	..	50
Tobacco diseases and their control	R. G. O'Brien	..	..	..	..	..	51
Oats varieties for 1975 plantings	Agriculture Branch	..	..	..	..	..	58
Rapid pregnancy diagnosis for sheep	M. S. Pratt and P. S. Hopkins	..	..	..	..	..	61
Animal waste disposal problems	G. D. Stewart	..	..	..	..	..	63
Onion thrips in the Lockyer	K. J. Giesemann	..	..	..	..	..	71
Fish that are poisonous to eat	B. R. Pollock	..	..	..	..	..	73
Beef from green panic-glycine on Atherton Tableland	L. Winks and others	..	..	..	..	..	78
Tuberculosis-free cattle herds	..	..	..	..	..	..	84
Formula for ordering day-old chicks	J. S. Sloane	..	..	..	..	..	85
Measurement system to judge beef carcasses	W. R. Ramsay	..	..	..	..	..	87
West Indian drywood termite in Queensland	N. W. Heather	..	..	..	..	..	91
Aneilema and Murdannia	Beryl A. Lebler	..	..	..	..	..	95
Brands and earmarks for Qld. stock	K. M. Vernon	..	..	..	..	..	101
Care of meat and meat products	W. R. Ramsay and B. Dobrenov	..	..	..	..	..	109
Brucellosis-tested swine herds	..	..	..	..	..	..	114
Nematode control in tobacco	R. A. Broadley	..	..	..	..	..	115
Wheat and barley varieties, 1975	S. R. Walsh	..	..	..	..	..	118
Getting the right urea-molasses mix	J. Wedmaier	..	..	..	..	..	121
Farm Home	..	..	..	..	..	..	124
Dishes for cheese lovers	..	..	..	..	..	..	127



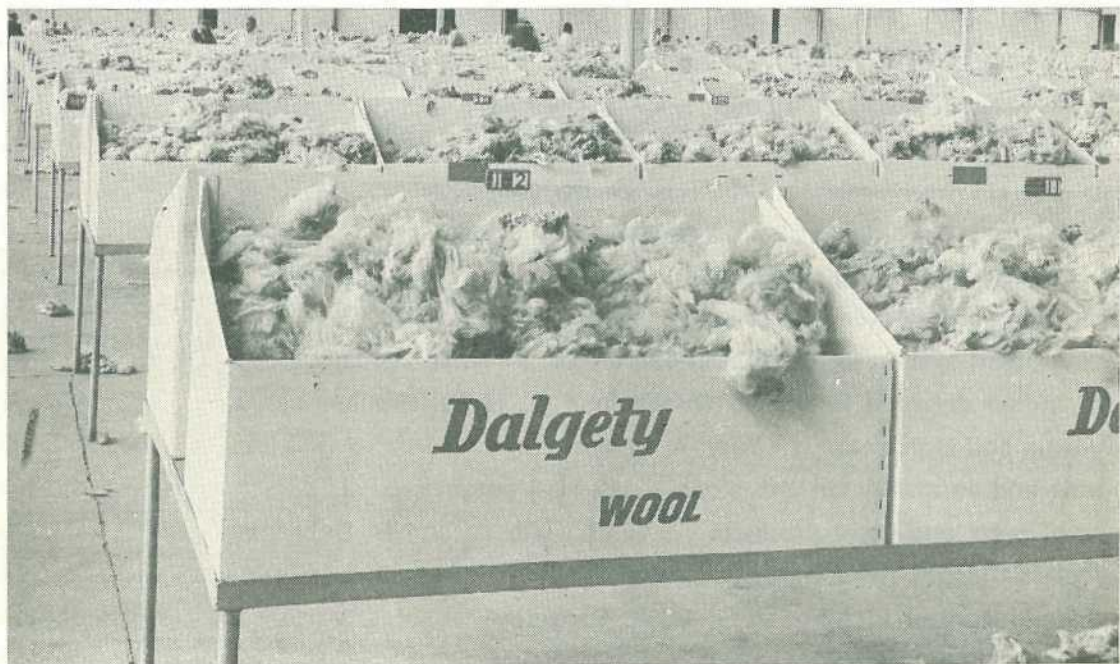
# Changes in marketing wool

MORE than one-third of Queensland's wool was sold by sample during the past season. Within the next two seasons it is expected that more than 90% of wool will be sold by this method.

by K. H. McINTYRE,  
formerly Sheep and Wool Branch.

In both South Australia and Western Australia adoption of sale by sample is following a similar pattern.

## Selling by sample is replacing



*A display of samples of wool being sold by objective measurement.*

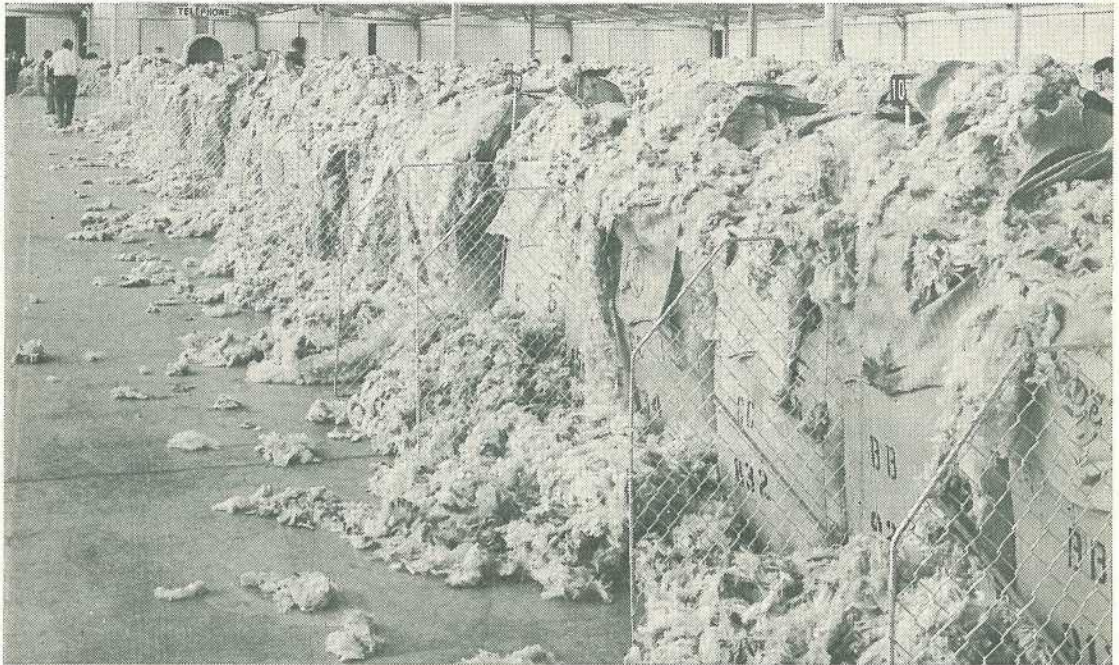


## Grab sampling

In selling wool by sample, certain procedures are involved which differ from those used in traditional sales. Each bale of wool is cut open by a hot electric iron so that a 'grab sample' of wool can be extracted. The hot iron is used rather than a cutting instrument to minimize the possibility of contamination of wool fibres with fibres from the wool pack.

When the cut is made, the bale of wool passes mechanically on to a weighing scale, where the weight is recorded. A mechanical clawed instrument known as a 'grab' is then inserted through the cut in the pack into the wool inside. It grabs a sample of wool in this manner from each bale in a line or lot of wool, for example, AAA COMB. These grab samples are then bulked and a sample of 8 kg is displayed in a box for the buyer or valuer to examine.

## the traditional method



*A display of wool offered for sale by the traditional method.*



## Core sampling

After weighing and 'grab sampling', the bale of wool passes on a mechanical belt to the next operation which is called 'core sampling'.

The bale is mechanically turned on to one of its ends and compressed to about one-third to half its normal length. During this process a hollow 22 mm ( $\frac{7}{8}$  in.) steel tube is forced into the bale and a core of wool from the bale is collected into a plastic bag.

A minimum of 20 core samples is required from each line of wool, so that, in lots consisting of fewer than 20 bales, each bale may be core-sampled two or more times to obtain the required 20 core samples.

## Laboratory testing

Each plastic bag with the core samples also contains a card displaying the number of bales in the lot, the name and address of the owner, the lot and test number and the wool broker.

The core samples are sent to a wool testing laboratory for analyses of yield, fibre diameter and whatever other measurements are required. Most samples from Queensland are sent to the Australian Wool Testing Authority's (A.W.T.A.) laboratory in Sydney. The results are returned in a few days.

Before testing, the sample material from each lot is blended and then five sub-samples are extracted from the blended bulk sample. Three of these are chosen at random and tested for—

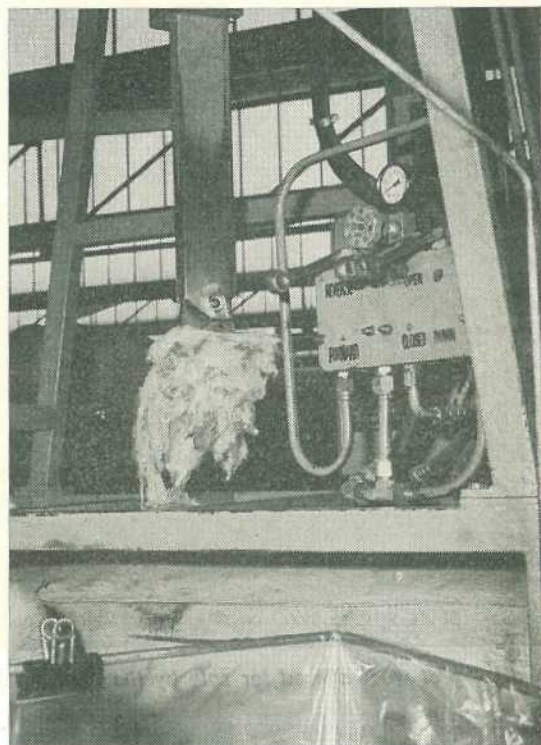
**1. Yield.** To estimate yield, the three selected sub-samples are weighed, scoured, dried and then re-weighed. From the resulting wool, determinations are made of vegetable matter, alcohol extractable matter and inorganic residue. The yield of clean, scoured wool is then calculated.

**2. Fibre diameter.** Fibre diameter is measured in microns (one-thousandth of a millimetre, or one twenty-five thousandth of an inch). The sonic method is used. Two prepared, scoured samples of wool are each measured four times. Each sample or plug contains approximately 200 000 fibres.

The specific surface area of these fibres is measured by passing sound or sonic waves through them. Their resistance to the passage of the waves is related to their surface area and hence their fibre diameter. The result gives an average diameter of the fibres in the sample.

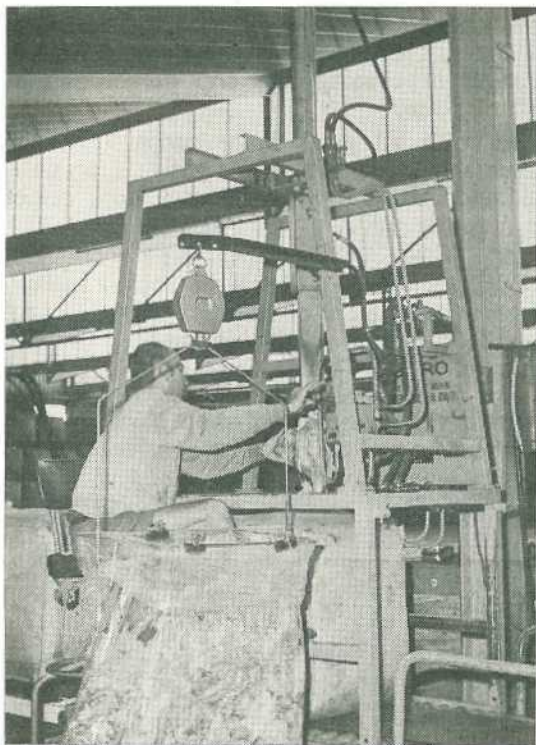


*A bale being opened with a hot iron before sampling.*



*Grab sampling of wool.*





Wool being taken from the grab into the collection bag.

It does not give a result for each wool fibre in the sample or any indication of the variation in fibre diameter of the 200 000 fibres within the sample.

However, the time involved in this measurement is small, so it is relatively inexpensive. Besides being much less expensive than the Micro-Projection Method, in which the diameters of individual wool fibres are measured, it is claimed to be more accurate because it measures two samples each of 200 000 fibres, whereas, in the Micro-Projection Method, only 150 to 600 fibres are measured.

### Displaying wool for sale

These measurements have to be made before the wool can be sold. They are carried out as soon as the wool reaches the brokers' stores and are supervised by officers of the A.W.T.A.

When the time for selling arrives, the buyers and valuers can examine the 8 kg grab sample of wool from each line, which is displayed in a cardboard box. Characteristics such as colour, tenderness and crimp which were not measured by the machines can be assessed visually by the buyer.

A certificate on the display box shows the yield and fibre diameter which were measured objectively in the laboratory. These are the characteristics that are so important to the wool manufacturer. They are also printed in the sale catalogue alongside each lot number.

### Cost of pre-sale testing

In the latest system of charges for pre-sale testing of wool for the I.W.T.O. pre-sale certificate, lots fewer than 40 bales cost \$17 and lots greater than 40 bales, \$21. There is obviously a distinct advantage in having as few lots as possible.

An additional charge of 28c per bale is levied for supervision on the machine line during weighing and grab and core testing.

On the other hand, warehousing charges are reduced from \$5.02 per bale if selling by the traditional selling methods to \$4.07 per bale if the wool is sold by sample.

The warehousing charge for wool sold by sample is expected to be reduced further in relation to wool sold by traditional methods as a higher proportion of the total clip is sold by sample.

### Advantages

Selling-by-sample has advantages over traditional selling methods.

In traditional selling methods, all bales being sold were opened on the wool floor for buyers to examine. This involved a very great amount of labour in moving large numbers of bales and arranging them in order.

Under the new method, this has been eliminated so that once the grab and core samples have been taken, the wool bales can be stored away from the display floor.

With rapidly rising wages, the reduction in labour costs has been very large. This saving in the warehouse charges should mean a reduction in costs normally passed on to the wool producer by the wool brokers.



*A bale being compressed during core sampling.*

Secondly, wool manufacturers are very specific in their requirements for yield and fibre diameter in wool purchased.

For several years, samples of wool have been tested after sale to protect buyers from manufacturers' claims on misjudgements for yield and fibre diameter. It has been shown that results from machines are more accurate and reliable than even the most experienced wool buyers' and valuers' assessments of yield and fibre diameter.

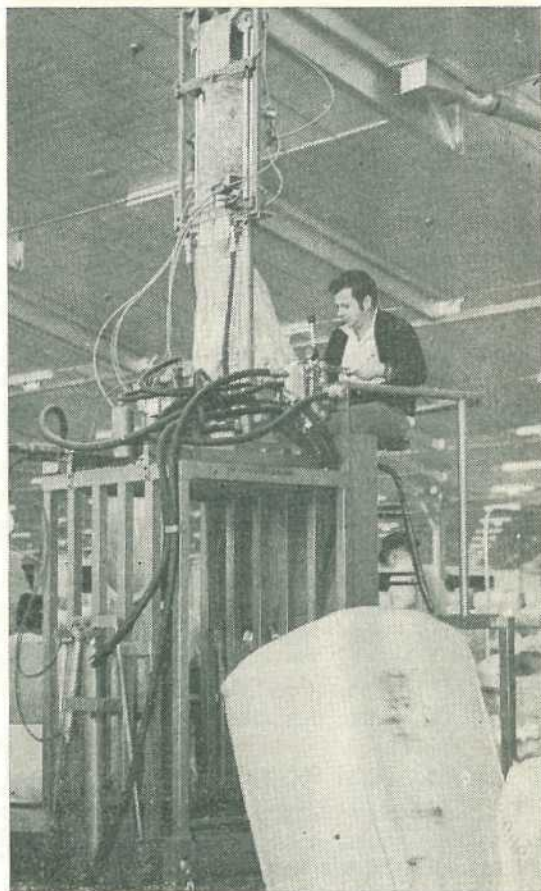
One of the main advantages of synthetic fibres is that the manufacturer can order fibres of a particular diameter and know that these will be absolutely correct. If wool is to compete with synthetics, it is logical that only the most accurate estimates of yield and fibre diameter will suffice.

### **Changes in classing**

The sale of wool by sample may involve changes in classing and clip preparation at shearing time.

As with all good fleece preparation, the fleece should be skirted as lightly as possible, taking off about 10% of the total fleece weight as a rough guide.

All stains, skin pieces, short wool and second cuts of wool should be kept out. Stain reduces the number of end-uses to which wool can be put and dried skin pieces take dye differently from wool, thereby reducing the value of the finished product. Second cuts increase the percentage of short fibres, or noil, combed out and these realize considerably less money than combed tops.



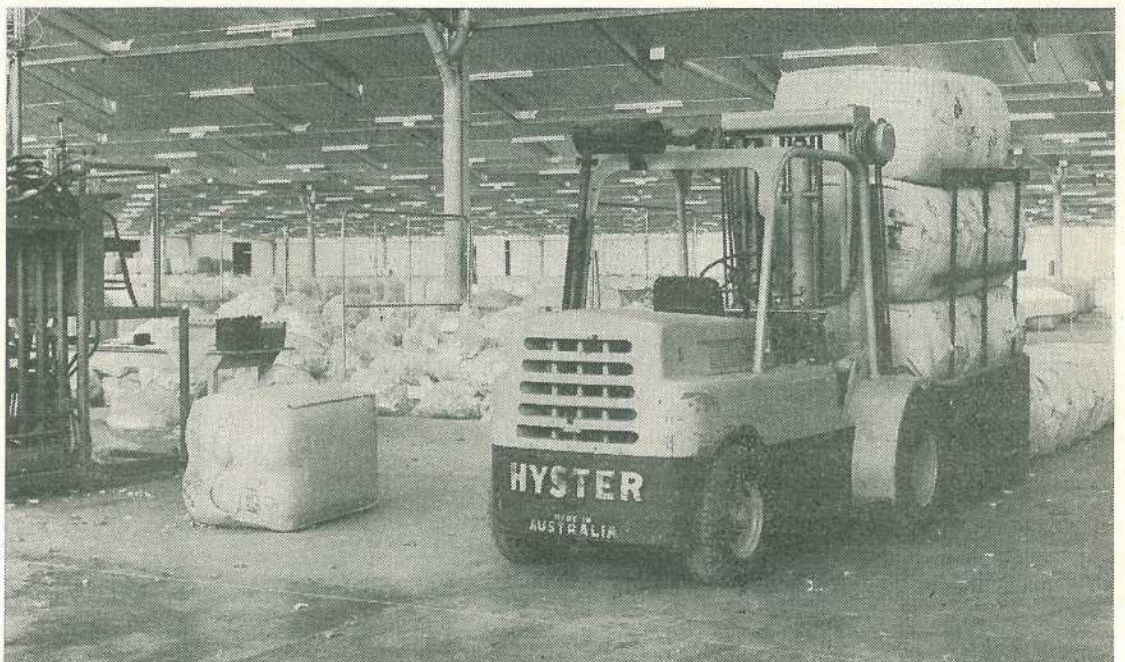
*A bale ejected after core sampling.*





▲ Grab samples ready for placing in display boxes for inspection by buyers.

Mechanised handling of bales of wool after sampling. ▼





A large difference, both visibly and in yield of clean wool, should be kept between fleece lines and pieces. The price for pieces is always much lower than that for similar fleece wool.

Wool classers assess fineness subjectively on the basis of the number of crimps per inch. Research results show that in only 50% of cases is crimps per inch a reliable indication of fineness.

When fibre diameters are actually measured by machine, some clips are finer than they look, and, conversely, some clips are stronger than they look.

A check on the classers' assessment can be made by sending wool samples from several of his fleece lines for measurement.

This is called a Guidance Report and costs \$12 a lot for fibre diameter and yield, or \$6 a lot for fibre diameter alone. These results cannot be used as a basis for selling by sample or description. They do give the classer a lead on whether his lines of wool are appreciably different in fibre diameter.

If the fibre diameters of lines, based on crimp, are different by more than 2 microns, it means he is correct in his visual assessment that the lines should be separated. If, however, two or more of his fleece lines show a difference in fibre diameter less than 2 microns, these lines should be combined into one line for sale.

Only the strongest Merino fleeces need be kept as separate lines. All tender and off-type wool should be kept separate also.

## The future of wool marketing

It has been stated already that, because of increasing labour costs and also because of competition from synthetics, sale by sample will account for more than 90% of wool sold in Queensland within 2 years.

Another advantage of sale by sample is 'sale by separation'. In this, the same testing procedures apply as those outlined previously. However, the 8 kg wool samples representing each line in the clips, together with the measurements for yield and fibre diameter, are sent from the warehouse where the wool was received, for example, Brisbane, to sales at other wool selling centres in Australia, for example, Geelong and Newcastle.

Growers are expected to make greater use of this method this season to sell their wool quickly or at what they hope will be a better price. After sale, the wool is then shipped from the warehouse to the country the buyer represents.

A further advance would be to sample the wool on properties or at major country warehouses and send the sample and measurements to any selling centre in Australia.

After sale, the wool could then be shipped direct to the destined country. This would save warehousing costs in congested metropolitan centres and might allow the wool to be dumped or put into containers in country centres and be transported directly to any shipping port in Australia.

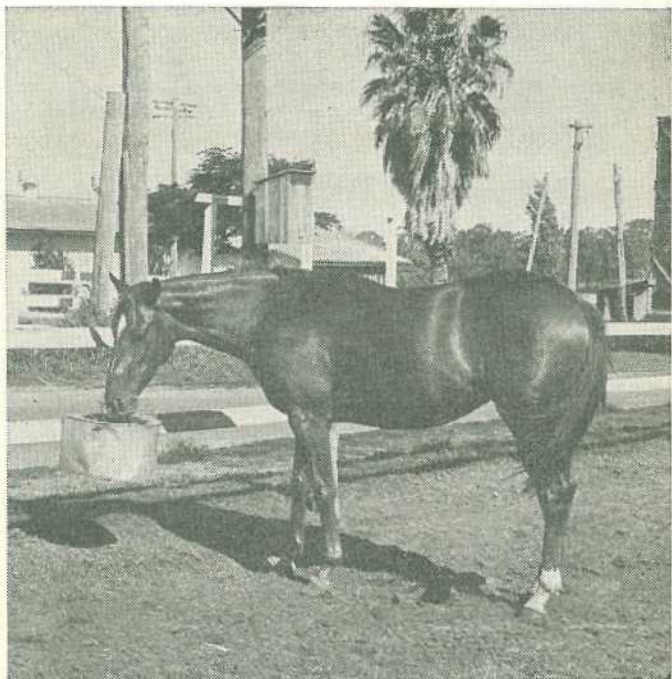




A well-fed hack. Note the solid condition and bloom of this mare.

# Feeding horses

By M. A. BURNS, Beef Cattle Husbandry Branch.



HORSES, like all other farm animals, require an adequate and balanced diet if they are to perform satisfactorily. Native pastures provide the sole source of feed for most Queensland horses.

These pastures, in the young and growing stage, provide sufficient nutrients for most classes of horses but when mature they often fall short of normal requirements. The working capacity and body condition of the horse suffers accordingly. It is at these times that supplementary, or even complete, hand feeding becomes necessary.

The food requirements of animals can be expressed in terms of appetite, energy, protein, minerals and vitamins. The amount of each of these required by the horse is determined by its age and size and the type of work it performs.

## Energy

The main function of food is to provide energy: energy for work and movement and energy for all chemical processes that go on

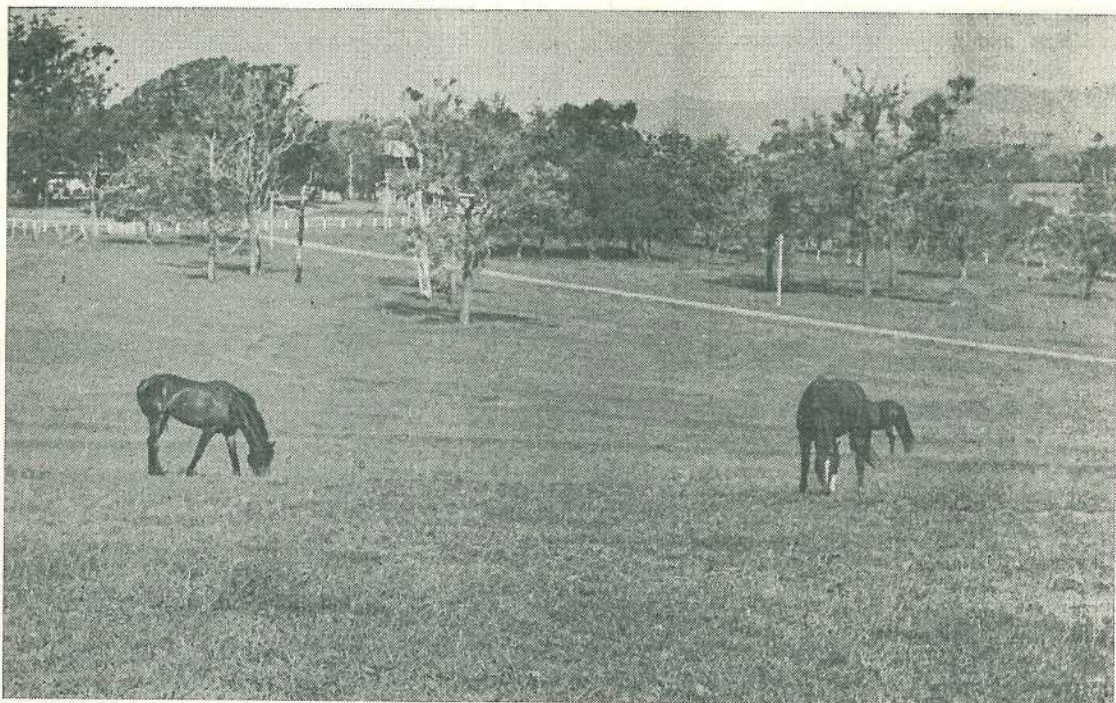
in the animal's body. The energy requirement of an animal is expressed in this article in total digestible nutrient (T.D.N.) in terms of kilograms per day or as a percentage of the ration.

T.D.N. is a measure of the total energy value of a food. It is the sum of the digestible portions of the protein, fat, fibre and carbohydrates expressed as a percentage. Fat is multiplied by a factor (2.3), before inclusion, to allow for its greater energy value per unit.

## Protein

As well as providing energy, food must also supply the animal with certain substances that it cannot make itself. They are the essential amino acids, the building blocks of protein. To do this, the food must contain a minimum amount of digestible protein (D.P.) as well as an adequate amount of energy (T.D.N.).





## Minerals

Several elements are essential for proper health and production by stock. Not only is it essential that they be present in adequate amounts but also that they should be in correct balance in the diet.

This is particularly true of calcium and phosphorus. Together, these minerals make up the greater part of the skeleton of animals and are the major ones to be considered under hand feeding conditions or when horses are grazing pastures on unsound country. The ratio of calcium to phosphorus in the diet should be between one part calcium to two parts phosphorus and two parts calcium to one part phosphorus.

When horses are hand fed, this ratio can easily be checked by weighing the quantity of each feedstuff and calculating the amount of each of the two minerals in the daily ration. Ratios outside this range may give rise to a

disease known as osteodystrophia fibrosa, a condition often seen in fast moving horses such as trotters and thoroughbreds.

Symptoms of the disease may range from mild lameness and tiredness to small bony swellings under the jaw or on the side of the face. In more severe cases, stiffness, shortening of stride, lameness, bony swellings round the legs or joints and loss of appetite may result.

Osteodystrophia fibrosa has become increasingly more prevalent in Queensland in recent years following the introduction of certain improved pasture mixtures. Some grass species contain high levels of oxalates which combine with calcium and make it unavailable to the horse. Thus, pastures which otherwise may contain adequate levels of calcium provide a calcium deficient diet because of the high oxalate levels. The condition may be prevented in these circumstances by supplying additional calcium in the diet.



◆ Grazing from good quality pasture provides sufficient nourishment for most classes of horses.

◆ Brood mares should be kept in strong condition. Their diet should contain liberal amounts of energy, protein, calcium, phosphorus and vitamins for high milk production.



An excess of either calcium or phosphorus can interfere with the absorption of the other. With an excess of either one, the other tends to become tied up as the insoluble tricalcium phosphate which the horse cannot absorb. This means that, if a horse were being fed a ration low in phosphorus and included a very high level of calcium, the level of phosphorus available to the horse would become even lower.

High levels of magnesium, iron and aluminium in the ration should be avoided since they interfere with the absorption of phosphorus by forming insoluble phosphates.

Sodium and chlorine, the components of common salt, are two minerals which should be supplied freely to horses. Horses doing hard work excrete considerable quantities of salt in the sweat and consequently need more salt than idle horses. An allowance of 28 to 56 g of salt a day is sufficient. This may be supplied in the feed or horses can be given free access to a salt lick.

Most of the other minerals are adequately supplied under normal grazing or when horses are hand fed and therefore require little attention.

### Vitamins

Some vitamins are essential for proper health of animals. However, deficiencies of vitamins in the ordinary rations of mature work horses are not common as their vitamin requirements are low. The requirements of brood mares and young horses are higher but these, too, are usually adequately provided in the normal diet.

Vitamin D is one which is important as it is necessary for the proper assimilation and use of calcium and phosphorus and, therefore, the development of sound bones and teeth. This is particularly important in the early stages of growth and has particular importance for young horses and for brood mares.



*Stock horses doing hard work need supplementary feeding during the winter.*

Sunlight is an effective source of vitamin D for animals and, since vitamin D can be stored in the liver, it is not likely that a deficiency will be encountered under Queensland conditions, except perhaps when horses are continuously stabled.

It is very important to supply an adequate level of vitamin A in the ration. High quality green crops and pasture are an excellent source of carotene, the precursor of vitamin A. Provided horses have access to some green feed, a deficiency of vitamin A is not likely to occur.

On the other hand, forages that are mature and exposed to rain during the curing process and fodders that have been in storage for some time lose much of their carotene content. Horses that are fully hand fed for long periods on rations containing no green feed or good quality roughage could suffer from a deficiency of vitamin A.

Symptoms such as night blindness, poor hoof development, a predisposition to respiratory infection, progressive weakness and possibly certain bone and joint disorders may result. A deficiency of vitamin A can be corrected by feeding green feed or one of the proprietary vitamin A products on the market.

### **Daily requirements**

The chief requirement of an animal doing muscular work is a liberal supply of energy. However, the protein, mineral and vitamin requirements are not appreciably increased by hard work and are little more than those required when the horse is idle.

On the other hand, brood mares need liberal amounts of protein, minerals and vitamins during pregnancy. When they are nursing foals, their requirements for these nutrients are still greater. Young growing horses need a much greater proportion of protein than mature work horses as well as more calcium, phosphorus and vitamins.



The total feed requirement of an animal is measured in terms of the amount of dry feed (moisture-free material) or air-dry feed (containing 10% moisture) that it can eat in one day. This appetite requirement is related to body size and depends upon the age and weight of the animal and the type of work being performed.

The daily food requirements and the recommended nutrient content of rations for the various classes of horse are set out in Tables 1 and 2 respectively. These tables are a very good guide in compiling rations for horses which are being partly or fully hand fed.

TABLE 1  
DAILY NUTRIENT REQUIREMENTS OF HORSES\*  
(BASED ON AIR-DRY FEED CONTAINING 90% DRY MATTER)

Body Weight (kg)	Daily Feed Animal (a) (kg)	Daily Nutrients per Animal					
		Digestible Protein (kg)	TDN (kg)	Ca (g)	P (g)	Carotene (mg)	Vitamin A IU (thousands)
<i>GROWING HORSES—270 kg Mature Weight</i>							
90 .. ..	2.77	0.24	1.72	11	10	3	1.7
185 .. ..	2.68	0.20	1.68	11	11	6	3.3
270 .. ..	3.40	0.19	2.13	6	6	9	5.0
<i>GROWING HORSES—365 kg Mature Weight</i>							
90 .. ..	3.04	0.34	1.91	14	11	3	1.7
185 .. ..	4.26	0.28	2.68	17	13	6	3.3
270 .. ..	4.72	0.27	2.95	13	13	9	5.0
365 .. ..	4.22	0.23	2.63	9	9	12	6.7
<i>GROWING HORSES—455 kg Mature Weight</i>							
90 .. ..	3.04	0.38	1.91	16	11	3	1.7
185 .. ..	4.49	0.34	2.81	15	12	6	3.3
270 .. ..	5.17	0.30	3.22	14	12	9	5.0
365 .. ..	5.58	0.29	3.49	13	12	12	6.7
455 .. ..	4.94	0.27	3.08	11	11	15	8.3
<i>GROWING HORSES—545 kg Mature Weight</i>							
90 .. ..	3.40	0.50	2.13	19	16	3	1.7
185 .. ..	5.08	0.45	3.18	18	17	6	3.3
270 .. ..	5.94	0.39	3.72	18	17	9	5.0
365 .. ..	6.08	0.34	3.81	18	17	12	6.7
455 .. ..	6.08	0.32	3.81	12	12	15	8.3
545 .. ..	5.67	0.31	3.54	12	12	18	10.0
<i>GROWING HORSES—635 kg Mature Weight</i>							
90 .. ..	3.63	0.60	2.27	24	17	3	1.7
185 .. ..	5.31	0.54	3.31	21	17	6	3.3
270 .. ..	6.53	0.49	4.08	19	17	9	5.0
365 .. ..	6.99	0.43	4.35	18	17	12	6.7
455 .. ..	6.99	0.38	4.35	14	14	15	8.3
545 .. ..	6.80	0.36	4.26	13	13	18	10.0
635 .. ..	6.35	0.35	3.99	13	13	21	11.7
<i>MATURE HORSES—at Light Work</i>							
185 .. ..	3.76	0.14	2.36	6	6	6	3.3
270 .. ..	5.08	0.19	3.18	9	9	9	5.0
365 .. ..	6.26	0.23	3.90	10	10	12	6.7
455 .. ..	7.39	0.27	4.63	12	12	15	8.3
545 .. ..	8.48	0.31	5.31	14	14	18	10.0
635 .. ..	9.53	0.35	5.94	16	16	21	11.7

a Based on 62.5 per cent. T.D.N. in air-dry matter.

\* Adapted from 'Nutrient Requirements of Horses', National Research Council—Publication 1401.

TABLE 1—*continued*  
 DAILY NUTRIENT REQUIREMENTS OF HORSES\*  
 (BASED ON AIR-DRY FEED CONTAINING 90% DRY MATTER)

Body Weight (kg)	Daily Feed Animal (a) (kg)	Daily Nutrients per Animal					
		Digestible Protein (kg)	TDN (kg)	Ca (g)	P (g)	Carotene (mg)	Vitamin A IU (thousands)
<i>MATURE HORSES—at Medium Work</i>							
185 .. ..	4.35	0.14	2.72	8	8	6	3.3
270 .. ..	5.90	0.19	3.67	10	10	9	5.0
365 .. ..	7.35	0.23	4.58	12	12	12	6.7
455 .. ..	8.62	0.27	5.40	14	14	15	8.3
545 .. ..	9.93	0.31	6.21	16	16	18	10.0
635 .. ..	11.11	0.35	6.94	18	18	21	11.7
<i>MATURE MARES—Last Quarter of Pregnancy</i>							
185 .. ..	2.63	0.18	1.63	9	8	28	9.3
270 .. ..	3.63	0.25	2.27	12	11	42	14.0
365 .. ..	4.45	0.30	2.77	14	13	56	18.7
455 .. ..	5.31	0.36	3.31	16	15	70	23.3
545 .. ..	6.08	0.42	3.81	18	17	84	28.0
635 .. ..	6.80	0.47	4.26	20	19	98	32.7
<i>MATURE MARES—Lactation Peak</i>							
185 .. ..	6.99	0.55	4.35	18	13	28	9.3
270 .. ..	7.98	0.63	4.99	23	18	42	14.0
365 .. ..	9.43	0.74	5.90	27	22	56	18.7
455 .. ..	10.43	0.81	6.53	30	24	70	23.3
545 .. ..	11.52	0.91	7.21	34	27	84	28.0
635 .. ..	13.15	0.98	8.21	37	30	98	32.7

a Based on 62.5 per cent. T.D.N. in air-dry matter.

\*Adapted from 'Nutrient Requirements of Horses,' National Research Council—Publication 1401.

TABLE 2  
 RECOMMENDED NUTRIENT CONTENT OF RATIONS\*  
 (EXPRESSED AS PERCENTAGE COMPOSITION OF AIR-DRY RATIONS CONTAINING 90% DRY MATTER)

Body Weight (kg)	Daily Feed (kg)	Percentage, or Amount per kg, of Feed						
		Total Protein (%)	Digestible Protein (%)	TDN (%)	Ca (%)	P (%)	Carotene (mg/kg)	Vitamin A (IU/kg)
<i>GROWING HORSES—270 kg Mature Weight</i>								
90 .. ..	2.77	13.1	8.7	63	0.40	0.36	0.9	550
185 .. ..	2.68	10.1	7.3	63	0.41	0.41	1.5	840
270 .. ..	3.40	8.0	5.3	63	0.18	0.18	2.6	1 480
<i>GROWING HORSES—365 kg Mature Weight</i>								
90 .. ..	3.04	16.4	11.2	63	0.46	0.36	0.9	550
185 .. ..	4.26	9.6	6.6	63	0.40	0.30	1.3	770
270 .. ..	4.72	7.7	5.7	63	0.28	0.28	2.0	1 060
365 .. ..	4.22	7.5	5.5	63	0.21	0.21	2.9	1 590

\* Adapted from 'Nutrient Requirements of Horses,' National Research Council—Publication 1401.



TABLE 2—continued  
RECOMMENDED NUTRIENT CONTENT OF RATIONS\*

(EXPRESSED AS PERCENTAGE COMPOSITION OF AIR-DRY RATIONS CONTAINING 90% DRY MATTER)

Body Weight (kg)	Daily Feed (kg)	Percentage, or Amount per kg, of Feed							
		Total Protein (%)	Digestible Protein (%)	TDN (%)	Ca (%)	P (%)	Carotene (mg/kg)	Vitamin A (IU/kg)	
<i>GROWING HORSES—455 kg Mature Weight</i>									
90	.. ..	3.04	17.9	12.5	63	0.52	0.36	0.9	550
185	.. ..	4.49	11.1	7.6	63	0.33	0.27	1.3	730
270	.. ..	5.17	8.8	5.9	63	0.27	0.23	1.8	970
365	.. ..	5.58	7.3	5.3	63	0.23	0.22	2.2	1 190
455	.. ..	4.94	8.2	5.5	63	0.22	0.22	3.1	1 680
<i>GROWING HORSES—545 kg Mature Weight</i>									
90	.. ..	3.40	21.3	14.8	63	0.56	0.47	0.9	550
185	.. ..	5.08	12.5	8.9	63	0.35	0.33	1.3	750
270	.. ..	5.94	9.2	6.7	63	0.30	0.29	1.5	880
365	.. ..	6.08	8.2	5.7	63	0.30	0.27	2.0	1 100
455	.. ..	6.08	7.4	5.3	63	0.20	0.20	2.4	1 370
545	.. ..	5.67	8.0	5.5	63	0.21	0.21	3.1	1 760
<i>GROWING HORSES—635 kg Mature Weight</i>									
90	.. ..	3.63	23.8	16.5	63	0.66	0.47	0.9	550
185	.. ..	5.31	14.5	10.0	63	0.40	0.32	1.1	640
270	.. ..	6.53	10.4	7.4	63	0.29	0.26	1.5	820
365	.. ..	6.99	9.0	6.2	63	0.26	0.24	1.8	950
455	.. ..	6.99	7.8	5.5	63	0.20	0.20	2.2	1 190
545	.. ..	6.80	7.3	5.3	63	0.20	0.20	2.6	1 480
635	.. ..	6.35	7.8	5.5	63	0.20	0.20	3.3	1 850
<i>MATURE HORSES—at Light Work</i>									
185	.. ..	3.76	5.2	3.6	63	0.16	0.16	1.5	880
270	.. ..	5.08	5.2	3.7	63	0.16	0.16	1.8	990
365	.. ..	6.26	5.3	3.7	63	0.16	0.16	2.0	1 080
455	.. ..	7.39	5.3	3.7	63	0.16	0.16	2.0	1 130
545	.. ..	8.48	5.3	3.7	63	0.16	0.16	2.2	1 170
635	.. ..	9.53	5.2	3.7	63	0.16	0.16	2.2	1 240
<i>MATURE HORSES—at Medium Work</i>									
185	.. ..	4.35	4.4	3.1	63	0.18	0.18	1.3	750
270	.. ..	5.90	4.5	3.2	63	0.17	0.17	1.5	840
365	.. ..	7.35	4.5	3.2	63	0.16	0.16	1.5	900
455	.. ..	8.62	4.5	3.2	63	0.16	0.16	1.8	970
545	.. ..	9.93	4.5	3.2	63	0.16	0.16	1.8	1 020
635	.. ..	11.11	4.5	3.2	63	0.16	0.16	2.0	1 060
<i>MARES—Last Quarter of Pregnancy</i>									
185	.. ..	2.63	9.8	6.9	63	0.34	0.30	10.6	3 530
270	.. ..	3.63	9.9	6.9	63	0.33	0.30	11.7	3 860
365	.. ..	4.45	9.8	6.8	63	0.31	0.29	12.6	4 210
455	.. ..	5.31	9.7	6.8	63	0.30	0.28	13.2	4 390
545	.. ..	6.08	9.8	6.9	63	0.30	0.28	13.9	4 610
635	.. ..	6.80	9.8	6.9	63	0.29	0.28	14.3	4 180
<i>MARES—Peak of Lactation</i>									
185	.. ..	6.99	11.3	7.9	63	0.26	0.19	4.0	1 320
270	.. ..	7.98	11.2	7.8	63	0.29	0.23	5.3	1 760
365	.. ..	9.43	11.3	7.9	63	0.29	0.23	6.0	1 980
455	.. ..	10.43	11.1	7.8	63	0.29	0.23	6.6	2 230
545	.. ..	11.52	11.3	7.9	63	0.29	0.23	7.3	2 430
635	.. ..	13.15	10.7	7.5	63	0.29	0.23	7.5	2 490

\*Adapted from 'Nutrient Requirements of Horses', National Research Council—Publication 1401.

In assessing the standard of work being performed by a horse, hard work may be defined as doing 5 to 8 hours' solid work a day. Horses working hard for a shorter daily period of 3 to 5 hours should be classed as medium work, and 1 to 3 hours as light work. The amounts of nutrients advised for idle horses should keep them in thrifty condition and should prevent any loss in weight.

### Assessing weight

As indicated by the tables on nutrient requirements, an idea of the liveweight of horses is necessary to determine the level of feeding. Unfortunately, very little information is available on the weight of horses so this calls for a certain amount of judgement on the part of the feeder. As a guide to the approximate weight of the various classes of horses, the following table is given:

TABLE 3  
APPROXIMATE LIVWEIGHT OF HORSES  
(IN GOOD CONDITION)

Type	Height (Hands)	Liveweight (kg)
Shetland .. .. .	8-10	200-230
Pony .. .. .	10-12	230-270
Galloway .. .. .	14	270-360
Light Hack .. .. .	14-16	360-450
Heavy Hack .. .. .	16-17	450-550

### Feedstuffs

Materials used in the feeding of horses fall into two classifications: concentrates and roughages.

**Concentrates.** As the name implies, concentrates incorporate feeds high in nutritive value and low in fibre content. They may be divided into two main groups: energy rich and protein rich.

The various mineral and vitamin feed additives may also be included under this heading.

**ENERGY-RICH CONCENTRATES.** The various grains and molasses are included in this category. While oilseed meals contain considerable amounts of energy, they are more conveniently grouped under protein-rich concentrates because of their high protein level.

All grains are high in energy and contain appreciable levels of phosphorus but are low in calcium content. This should be kept in mind when compounding rations. Most of the commonly used grains are about equal in feeding value.

The exception is oats, which, because of its higher fibre content, is slightly lower in energy than other grains and more of it is required in the ration. However, oats is undoubtedly the best and safest of the grains to feed to horses and it is the standard with which other grains are compared.

Because of the bulky hull, oats forms a loose mass in the stomach and can be easily digested. Other grains such as maize, wheat and, to a lesser extent, barley are less fibrous and tend to pack, sometimes causing colic. However, this does not mean that these grains cannot be fed safely. In fact, for horses at very hard work, a mixture of oats with maize or barley is better than oats as the only grain.

Particular care is necessary in feeding certain grains to horses. For preference, maize should not make up more than half the grain ration during the summer. Heavy feeding with wheat should be avoided as this may result in severe digestive disturbances, laminitis and occasional deaths. However, it is a satisfactory substitute for oats provided it is coarsely crushed, and mixed with bulky feed such as chaff which helps to prevent colic.

Likewise, barley should be mixed with some bulky feed such as 15% or more of wheat bran or chaff or 25% of crushed oats. Sorghum tends to cause constipation in horses and, for this reason, should be fed mixed with wheat bran.

Bran is a safe bulky feed for horses. It is somewhat richer in protein than the grains and its addition to the concentrate mixture will be of value, particularly when oats is in short supply. Bran has mild laxative properties and is of particular value if horses are constipated.

Molasses is a good source of energy but is usually fed as an appetizer and conditioner rather than for its energy value. Diluted in water, molasses is useful for sprinkling over poor quality roughages to improve their palatability. Up to 1½ litres of molasses can be included in the daily ration for horses.



While oats can be fed to horses whole, it is desirable that this and the other grains should be crushed or coarsely ground before feeding. If this is not possible, the harder grains such as barley, maize, sorghum and wheat should be soaked to soften the kernels before feeding. This is particularly important for young horses and horses with bad teeth.

No advantage is gained by boiling grain which, if anything, results in a loss of some nutrients, particularly vitamins. Grains should not be ground too finely as this often reduces their palatability, may predispose to digestive upsets and results in some wastage through loss of the powdered grain.

Using goats as the standard and comparing it on the basis of energy value, the following quantities of the commonly fed grains are equivalent to 5 kg of oats:

	kg
Maize .. ..	4.5
Grain sorghum .. ..	4.5
Wheat .. ..	4.6
Barley .. ..	4.6

**PROTEIN-RICH CONCENTRATES.** These materials are high in protein content but at the same time also provide a good source of energy. The protein concentrates can be divided into two classes: those of vegetable origin and those of animal origin.

The vegetable meals are generally palatable while those of animal origin are unpalatable. The protein meals are not used widely in horse feeding and their place is taken mainly by the vegetable meals. They can be used to good advantage for adding protein to the ration particularly when low quality roughages are being fed.

Because of oil residues, the vegetable meals such as linseed meal, cottonseed meal, peanut meal and the less common ones, soybean and safflower meals, produce bloom in animals as is evident in glossy coats. These meals are particularly useful in preparing horses for the show ring. Of the vegetable meals, linseed meal is the most popular. These meals can be included in the daily ration up to  $\frac{1}{2}$  or 1 kg but heavy feeding should be avoided as this may cause digestive upsets.

**Roughages.** Roughages are higher in fibre content and lower in nutritive value than concentrates. They include all plant materials and can be classified into dry roughages and green or succulent roughages.

Dry roughages include hay and chaff while the green roughages are growing crops and pastures and silage. These can be further classed into protein-rich materials such as the legume hays and young growing crops and pastures, and low-protein roughages such as cereal hays and straws, mature crops and pastures and silage made from non-legume crops.

In Queensland, roughages, particularly unimproved pasture, form the bulk of the diet of most horses. Provided they are of reasonably good quality, roughages alone will provide sufficient nutrients for most classes of horses. However, for horses performing heavy work, growing colts, lactating mares, or horses on low quality roughage, supplementary feeding is often necessary.

Where hand feeding is employed, the most commonly used roughages are wheaten, oaten or lucerne chaffs and hays. However, even well-cured grass or grass-legume hay or chaff provides a useful source of roughage for horses. Good quality green feed has a special place in horse feeding because of its laxative properties and its source of vitamin A. Fed in small quantities in the daily ration, or a couple of times a week, it helps to sharpen the appetite.

Depending upon the type of work being performed and the stage of growth of the animal, roughages can make up varying percentages of the ration, supplemented with concentrates as required to balance the diet.

Conserved roughages may be fed either chaffed or as long hay. Where heavy grain feeding is employed it is a good practice to feed some of the roughage as chaff mixed with the concentrates as this will prevent the horse eating too rapidly and getting digestive upsets.

Under no circumstances should mouldy feed be given to horses as this, too, can cause digestive troubles. Dusty chaff should be avoided if possible as it can affect the respiratory system and reduce the working ability of the horse. If this type of roughage must be fed it should be dampened, preferably with hot water or sieved before feeding.

The nutritive values of the more commonly used feedstuffs for horse feeding are given in Table 4.

NOTE. In comparing the nutritive values of various feedstuffs they should be compared on the same percentage dry matter basis. For simplicity, this is best done on 100% dry matter. As an example, compare the T.D.N. (energy value) of pasture hay with a D.M. (dry matter) content of 90% and a T.D.N. of 45%, and immature growing pastures containing 30% D.M. and 16% T.D.N. (Table 4).

PASTURE HAY

$$\begin{aligned} &45\% \text{ T.D.N. in } 90\% \text{ D.M.} \\ &\quad \times \text{ T.D.N. in } 100\% \text{ D.M.} \\ &45 \times 100 \\ &= \frac{\quad}{90} = 50\% \text{ T.D.N.} \end{aligned}$$

IMMATURE GROWING PASTURE

$$\begin{aligned} &16\% \text{ T.D.N. in } 30\% \text{ D.M.} \\ &\quad \times \text{ T.D.N. in } 100\% \text{ D.M.} \\ &16 \times 100 \\ &= \frac{\quad}{30} = 53\% \text{ T.D.N.} \end{aligned}$$

Thus on an equivalent dry matter basis, immature growing pasture has a higher T.D.N. content than pasture hay.

TABLE 4  
AVERAGE NUTRITIVE VALUES OF VARIOUS FEEDS  
(AS-IS BASIS)

Feedstuff	D.M. (%)	D.P. (%)	T.D.N. (%)	Calcium		Phosphorus		
				(%)	(g/kg)	(%)	(g/kg)	
<b>Hays</b>								
Oaten .. .. .	} 90	3.0	50	0.20	1.98	0.20	1.98	
Wheaten .. .. .		10.0	50	1.20	11.88	0.20	1.98	
Lucerne .. .. .		5.0	46	0.80	7.92	0.20	1.98	
Grassy lucerne .. .. .		2.0	45	0.4	3.96	0.2	1.98	
Pasture .. .. .	90	2.0	45	0.4	3.96	0.2	1.98	
<b>Green fodders</b>								
Grazing oats, wheat, barley in growing stage .. .. .	25	2.0	14	0.08	0.08	0.06	0.66	
Young leafy pasture .. .. .	15	2.0	10	0.07	0.06	0.05	0.44	
Immature pasture .. .. .	30	2.0	16	0.13	1.27	0.07	0.68	
Mature pasture .. .. .	40	1.0	16	0.01	0.08	0.05	0.44	
<b>Grains</b>								
Oats .. .. .	90	8	72	0.06	0.66	0.20	1.98	
Barley .. .. .	90	7	77	0.05	0.44	0.35	3.5	
Maize .. .. .	90	8	80	0.01	0.11	0.30	3.08	
Grain sorghum .. .. .	90	8	80	0.03	0.22	0.03	3.08	
Wheat .. .. .	90	8	78	0.04	0.44	0.04	3.96	
<b>Protein-rich concentrates</b>								
Linseed meal .. .. .	90	26	76	0.40	3.96	0.75	7.48	
Peanut meal .. .. .	90	37	80	0.15	1.54	0.60	5.94	
Cottonseed meal .. .. .	90	33	75	0.20	1.98	1.20	11.88	
<b>By-products</b>								
Wheat bran .. .. .	90	11	63	0.09	0.88	1.00	9.90	
Wheat pollard .. .. .	90	11	73	0.09	0.88	0.65	6.60	
Molasses .. .. .	75	..	60	1.00	9.90	0.89	8.80	



TABLE 5  
MINERAL SUPPLEMENTS

Supplement	Calcium (%)	Grams (Ca/kg)	Phosphorus (%)	Grams (P/kg)
Ground limestone	38	380	..	..
Boneflour ..	23	230	11	110
Tricophos ..	31	310	18	180
Mono ammonium phosphate ..	..	..	22	220
Biophos ..	18	180	21	210

### Compiling rations

In determining the level of feeding for horses, the judgement of the feeder is by far the best guide. Using the condition of the horse as an indicator, the experienced horse-man can tell at a glance whether the horse is 'doing' or not on the current diet and adjustments can be made to the ration accordingly. This applies to grazing or other forms of feeding.

Young pastures of good quality will supply sufficient nutrients for all classes of horses, and supplementary feeding is not necessary. On the other hand, once pastures have reached maturity, they fall short of the nutrient requirements of most animals and some level of supplementary feeding is necessary. Under Queensland conditions, the most critical stage is from late autumn until early summer when most grasses have matured and hayed-off and are low in feeding value.

When horses are being hand fed as well as being allowed paddock grazing, the supplementary ration can consist almost entirely of concentrates with perhaps just sufficient chaff to leaven the concentrates and to prevent 'bolting' of the feed. When full hand feeding is employed, then the ratio of roughage to concentrates can be balanced according to the needs of the horse in relation to the work performed.

It is considered that the minimum daily roughage requirements of the horse are about 0.5% of bodyweight. Thus a 450 kg horse will need a minimum of 2½ kg roughage a day. A guide to the daily quantities of concentrates and roughage per 100 kg liveweight for horses performing different levels of work is given in Table 6.

TABLE 6  
DAILY QUANTITIES OF FEED PER 100 KG LIVELWEIGHT  
FULL HAND FEEDING

Type of Work	Concentrates (kg)	Hay or Chaff
Hard .. .. .	1-1½	1
Medium .. .. .	¾-1	1-1½
Light .. .. .	½-¾	1¼-1½
Idle .. .. .	Some if roughage is low quality	1½

By consulting the nutritive requirements of horses in Table 1 the nutritive values of feedstuffs in Tables 4 and 5 and the guide to the quantities of feed per 100 kg liveweight in Table 6, it is now possible to compile a ration for a particular class of animal.

As an example, assume it is desired to fully hand feed a mature horse of 455 kg liveweight performing medium work at the rate of 5 hours a day.

From Table 1, it will be seen that this horse requires daily 8.62 kg of air-dry feed (90% D.M.); 0.27 kg digestible protein; 5.4 kg T.D.N. and 14 grams each of calcium and phosphorus. Using the figures in Table 6 as a guide, the animal would require approximately 4 kg of concentrates and 5 kg of hay or chaff.

Assume that the feedstuffs available are oaten chaff, oats grain and bran, a suitable ration would be—

	Air-Dry Feed		T.D.N. (kg)	Calcium (g)	Phosphorus (g)
	90% D.M. (kg)	D.P. (kg)			
Oaten chaff ..	5	0.15	2.5	9.9	9.9
Oats grain ..	3.5	0.28	2.53	2.3	6.9
Wheat bran ..	0.5	0.05	0.31	0.44	4.9
Salt .. .. .	28-56 (g)	..	..	..	..
	9.0	0.48	5.34	12.64	21.7



This ration contains adequate protein and phosphorus and is almost sufficient in energy and calcium. A slight adjustment to the chaff-grain ratio or the substitution of a little maize, sorghum, wheat or barley for part of the oats would balance the energy in the ration. The addition of 28 g of ground limestone to the ration or the substitution of some legume hay for oaten chaff would bring the calcium up to a satisfactory level.

Rations for other classes of horses can be compiled in this way from figures given in the Tables.

### **Feeding management**

The digestive capacity of a horse is very limited. This is probably the reason why horses are very susceptible to overfeeding, particularly with roughage. It is therefore advisable to distribute the rations uniformly over the day for fully hand fed horses.

The normal procedure is to feed three times a day except for horses at heavy work where it is often practicable to feed only twice a day. Feeding times at morning, noon and night are most convenient or morning and night where twice daily feeding is practised.

For working horses, the morning and mid-day meals should be smaller in quantity but contain the bulk of the daily concentrate ration. The evening meal should be more bulky and contain a greater quantity of roughage as not only is digestion more efficient when the horse is resting but the greater quantity of feed will keep the horse more contented during the night.

The recommended method of feeding is to divide the daily concentrate ration equally into three feeds, morning, noon and night. It is best to feed only a small amount of roughage in the morning, so that the horse's digestive tract is not too distended when it is at work. About one quarter of the daily roughage should be fed at each of the morning and midday feeds and the remaining half at night.

Horses should not be worked hard immediately after feeding. This is because the blood supply is directed towards the digestive system after feeding which is necessary for good digestion. When working, the muscular system requires a greater supply of blood

which is taken away from the digestive system. Consequently, horses worked too soon after feeding are liable to digestive disorders.

When working horses are resting, such as at week-ends, the allowance of grain should be reduced by 50 to 70% of the amount usually fed. Part of the grain should be replaced by a bran mash and the remainder of the ration made up of good quality roughage.

If kept on a full working ration, sugars and glycogen absorbed from the food accumulate in the muscles. When put to work again, there is likelihood of excess lactic acid being formed in the muscles causing a breakdown of muscle tissue and causing a condition known as myoglobinuria. This is characterized by muscle tremors, sweating and the passage of port wine coloured urine.

Sudden changes in the composition of feed rations should be avoided, particularly increases in the concentrate portion of the ration. At the start of feeding, horses should be gradually introduced to concentrate feed and the quantity increased to the desired level over a number of days.

Sudden increases in the level of concentrate feeding may lead to serious illnesses, such as colic. On the other hand, during rest periods, the quantity of concentrates can be reduced all at once. Sudden changes from one type of grain to another or from old grain or roughage to new should also be avoided.

### **Watering**

Horses require up to 70 litres of water a day depending on the temperature and the amount of work performed.

Before nutrients can be absorbed from the bowels into the body, they must be in solution. There is a constant drainage of water going on in the body, particularly during work. Deficiency of water hampers digestion and this is liable to cause colic, debility and affect the general health of the animal.

Water should be of good quality and not contaminated by decomposing organic matter, sediment or high in salt content rendering it unpalatable. The maximum level of salt horses can tolerate in drink water is about 90 grains to the litre.



Horses may be watered before, during or after feeding without interfering with the digestion or absorption of food. The important thing is that they be watered at regular times. If horses have been worked hard it is preferable that they be watered before feeding but not be allowed too much water while they are still hot.

### Feeding problems

Undoubtedly one of the most common ailments encountered in horse feeding is colic. This condition is the result of derangements of the digestive organs and is characterized by severe abdominal pain. It may result from a number of factors but by far the most common causes are errors in diet. A sound feeding system will therefore do more towards preventing colic than any other factor. If the following rules of feeding are adopted the incidence of colic can be kept to a minimum—

1. Do not overfeed: feed in small quantities and often.
2. Never make sudden changes in the diet, particularly of concentrates.
3. Never feed damaged or mouldy fodders.

4. Do not work a horse hard immediately after feeding.
5. Preferably water the horse before feeding and if it is hot, limit the amount it drinks.

Faulty mastication of feed caused by faulty teeth is a problem which is commonly encountered and is a cause of digestive upsets.

In young horses, faulty shedding of the milk teeth results in poor mastication of feed while unevenly worn teeth and sharp edges cause a similar situation in older animals. Faulty teeth induce the horse to bolt its feed causing fermentation in the stomach, which predisposes to colic.

The teeth of horses should be examined periodically for unevenness and sharp edges. Filing should be carried out where necessary. Apart from colic, faulty teeth can result in a considerable loss of condition in affected horses. In hand fed horses it is not uncommon to see small balls of partly chewed food in the feed box. This is an indication that the teeth are in need of attention.

Heavy infestation with internal parasites (worms) is a cause of a type of colic and also ill-thrift in horses. It is a wise precaution therefore to treat horses for worms at least twice a year.

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## Earlier tobacco planting time

STARTING from the 1975 season, tobacco growers in the Mareeba, Herberton, Atherton, Hinchinbrook and Cardwell shires will be able to plant a month earlier.

The Minister of Primary Industries (Hon. V. B. Sullivan, M.L.A.) said the Tobacco Industry Protection Regulations of 1966 had been amended to advance planting time from 1 May to 1 April.

The closed planting season for these Shires, Districts 2 and 3, now would extend from 1 November to 31 March of the following year.

Mr. Sullivan stressed the need for the closest co-operation of all involved in the tobacco growing industry to ensure that

seedbeds and crop residues were promptly destroyed.

Residues should be destroyed before 1 January each year or as soon as harvesting was completed.

Every effort must be made to minimize the chance of blue mould carry-over from one season to the next.

Blue mould was the industry's most costly disease in north Queensland.

Mr. Sullivan added that the change in planting time had been recommended by the Tobacco Leaf Marketing Board and supported by Departmental officers in the areas.

# Insect pest control in citrus . . .

Entomology Branch Officers.

THE following tabulation summarizes the recommended pest controls for citrus in Queensland. Further details on identification, and control of the pests listed and of some minor pests not listed, where necessary should be sought from extension officers of the Department.

Of the materials listed, only oil, dicofol, mezinzeb, mancozeb, soda ash and sodium metasilicate have little harmful effect on parasites and predators. Some citrus blocks, in particular Joppas and Valencias grown for juice, lend themselves to the sole use of these materials, thus encouraging biological control. Where more harmful materials must be used, make timely applications of only enough insecticide to kill the pests.

Description and Life History	Seasonal Incidence	Pest Status	Damage	Control (if infestation warrants)	
				Timing	Material
<p><b>Red Scale</b> <i>Aonidiella aurantii</i></p> <p>The adult female is slightly less than 2 mm across and orange-red in colour. Living young are produced. These are dispersed by the wind, settle and begin forming the protective scale covering. The life cycle is completed in about 60 days</p>	<p>Crawlers produced from adults on the twigs move on to young fruit in late spring. Up to five generations occur annually</p>	<p>An important Queensland pest throughout citrus, but worst in the drier Gayndah-Mundubbera area</p>	<p>All parts of the tree can be infested resulting in severe fruit blemish, leaf drop and branch dieback. Young fruit are severely pitted</p>	<p>Late November-early December usually followed by a further spray in late January-early February</p>	<p>On Glen Retreat mandarins—methidathion 0.05% plus a wetting agent. On other varieties white oil or summer superior oil 1 : 80 to 1 : 60 or methidathion 0.05% plus oil 1 : 100</p>
<p><b>Circular black scale</b> <i>Chrysomphalus ficus</i></p> <p>The adult female covering is black, 2 mm across, loosely attached to the scale insect's body. Living young are produced. The life cycle is completed in about 64 days</p>	<p>Crawler production begins in early spring resulting in a scale build up mainly on the foliage. Crawlers move on to the fruit in late summer. Four generations occur annually</p>	<p>An important pest more common in coastal citrus especially Howard and Grantham</p>	<p>Leaves and fruit are infested resulting in leaf drop and fruit blemish</p>	<p>As for red scale . .</p>	<p>As for red scale</p>
<p><b>White wax scale</b> <i>Gascardia destructor</i></p> <p>The adult female has a soft, white, waxy covering 6 mm across. Eggs are deposited under the body of the scale. Crawlers on emerging settle along the midrib of leaves but at the first moult, the young scales migrate back to the twigs. Wax accumulates forming first a small peak then finally the large globular covering seen in the adult</p>	<p>Two generations occur annually. Summer crawler emergence begins in mid October and continues until late February. Winter crawlers emerge from early April until October</p>	<p>An important pest especially in coastal areas. Infestations have been light since 1972</p>	<p>Most of the life cycle is spent on the twigs. The worst effect of the scale is the encouragement of sooty mould on leaves and fruit</p>	<p>Late November-early December (before summer generation scales become too waxed over). Repeat in late January-early February (at the end of the summer emergence)</p>	<p>On Glen Retreat mandarins, methidathion 0.05% plus a wetting agent. On other varieties, methidathion 0.05% plus 1 : 100 oil or promecarb 0.05% plus 1 : 100 oil or sodium metasilicate 1.5 kg/100 litres plus 1 : 100 oil</p>



<p><b>Pink wax scale</b> <i>Ceroplastes rubens</i> The adult female has a firm pink waxy covering up to 3.5 mm across. Eggs are deposited under the scale's body. Emerging crawlers settle mainly along the midrib on both sides of the leaves</p>	<p>Two generations occur annually. Summer crawler emergence begins in mid October and is completed by early December. Autumn crawlers emerge from early March until June</p>	<p>An important pest in most citrus growing areas of Queensland</p>	<p>Scales infest leaves and twigs. Honey dew secretion by the scale encourages sooty mould on leaves and fruit</p>	<p>Late November-early December (at the end of the summer emergence)</p>	<p>On Glen Retreat mandarins, methidathion 0.05% plus a wetting agent. On other varieties, methidathion 0.05% plus 1 : 100 oil, or soda ash 0.5 kg/100 litres plus 1 : 100 oil or sodium metasilicate 1.5 kg/100 litres plus 1 : 100 oil</p>
<p><b>White louse scale</b> <i>Unaspis citri</i> The adult female is about 1.5 mm long and covered by a brown mussel-shaped covering. The smaller but more conspicuous male covering is white and longitudinal. The female lays eggs. The crawlers settle mainly on limbs and twigs. The life cycle takes about 65 days</p>	<p>The first crawler emergence is in early September. Up to five generations occur annually</p>	<p>An important pest in most areas on older trees, not so prevalent at Gayndah-Mundubbera</p>	<p>Scales infest the trunk and the main limbs causing dieback. If infestation is heavy it spreads to leaves and fruit</p>	<p>Mid July</p>	<p>Lime sulphur 0.66% (in summer, scalicides also assist in control)</p>
<p><b>Citrus rust mite</b> <i>Phyllocoptruta oleivora</i> The mite is yellow torpedo shaped and less than 0.2 mm long. The eggs are spherical in shape; the nymphs are small replicas of the adults. The life cycle is completed in 1 week during summer; in 2-3 weeks in winter. Less exposed surfaces are preferred, the underside of the leaves and the inner side of the fruit</p>	<p>The mites move on to the young fruit from the leaves in late spring. Breeding continues throughout the year</p>	<p>Important pest throughout Queensland citrus</p>	<p>Severe rind injury is caused; in lemons a grey coarse shark-skin, in other varieties a brown-black 'boot polish' effect. Infestations build up very rapidly in the summer</p>	<p>Mid July (necessary to rid the tree of the high numbers of mites on the foliage at the end of the season) Early summer and late summer to early autumn</p>	<p>sulphur 0.3 kg/100 litres or lime sulphur 0.66%  sulphur 0.3 kg/100 litres or dicofol 0.05% (mezineb and mancozeb when used for black spot will give reasonable control of rust mite)</p>
<p><b>Brown citrus rust mite</b> <i>Tegolophus australis</i> The mite is brown, wedge-shaped and less than 0.2 mm long. Eggs are helmet-shaped, and nymphs small replicas of the adults. The</p>	<p>The mites move on to young fruit from the leaves in the late spring. At the end of the season high numbers of mites can be found on the foliage of infested trees</p>	<p>Important in southern citrus areas particularly Gayndah-Mundubbera</p>	<p>Severe rind injury is caused. In all varieties a smooth dark brown 'boot polish' effect occurs</p>	<p>As for citrus rust mite</p>	<p>As for citrus rust mite</p>

Description and Life History	Seasonal Incidence	Pest Status	Damage	Control (if infestation warrants)	
				Timing	Material
<p>life cycle is completed in just over 1 week in the summer; in over 3 weeks in the winter. Exposed areas are preferred, the upper surface of the leaves, and the outer side of the fruit and the upper part of the tree</p>					
<p><b>Broad mite</b> <i>Hemitarsonemus latus</i> This is a plump, translucent mite about 0.2 mm long, that is just visible to the naked eye. Eggs are helmet-shaped, and the nymphs small replicas of the adults. The life cycle is completed in about 1 week in the summer. Mites accumulate on underside of the leaves and the inner side of the fruit</p>	<p>On infested trees, a residue of mites persists on older leaves breeding continuously throughout the year. Numbers build up on young foliage or fruit that becomes available</p>	<p>Important on lemons and on some mandarin varieties including Hickson and Ellendale</p>	<p>Severe rind injury is caused; in lemons a fine grey skin, in mandarins a grey 'sandpaper' effect. Injury is caused when the fruit are young</p>	<p>When mites appear; on young fruit, that is late spring-early summer, late summer-early autumn</p>	<p>sulphur 0.3 kg/100 litres or dicofol 0.05%</p>
<p><b>Queensland fruit fly</b> <i>Dacus tryoni</i> The adult female is brown with yellow markings on the thorax and about 8 mm long. Eggs are deposited within the rind. Ruptured oil cells often destroy the eggs. Emerging larvae tunnel into the pith or feed on the juice</p>	<p>Fruit fly can be active in all but the winter months. Damage is more usual from February to April following summer rain</p>	<p>Important on most varieties throughout Queensland</p>	<p>Even if larvae fail to develop, stung fruit are of no commercial value and usually prematurely fall. In the autumn, grapefruit can be heavily infested. Also attacked are navels and early mandarins. Late hanging Valencias can be attacked in the spring</p>	<p>Late summer-early autumn and spring</p>	<p>DDT 0.2% (sweep spray) or dimethoate 0.03% (not on Meyers, Sevilles, cumquats) or fenthion 0.04%</p>
<p><b>Larger horned citrus bug</b> <i>Biprorulus bibax</i> The adult is green, about 20 mm long with two anterior spines. The eggs, which are spherical, are laid in batches usually on the leaves. Five nymphal stages occur</p>	<p>Four generations occur annually. The bugs overwinter as adults and begin laying in September</p>	<p>Important every 2-3 years particularly at Gayndah-Mundubbera on early mandarins. Lemons are also attacked</p>	<p>The bug sucks the fruit. Maturing fruit in the late summer - autumn are attacked with serious fruit drop resulting</p>	<p>Late summer-early autumn</p>	<p>methidathion 0.05% or carbaryl 0.05% or promecarb 0.05%</p>



<p><b>Fruit sucking moth</b> <i>Othreis fullonia</i> The adult is a large, colourful moth 100 mm across. The forewings are mottled green-brown, the hindwings are orange-yellow</p>	<p>The adults are most prevalent during summer-autumn. Larvae feed on several native vines growing in rain-forest areas and along creek banks</p>	<p>Important in northern citrus areas. Occasionally troublesome in the Biggenden-Howard areas</p>	<p>Early varieties are worst effected (March to May). The moths pierce the ripening fruit and suck the juice causing serious fruit drop in grapefruit, navels, early mandarins, Silletas and occasionally to Joppas</p>	<p>No established control. In northern areas, Valencia and other late varieties avoid the pest</p>	<p>..</p>
<p><b>Citrus leaf miner</b> <i>Phyllocnistis citrella</i> The adult moth is only 3 mm across and silvery-white. It lays its eggs singly, usually on the lower side of young leaves. The larva mines through the leaf surface and finally forms a cocoon on the edge of the leaf. During summer, the life cycle takes about 2 weeks</p>	<p>In southern areas, the moth is active from November to May. This period is less defined in northern areas</p>	<p>Of sporadic importance on young trees. The main growth flush usually occurs before the pest becomes active</p>	<p>Only young growth is attacked. Once the flush has hardened it is no longer susceptible. Mined leaves become twisted and hard. Parasitism increases later in the season</p>	<p>Protect threatened major growth flushes on young trees (including nursery stock) by 2-3 well-spaced sprays during December-April. Sprays for other pests also assist control. Spot spray only the growth flush</p>	<p>methidathion 0.05% or diazinon 0.05%</p>
<p><b>Orange fruit borer</b> <i>Isotenes miserana</i> The adult moth is light-grey with a wingspan of about 20 mm. Mature larvae are up to 24 mm long, brown with two longitudinal brown stripes and a dark head capsule</p>	<p>Periods of most common occurrence of adults are March-May, October-November and in January. Breeding appears to continue through the year</p>	<p>Of sporadic importance on late maturing varieties particularly at Gayndah-Mundubbera Young fruit are also attacked</p>	<p>The larvae bore into the fruit at the calyx end or where two fruit touch. Injured fruit usually drop</p>	<p>When infestation heavy</p>	<p>methidathion 0.05% or carbaryl 0.1%</p>
<p><b>Black citrus aphid</b> <i>Toxoptera citricidus</i> Adults are black, soft bodied insects about 2 mm long. The aphids accumulate in colonies of winged and wingless adults and immature forms on young growth</p>	<p>Multiply on growth flushes especially in the spring-early summer</p>	<p>Of sporadic importance on young trees. Normally kept at a low level by parasites and predators</p>	<p>The aphids feed on the sap causing bunching and crinkling of young growth and accumulation of sooty mould</p>	<p>When infestation is heavy, spot spray young trees. Control is rarely necessary on an orchard basis</p>	<p>dimethoate 0.03% (not on Meyers, Seviles, cumquats) or demeton-S-methyl 0.025% (Some scalicides, for example, methidathion also assist control)</p>

Description and Life History	Seasonal Incidence	Pest Status	Damage	Control (if infestation warrants)	
				Timing	Material
<p><b>Citrus bud mite</b> <i>Aceria sheldoni</i></p> <p>The adult is a small, white to brown torpedo-shaped mite less than 0.2 mm long. Eggs are elliptical, and nymphs small replicas of the adult. The mite feeds mainly in unopened flower and leaf buds. The life cycle is completed in about 10 days in the summer</p>	Breeding is continuous throughout the year. Spring growth is worst affected	Of minor importance. Spray operations for other pests appear to keep the mite in check	Feeding in the leaf buds results in malformation and bunching of the terminal shoots	Controlled by sprays for rust mites	..
<p><b>Bronze orange bug</b> <i>Musgraveia sulciventris</i></p> <p>The adult is a shield-shaped, bronze bug 25 mm long. The spherical eggs are laid in clusters on the leaf underside. The nymphs are small replicas of the adult but green to orange in colour</p>	The adult lays its eggs during the summer. The nymphs moult and spend the autumn-winter as the small flat second instar in clumps on the underside of leaves. In spring, the nymphs rapidly pass through three other instars before the adult is reached	Of minor importance in commercial orchards. Spray operations for other pests keep the bug at low numbers. Occurs in southern citrus areas	The bug feeds on young shoots and fruit causing shoot dieback, fruit drop and setback to tree health	If the infestation becomes obvious, spray in spring, after blossoming is complete to avoid spraying bees	Methidathion 0.05% or carbaryl 0.05% or promecarb 0.05%
<p><b>Soft brown scale</b> <i>Coccus hesperidum</i></p> <p>Adult scales are brown, about 3 mm long; younger stages are yellow and flat</p>	Up to four generations occur annually	Of minor importance in southern Queensland being normally controlled by parasites	Infestations result in heavy sooty mould accumulation	Sprays applied for red scale give control	..
<p><b>Mussel scale</b> <i>Lepidosaphes beckii</i></p> <p>Adult is a purple-brown mussel-shaped scale about 2 mm long</p>	Up to four generations occur annually	Of minor importance in northern citrus areas normally controlled by parasites	Occurs on fruit, foliage and branches. Causes dieback when heavy infestation occurs	Sprays applied for red scale give control	..
<p><b>Red flat mite</b> <i>Brevipalpus californicus</i></p> <p>The adult is flat, red, less than 0.2 mm long</p>	Breeding continues throughout the year	Of minor importance in northern citrus areas	Injury is caused to the rind of fruit—a grey mottled effect	As for citrus rust mite	..
<p><b>Giant termite</b> <i>Mastotermes darwiniensis</i></p> <p>Soldiers of this soil-dwelling termite are up to 13 mm long</p>	Occurs in non rain-forest areas north of the Tropic of Capricorn	Of minor importance at Charters Towers	The termite invades the roots and trunk eventually girdling and killing the tree	When infestation detected	10 g 20% BHC dust per m <sup>2</sup> ; work into the topsoil within the main root zone



<b>Citrus gall wasp</b> <i>Bruchophagus fellis</i> Adult a small black wasp 2 mm across	Wasps emerge in September-October and lay their eggs in the twigs. Larvae becomes full grown by the following spring	Of minor importance in southern areas. Kept at low level normally by parasites	Feeding of the larvae in the twigs results in gall formation. Rough lemon and grapefruit are worst affected	Prune out and burn galled wood during the winter before the end of August	..
<b>Citrus mealy bug</b> <i>Planococcus citri</i> The adult is about 3 mm long and has a white, mealy appearance. Eggs are laid in loose cottony masses	Crawlers move on to young fruit in late summer. At least four generations occur annually	Of minor importance in navels. Parasites and predators (notably the mealybug ladybird) normally control	Feeding in the navel end results in rots and premature ripening and dropping. Heavy numbers in other varieties, for example lemons, can cause dropping of young fruit	Chemical control is difficult, especially when the bugs are settled in the navel ends. Methidathion as used for red scale assists control	..
<b>Citrus branch borer</b> <i>Uracanthus cryptophagus</i> The adult is a grey-brown longicorn beetle about 40 mm long	Adults emerge in the summer and lay their eggs in cracks in the branches. Larvae pupate in the branch the following spring	Of minor importance in some southern orchards: Blackall Range, Grantham, and Palmwoods	The larvae mine down the branches often girdling and killing them	Chemical control is difficult. Routine scalcicide operations involving use of materials such as methidathion assist control. Infested branches should be pruned out	

## QUANTITY OF MATERIAL PER 100 LITRES OR 100 GALLONS TO OBTAIN RECOMMENDED SPRAY CONCENTRATION

Material (common name)	Percentage concentration active constituent	Strength of Product (no particular company's formulation is favoured)	Quantity per	
			100 litres	100 gallons
carbaryl .. .. .	0.05 0.1	80% wettable powder .. .. .	65 g	10 oz.
		80% wettable powder .. .. .	125 g	1 lb. 4 oz.
D.D.T. .. .. .	0.2	25% emulsifiable concentrate .. .. .	800 ml	6 pt. 8 fl. oz.
demeton-S-methyl .. .. .	0.025	25% emulsifiable concentrate .. .. .	100 ml	16 fl. oz.
diazinon .. .. .	0.05	80% emulsifiable concentrate .. .. .	65 ml	10 fl. oz.
dicofol .. .. .	0.05	25% emulsifiable concentrate .. .. .	200 ml	1 pt. 12 fl. oz.
dimethoate .. .. .	0.03	30% emulsifiable concentrate .. .. .	100 ml	16 fl. oz.
fenthion .. .. .	0.04	55% emulsifiable concentrate .. .. .	75 ml	12 fl. oz.
methidathion .. .. .	0.05	40% emulsifiable concentrate .. .. .	125 ml	1 pt.
promecarb .. .. .	0.05	49% wettable powder .. .. .	100 g	1 lb.
lime sulphur .. .. .	0.66	20% solution as polysulphide sulphur .. .. .	825 ml	6 pt. 12 fl. oz.

# Dairy pastures for Atherton

*Of the wide range of tropical grasses and legumes available for planting improved pastures, only a few are really useful on the Atherton Tableland.*

These should be planted in appropriate proportions to supply continuity of feed.

The Atherton Tableland is situated south-west of Cairns between the Coastal Range and the Great Dividing Range at an altitude of 400 to 1 050 metres.

Dairying is restricted to the areas south of Kairi between 670 and 1 050 metres above sea level.

## Climate

Annual rainfall varies from 1 250 mm to 3 500 mm increasing towards the south and east. The wet season usually begins with storms in November-December and approximately 60% of the annual rainfall is received in January, February and March.

## These new pasture plants promise



*An experimental stand of Kenya white clover and kikuyu on Mr. W. MacKenzie's farm at Evelyn.*



# Tableland . . .

The following 3 months are characterized by overcast conditions accompanied by drizzle. Rainfall is unreliable from July to the start of the storms.

Severe frosts are often recorded in the higher Evelyn area. Milder frosts occur in most years on the rest of the Tableland but are more common in the drier areas of the dairying district.

Low solar radiation levels, particularly during Autumn, can severely restrict pasture

growth. The reduction in growth is greatest in the wetter areas.

## Topography

The Atherton Kairi-Tolga areas are gently undulating and used mainly for cropping. The country becomes steeper moving south and east and is mostly under pasture.

by T. J. QUINLAN, Agrostologist; W. H. R. EDGLEY, Dairy Cattle Husbandry Branch; and K. A. SHAW, Agriculture Branch.

# a longer growing season . . .



*Glycine wightii* C.P.I. 28279 combining well with *Nandi setaria* in a 3-hectare paddock on Mr. John Daley's farm at Millaa Millaa. New legumes such as this are tested under commercial conditions before release.



## Soils

The soils of the Atherton Tableland fall into four main groups according to their parent rocks. These are basalt, granite, metamorphic and acid volcanic. Soil acidity or pH generally falls within the range 5 to 6.5.

The most outstanding deficiency is phosphorus. Molybdenum is widely required for good legume growth and potassium deficiency is showing up in many of the higher rainfall areas.

## COMMERCIAL PASTURE SPECIES

### Grasses

**KIKUYU** (*Pennisetum clandestinum*). This grass is naturalized throughout the area but is more common in the wetter and/or colder areas. It provides excellent year-round feed provided moisture is not limiting, combines well with legumes and is also used in pure stands.

Two seeding cultivars of kikuyu have recently been developed by the N.S.W. Department of Agriculture. They have been named 'Whittet' and 'Breakwell', and seed of the former is now available commercially.

**COMMON GUINEA** (*Panicum maximum*). This was one of the earliest sown tropical grasses used and is still widely planted through the area.

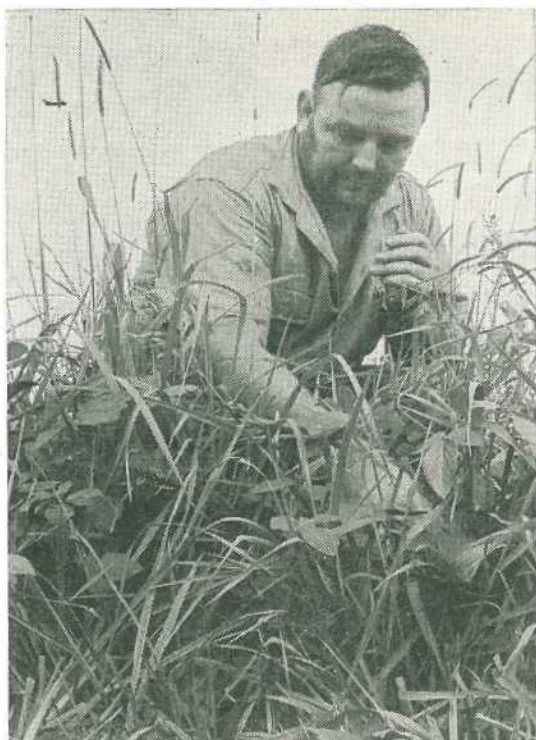
It provides excellent feed if its growth is controlled. Its main limitation is slow winter growth.

**GATTON PANIC** (*Panicum maximum* cv. Gatton). This cultivar of guinea grass has only recently gained favour on the Atherton Tableland and will probably replace green panic.

Their growth rhythms are similar but the lighter seeding habit of Gatton panic is much more easily controlled and it gives a better ground cover than green panic.

**HAMIL** (*Panicum maximum* cv. Hamil). This cultivar of guinea grass is capable of providing large amounts of bulk but is difficult to maintain in a quality state.

**PETRIE GREEN PANIC** (*Panicum maximum* var. *trichoglume*). This grass is also widely planted, and is particularly favoured for its winter production and spectacular growth after



Malanda dairy farmer, Mr. Clarence Stonehouse, inspects a pasture of Greenleaf desmodium and Nandi setaria.

storm rains. Green panic seeds very heavily from January to March. It does not perform well where rainfall exceeds 2 000 mm per year.

**CREEPING GUINEA** (*Panicum maximum* cv. Embu). Experience is very limited with this cultivar but it appears to have good winter growth and is a leafy, light seeding species.

**KAZUNGULA SETARIA** (*Setaria anceps* cv. Kazungula). This grass provides useful winter feed but heavy summer seeding and poor compatibility with legumes limit its use.

**NANDI SETARIA** (*Setaria anceps* cv. Nandi). This is a more useful cultivar than Kazungula as it is more leafy and combines better with legumes. Winter production is good. Heavy summer seeding is its main disadvantage.

**NAROK SETARIA** (*Setaria anceps* cv. Narok). This is a recent release whose frost tolerance makes it of interest. Seeding appears to be



lighter and later than that of the other two setarias. Animal performance data on Narok are not yet available.

**PANGOLA** (*Digitaria decumbens*). This grass is used mainly as a pure grass pasture at present and under irrigated experimental conditions has given high levels of milk production per hectare. Pangola has a heavy flowering phase in January-February and growth is slow during the winter. Under adverse conditions, it is susceptible to attack by rust (*Puccinia oahuensis*) and aphids (*Schizaphis* sp.).

**SIGNAL GRASS** (*Brachiaria decumbens*). This grass has performed well on the coast but its place in Atherton Tableland dairying has yet to be determined. It is a sward-forming grass which will be mainly suited to bag nitrogen.

**ELEPHANT GRASS** (*Pennisetum purpureum*). As with Hamil grass, this species provides large amounts of bulk but is difficult to maintain in a quality state. A small area rolled at

the end of winter will provide useful dry season feed because of its ability to make some growth during this period.

**PASPALUM** (*Paspalum dilatatum*). This grass has been widely used in the past. Advantages include frost tolerance and ability to withstand close grazing, but susceptibility to white grub (*Lepidiota caudata* and *Rhopaea magnicornis*) attack and ergot (*Claviceps paspali*) have caused it to fall into disfavour. It still provides useful feed in unimproved areas.

**MOLASSES GRASS** (*Melinis minutiflora*). The main use of this grass is for weed control in new scrub burns. In other situations there are better grasses.

**RHODES GRASS** (*Chloris gayana*). Because of its seeding habit and poor ratio of leaf to stem, Rhodes grass is not recommended for dairy production on the Atherton Tableland.

**PARA GRASS** (*Brachiaria mutica*). This grass provides useful dry season feed in creeks and swampy areas but does not persist in dryland paddocks.

## Legumes

**TINAROO GLYCINE** (*Glycine wightii* cv. Tinaroo). This legume is particularly well adapted to the higher fertility basalt soils around Kairi, Tolga, Atherton, Yungaburra and East Barron. It will make growth in all seasons provided subsoil moisture levels are adequate. Tinaroo is not so productive on other soil types and this appears to be because of a nodulation problem.

**COOPER GLYCINE** (*Glycine wightii* cv. Cooper). This cultivar is a vigorous summer grower which is better adapted to poorer soils than Tinaroo but is not generally planted because of its shorter growing season.

**CLARENCE GLYCINE** (*Glycine wightii* cv. Clarence). As with Cooper, this cultivar is considered inferior to Tinaroo because of its shorter growing season.

**GREENLEAF DESMODIUM** (*Desmodium intortum*). This is a very adaptable species and thrives on all soil types in the dairying area. Although Greenleaf slows down during its



Tinaroo glycine and guinea grass in a well-managed pasture. Controlled grazing can almost completely suppress seeding in the guinea grass component.



flowering-seeding phase, and is less tolerant to water stress than Tinaroo, overall it is the area's most productive legume.

Its main disadvantage is its susceptibility to insect damage, notably rough brown weevils (*Leptopius* spp.) webworm (*Oncopera* spp.) and webspinner moth (*Lamprosema abstinialis*).

**SILVERLEAF DESMODIUM** (*Desmodium uncinatum*). This is inferior to Greenleaf over most of the Atherton Tableland but has performed well in isolated areas. It appears to be somewhat more insect resistant than Greenleaf but has a shorter growing period. Silverleaf performs better in the cooler areas.

**HETERO** (*Desmodium heterophyllum*). On the coast hetero has combined well with pangola but experience is limited on the Tableland.

**STYLO** (*Stylosanthes guyanensis*). This legume has generally not been successful in this area.

**SIRATRO** (*Macroptilium atropurpureum*). This legume has also been generally unsuccessful in the area. Its disadvantages are a short growing season and susceptibility to disease.

**MILES LOTONONIS** (*Lotononis bainesii*). Performance of this species has so far been erratic. It may have some application on the forest soils.

### PROMISING NEW SPECIES

**KENYA WHITE CLOVER** (*Trifolium semipilosum*). Performance of this species has been outstanding in trial plots both on the Atherton Tableland and in southern Queensland. It combines very well with kikuyu, and is capable of year-round production. It withstands moderate frosts and is resistant to diseases affecting white clover in the area.

*Glycine wightii* CPI 28279. This species is more productive than Tinaroo on the less fertile soils, and is more resistant to insects than Greenleaf desmodium. It has a long growing period, similar to Tinaroo.

*Panicum maximum* CPI 37910. This guinea grass possesses all the attributes of common guinea and in addition gives better winter growth.



An excellent mixture of Greenleaf desmodium and kikuyu. With correct fertilizing and management, kikuyu mixes very well with legumes giving one of the most productive pasture mixtures on the Atherton Tableland.

### GRASS-LEGUME OR PURE GRASS?

Two pasture production systems are used on the Atherton Tableland: pure grass and grass-legume mixtures.

Both systems have their advantages and disadvantages. Pure grass pastures must be regularly fertilized with bag nitrogen if high quality feed is to be produced.

In dryland paddocks, irregular rainfall can have serious effects on plant protein content of pure grass pastures, although protein levels can be rapidly increased if suitable rain follows nitrogen application.

Protein levels in pangola grass rise to a peak approximately 3 weeks after nitrogen application in summer and 4 weeks in winter. They then drop rapidly until the next nitrogen application is washed into the root zone.



Protein content can fall to a level which will seriously reduce milk production if the nitrogen supply to the plant is unduly interrupted.

Grass-legume pastures are not nearly so dependent on rainfall to maintain adequate plant protein levels.

Nitrogen fertilizer is expensive and grass production with bag nitrogen is costly when compared with grass-legume.

Pure grass pastures have their best application in the following situations—

**EARLY STAGES OF FARM DEVELOPMENT**  
Large amounts of feed can be produced on small areas while other parts of the farm are being developed, particularly if a suitable area of kikuyu is available.



Another example of kikuyu combining well with a legume, this time Tinaroo glycine.

**STRATEGIC FEED.** Nitrogen on kikuyu will give excellent winter feed when many grass-legume pastures are slowing down.

Pure grass pastures provide greater flexibility in management by allowing feed to be produced quickly. For example prolonged rainy periods and waterlogged soils may necessitate spelling of legume paddocks.

Another example is the provision of quick feed after frost in the wetter areas or where irrigation is available.

**SMALL FARMS.** To milk a large herd on a small area, production per hectare is the important consideration and the farmer will have to rely on nitrogen fertilized pure grass, with irrigation during the dry season.

**INTENSIFICATION.** If a farmer wishes to intensify his operation, a relatively small area of nitrogen-fertilized grass can provide all or part of the grazing for the milking herd. The remainder of the farm can then be used for some other enterprise.

Apart from these limited applications for pure grass pastures, grass-legume pastures are the rule for dairy production on the Atherton Tableland. The remainder of this article deals with grass-legume mixtures.

## CHOOSING THE BEST SPECIES

Many farmers are confused by the wide variety of grasses and legumes available and find it hard to decide which species to plant.

### Grasses

The overall aim is to provide a sufficient bulk of quality feed throughout the year. Certain characteristics of grasses make this extremely difficult. Selection of grasses should be based on the following points:—

**GROWTH RHYTHMS.** Generally no one species will provide year-round feed and a range of species must be chosen to supply continuity of feed.

**RESPONSE TO MANAGEMENT.** Assuming dry matter production is satisfactory, the chosen species should, under practical management conditions, supply quality feed which is easily eaten by the animal. Some of the taller grasses, such as elephant grass, are difficult to manage.



**SEEDING HABIT.** Seeding is associated with a drop in nutritive value of the plant and reduced intake by the animal. Species that seed heavily and cannot be controlled by practical grazing management are not recommended.

**COMPATIBILITY WITH LEGUMES.** Some grasses which are useful as pure grass pastures (such as pangola) are too vigorous for most legumes.

**DISEASE AND PEST RESISTANCE.** Obviously these characteristics are desirable for productive and persistent pastures.

**ABSENCE AND HARMFUL PROPERTIES.** Some grasses exhibit toxic properties under certain seasonal, soil nutrient and fertilization conditions and/or at certain growth stages.

Examples include the possibility of high oxalate content of *Kazungula setaria* when heavily fertilized with nitrogen and/or potassium, ergot in *paspalum*, high nitrate levels in rain-grown nitrogen fertilized grasses or accompanying a large soil nitrogen release, and occasional cases of bloat on young fresh kikuyu. Bloat can be aggravated by molasses supplementation. However, toxicity is only a minor problem in the species now available and is not normally important.

## Legumes

The main function of the legume is to increase the nitrogen status of the system. Legumes provide a home for nodule bacteria (*Rhizobium* spp.) in their root tissue and in return the bacteria provide nitrogen for the legume. This is reflected in the high protein content of legumes. Nitrogen is transferred to the companion grass by way of leaf-fall, root and nodule decomposition and via the animal through dung and urine.

A vigorous legume component can provide 224 kg of nitrogen per hectare per year. This is equivalent to 660 kg of ammonium nitrate, costing approximately \$53.

As well as providing nitrogen, the legume should have similar attributes to those listed for grass selection. Another point worth considering is the variation in the ease with which



*Gatton panic* is increasing rapidly in popularity on the Atherton Tableland and is shown here in combination with Greenleaf desmodium. *Gatton panic* has a seeding phase in early summer and this is pictured here. At this time, guinea grass and kikuyu pastures provide higher quality feed.

animals graze different legumes. Desmodiums are easier to graze than glycines because of their more upright growth habit.

Frothy bloat has been recorded on tropical legumes but it not nearly as serious as with temperate legumes. Low sodium levels are a characteristic of some tropical legumes but are usually counteracted by higher levels in the companion grass and sometimes in the drinking water.

## THE FINAL SELECTION

A range of species which most closely meets year-round animal requirements is listed below, together with sowing rates. The sowing rates are those applicable where only one grass or legume is sown. Where two or more grasses or legumes are sown, they are reduced proportionately. Mixtures containing a single grass are recommended.

Figure 1 shows when each of these species provides useful feed.



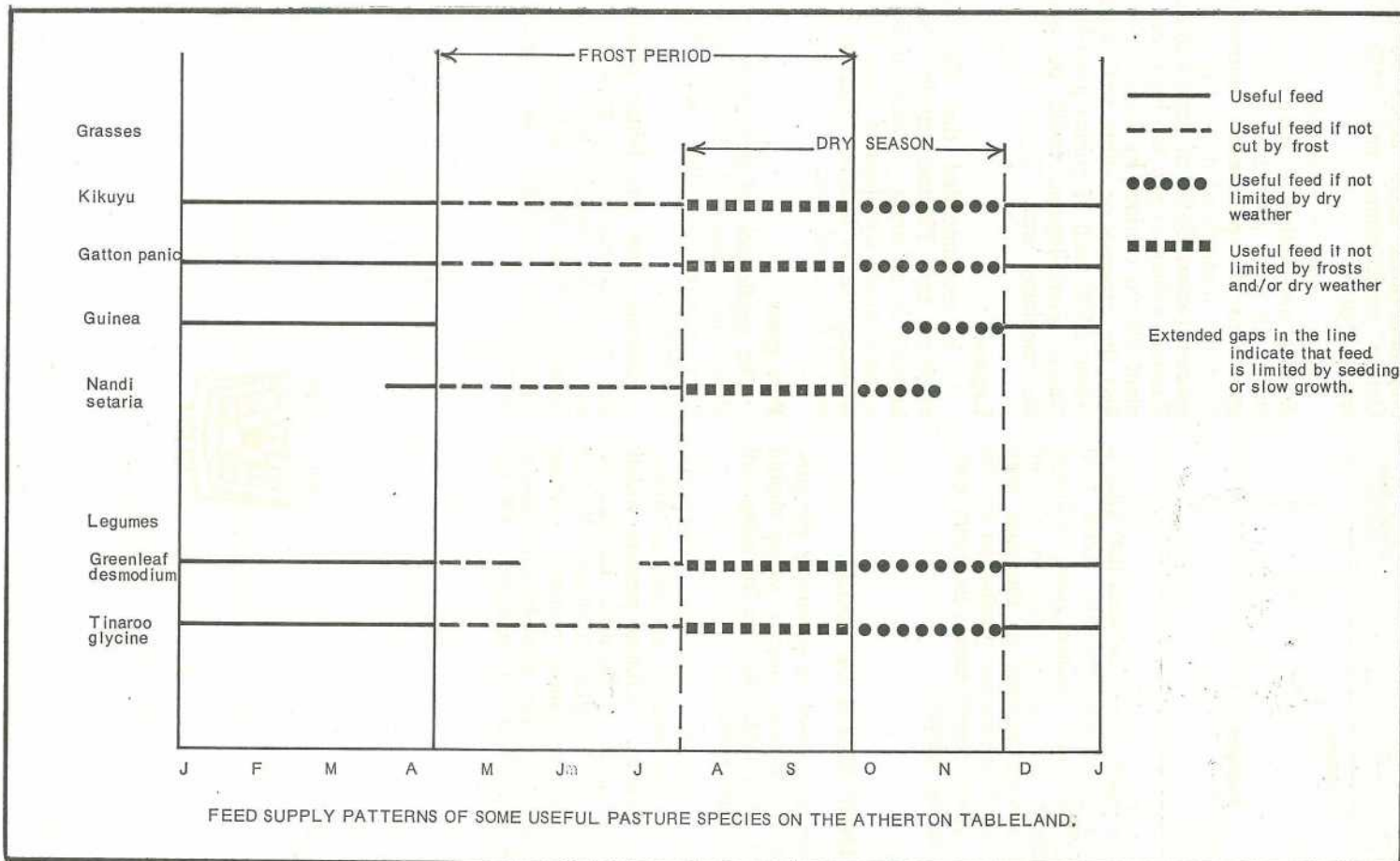


Figure 1

	Sowing Rates (kg/ha)
<b>Grasses</b>	
Kikuyu .. .. .	1
Gatton panic .. .. .	4
Guinea .. .. .	4
Nandi setaria .. .. .	1½
<b>Legumes</b>	
Greenleaf desmodium .. .. .	1½
Tinaroo glycine .. .. .	4

From the figure, it can be seen that kikuyu and Gatton panic can provide useful feed throughout the year. Guinea grass, although slow through the cooler months, is an important species because of the ease with which its excellent summer production can be managed. Nandi setaria makes its major contribution during winter.

### HOW MUCH OF EACH?

Exact figures cannot be given for the proportion of the various species which should be planted on a farm, but the following will serve as a useful guide:—

**WETTER AND/OR COOLER DISTRICTS.** Examples of these districts are Millaa Millaa, Evelyn and Topaz. Kikuyu persists widely through these areas. Cultivation, introduction of a legume and adequate fertilizer will lead to excellent kikuyu-legume pastures. About 50% of the area under grass-legume pasture should be planted to this mixture. Of the

remaining area, 25% could be planted to Gatton panic-legume and 25% to Nandi setaria-legume.

**DRIER AREAS.** Examples of the drier districts are Malanda, East Barron, Yungaburra. In these districts, kikuyu is not widespread in the paddocks. Gatton panic is therefore recommended as the major grass species (about 50% of grass-legume area). Farmers willing to pay the high seed price or plant kikuyu cuttings by hand, however, will find the expense or effort well worth while. About 25% each of guinea grass-legume and Nandi setaria-legume could be planted on the remaining area.

### Legumes

It is recommended that Greenleaf desmodium and Tinaroo glycine be planted together in all areas. Greenleaf is generally a more productive legume than Tinaroo but is susceptible to insects. Tinaroo is a backstop if Greenleaf fails.

### Pure grass

The application of pure grass pasture has already been discussed. The proportion of the farm planted to this will be decided accordingly.

Although new and better pasture species may be released, current grass-legume plantings should be restricted to those species mentioned in 'The Final Selection' or specific replacement cultivars as these become available.





# Lablab bean for autumn grazing



*A good crop of lablab bean on the Darling Downs (plate 1).*

SINCE its release by the N.S.W. Department of Agriculture in 1962, the summer-growing legume lablab bean has been used with advantage by farmers and graziers in many districts of Queensland.

Its contribution to grazing systems is the production of high protein forage during the summer with the particular advantage of high yields during the autumn and, where frost does not occur, the early winter.

## What is lablab bean?

Lablab bean (*Lablab purpureus*) is the same plant that was previously known as *Dolichos lablab*. It is a tropical legume which, when allowed to develop, accumulates a deep mass of trailing stems and leaves. The leaves are large and resemble those of the common French bean.

The main place for lablab bean in Queensland is as an annual forage crop. However, the plant is a short-lived perennial that will continue growing for two seasons if leniently grazed in the first season and if no frost

occurs. It is a useful green manure and cover crop and is used as such in the sugar industry.

## Where will it grow?

Lablab bean can be grown wherever cowpeas will normally grow. It is suited to a wide range of soil types from the heavy black soils of the Darling Downs to sandy forest types. Free drainage of the root zone is essential as waterlogging ruins the crop.

## How is it used?

A characteristic of lablab bean is its steady production of high protein (26% crude protein) forage over a long growing season, with the potential to accumulate high yields in autumn.

Flowering begins in May and, in the absence of frost, will continue through the winter. Frost destroys the stand.

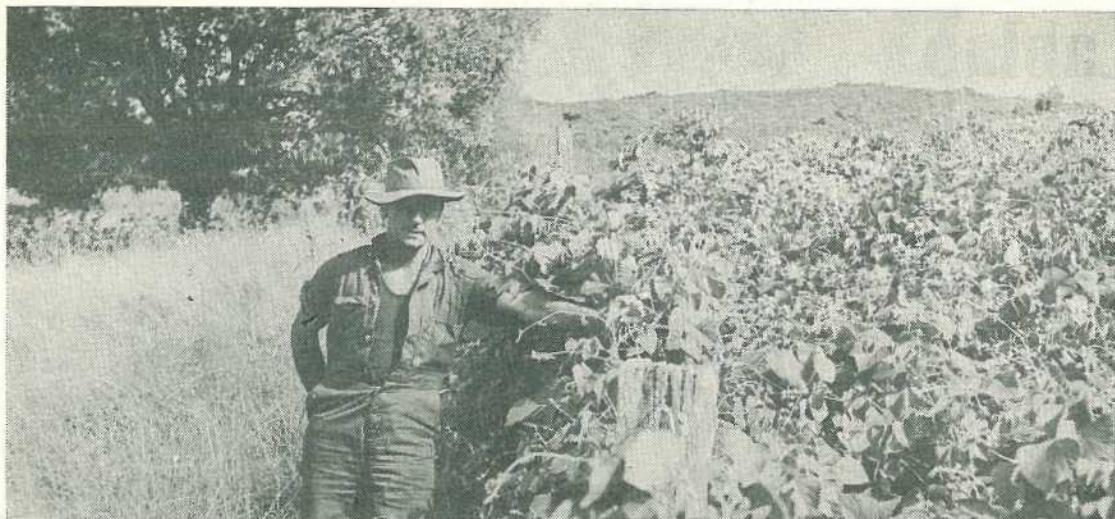
This autumn and early winter forage production can be made to overlap that of grazing oats, thus plugging a very real seasonal gap in the feed year programme.

Sowings, then, can be made from October to February, depending on local seasonal conditions. If growth is uninterrupted, early sown stands may be first grazed about 10 weeks after planting.

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by G. J. CASSIDY, Agriculture Branch.





This crop of lablab bean was sod-seeded into a run-down grass paddock (similar to that on the left of the picture) following treatment with paraquat at Mt. Mee near Brisbane (plate 2).

It is emphasized that the secret of a good yield in regrowth is the amount of stem left after grazing. The stem is the framework which carries the real forage, that is, the leaves, which appear quite quickly.

If the early grazing pressure is such that too much stem material is eaten or destroyed, regrowth will be restricted. By the same rule, the autumn yield from early sowings depends on the degree of stem development during the growing season.

Keeping this yardstick in mind, it is logical that—

Two or three lenient grazings can be obtained from early sown stands before allowing them to 'bulk up' for autumn.

Late sown stands give their highest yields if left ungrazed until around flowering time.

### How many varieties?

Two varieties or cultivars of lablab bean are available. Rongai, with which we are familiar, has white flowers and the seeds are coloured light brown when mature. The other is Highworth, a new cultivar which was released in 1973 following testing by the Queensland Department of Primary Industries.

Highworth differs from Rongai in that its flowers are purple, the mature seed is black and the stem has a purplish coloured band near the leaf-axil.

Besides this, flowering and seeding are about a month earlier. This means that lablab seed can be produced over an extended area of the State and that the variety has potential as a pulse crop for autumn-winter grazing. There is also a suggestion that the early season yield of forage in Highworth is higher than in Rongai.

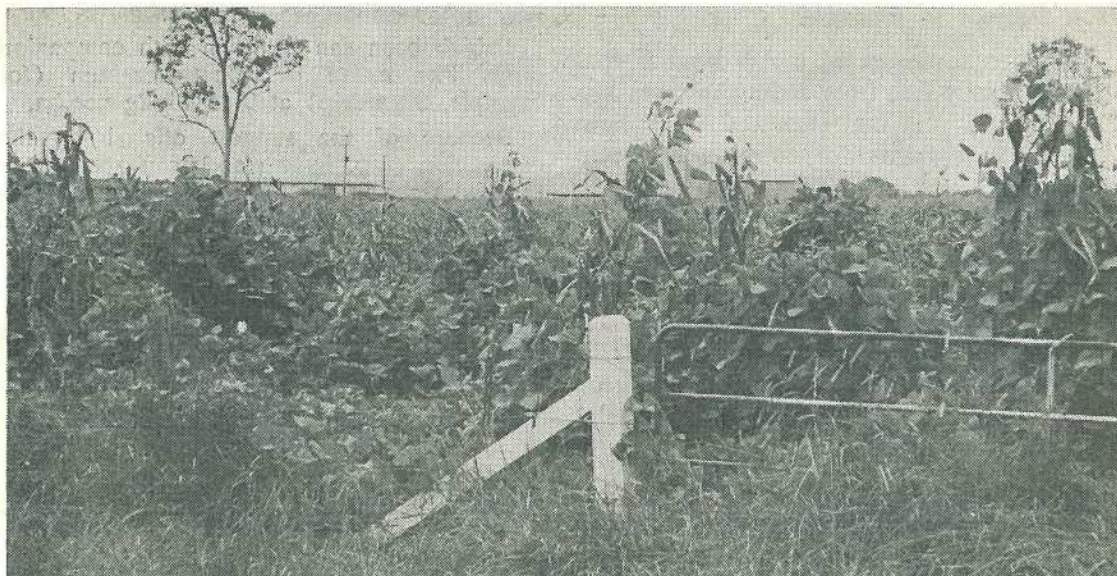
All other characteristics and requirements are the same as for Rongai. A more detailed description of Highworth appeared in the July 1974 issue of the *Queensland Agricultural Journal*.

### Sowing requirements

Are there any special sowing requirements?

No. These are largely routine, but nevertheless cannot be ignored. As with most crops, well prepared, fallowed seedbeds are best. Because the seed is large, the seedling is vigorous. As a result lablab bean will tolerate quite rough seedbeds, as long as the weed competition is not too strong. In fact,





A maize-lablab bean mixture overtops the fence at Christmas Creek near Beaudesert (plate 3).

it has been successfully established by sod-seeding into uncultivated ground following chemical desiccation of the existing grass cover with paraquat. (See Plate 2).

Recommended seeding rates are—

**Drilled:** 11 to 17 kg per ha in rows 50 cm to 1 metre apart.

**Broadcast:** up to 28 kg per ha.

Seed inoculation with lablab *Rhizobium* culture for adequate nodulation is recommended for all sowings.

## Fertilizers

Lablab bean needs a high level of available phosphorus and, on many coastal soils, molybdenum as well. A general requirement for establishment on all but the most fertile soils is usually 250 kg per ha (2 cwt. per acre) of molybdenized superphosphate. Rates up to 500 kg per ha are applied on the poorer coastal soils such as wallum.

Nothing better than a generalisation can be given in an article such as this, so the reader is strongly urged to seek a local fertilizer recommendation.

Remember also that inoculated seed and most fertilizers do not mix. The acid fertilizers such as superphosphate kill the inoculum. Therefore, close contact between the two must be avoided both before and after planting.

If drilling them simultaneously then separate the bands of fertilizer and seed. Broadcasting fertilizer either before or after planting involves no problem because contact between fertilizer and inoculated seed is not intimate enough to cause damage.

## What about bloat?

The risk of bloat is small, but it has to be acknowledged because odd cases have occurred, both in Queensland and Northern N.S.W.

The reports do not provide a satisfactory basis for defining conditions under which bloat could occur except that, in one or two instances, the animals were hungry and in others growth was very lush.

Most farmers have observed that cattle, on first being introduced to lablab bean, are disinclined to eat it and need a little time to acquire the taste.



### Is it subject to disease?

A major advantage of lablab bean is that it is practically free from serious diseases like *Phytophthora* root and stem rot which have limited the usefulness of cowpeas in recent years.

On the Atherton Tableland where pasture species have always been more subject to insect attacks, these are sometimes serious enough to warrant chemical control. In the rest of the State, some minor attacks by bean fly have occurred but generally this source of loss is not important.

### Any other considerations?

Lablab bean can be sown with companion crops like maize or sweet sorghum (for example, Sugardrip) at 9 to 11 kg per ha.

Because of the support offered by the companion crop, huge stands can accumulate for conservation as silage or late grazing in the paddock. The slower early growth of the legume makes it unsuitable as a companion for forage sorghums.

Lablab bean also makes a useful fill-in or nurse crop when included in plantings of perennial tropical pasture at a sowing rate no greater than 4 to 6 kg per ha. Higher rates are likely to suppress the establishment of the perennial pasture species.

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## Help for apple exporters

THE Queensland Government will guarantee the State's apple industry exports to a maximum of 40c a bushel, the Minister for Primary Industries (Hon. V. B. Sullivan, M.L.A.) announced this month.

He said that the guarantee would apply to a peak quantity of 35 000 bushels exported 'at risk' from Queensland to the United Kingdom and European markets.

'The Australian apple industry again faces a difficult situation in the 1975 season, with continuing increases in freight, bunkering and packaging costs, coupled with declining real returns from export markets,' Mr. Sullivan said.

'The uncertainty of prices in major export markets has made the shipping of fruit there a somewhat unattractive and risky proposition.'

The Minister said that total Australian apple exports for the 1974 season amounted to 4.2 million bushels, of which 3.2 million were exported 'at risk'.

For Granny Smith, the variety exported from Queensland, 1974 returns showed a

deficiency of slightly more than 66c a bushel, which was made up jointly by the Queensland and Federal Governments.

The Apple and Pear Corporation considered that further financial assistance was required in 1975 as an interim measure to prevent a collapse of the export industry, in view of the cost-price squeeze on growers.

Assistance beyond 1975 would be examined in the light of the report of the Industries Assistance Commission into the apple and pear industry.

Mr. Sullivan said that the Federal Government had agreed to make a similar guarantee of 40c a bushel.

'There is strong feeling in the industry in Queensland that, without additional financial assistance, growers will be reluctant to supply apples for export,' the Minister added.

'It is imperative for exporters to continue to supply their overseas customers if our apple export business is to remain viable.

'In addition, a satisfactory level of exports reduces the pressure on the domestic market.'



# Queensland's beef industry

THE Queensland beef industry plays a major role in the Queensland economy, providing thousands of people with a livelihood and contributing a significant proportion of the State's income.

It is Queensland's largest rural industry and, in 1972-73, its gross value of production was \$266.5m., which represented 27.8% of the total gross value of rural production in the State.

The beef cattle industry is widely spread throughout the State and operates under a large variety of climatic conditions. By and large, most cattle are still bred and fattened on unimproved native pastures on large properties in low rainfall areas.

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by C. W. ROBERTS, Marketing Officer.

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However, there has been a tendency in recent years towards more intensive husbandry in the more fertile high rainfall areas. This involves practices such as crop fattening and greater use of improved pastures, especially in the coastal and south-eastern districts.

Despite these advances, most beef cattle are still bred on native pastures, which are essentially summer growing, and deteriorate quickly in quality at the end of the growing season. For this reason, cattle, especially export types, are turned-off, that is, sent to market, during the winter months resulting in a seasonal killing period between approximately March and October each year.

Queensland's beef herd has been based traditionally on British breeds. However, in recent years, various breeds developed from Asian blood-lines have been introduced.

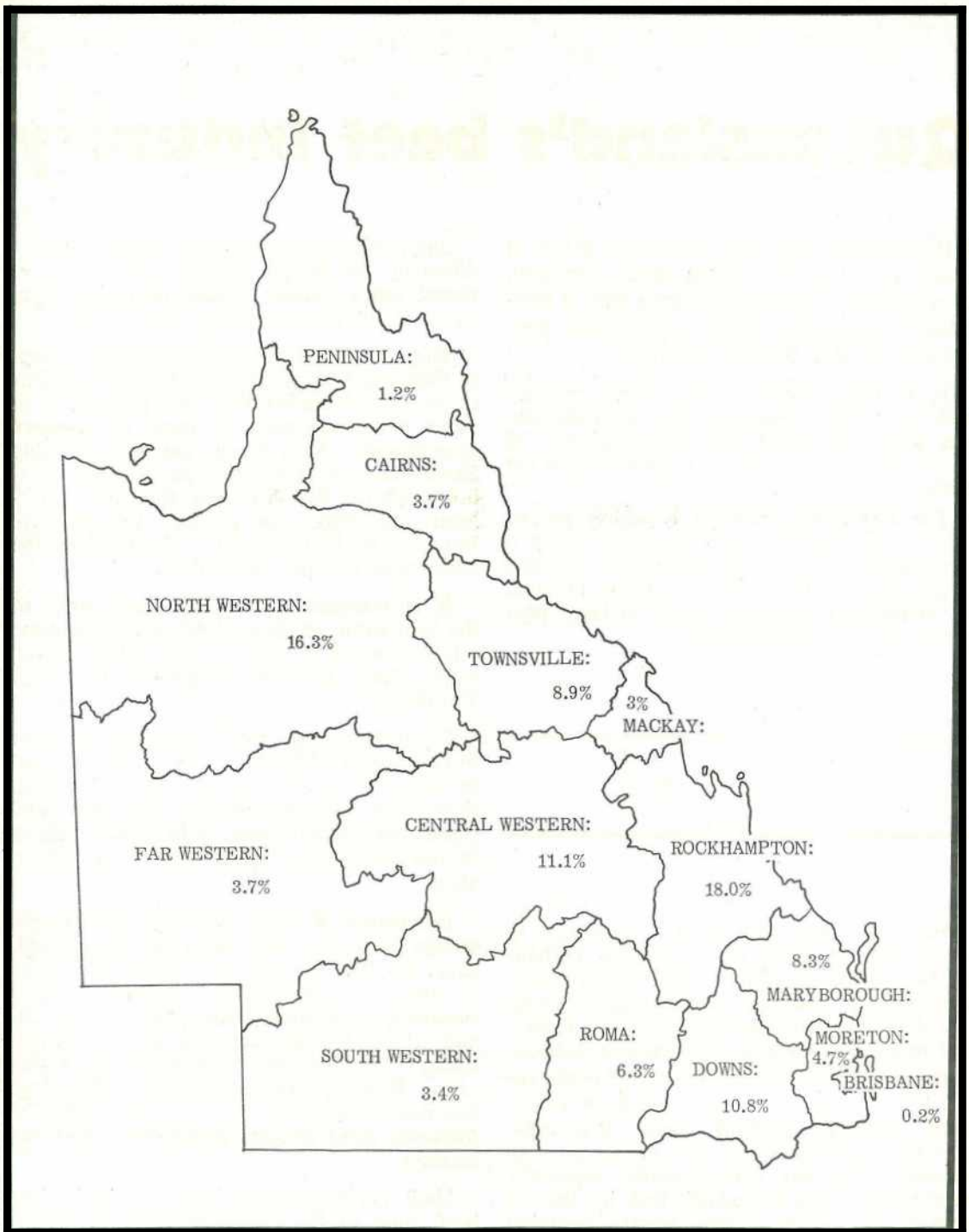
These imported breeds have attributes such as tolerance to high temperature and resistance to ticks which enable them to cope better with harsh conditions such as those in northern Queensland. As a result, the Brahman and Santa Gertrudis breeds have been widely cross-bred with the British breeds, Hereford, Shorthorn and Angus, to produce the Braford, Brangus and Droughtmaster which display the advantages of both blood-lines.

It is estimated that more than 50% of the beef cattle in Queensland now have some infusion of this tropical or *Bos indicus* blood, while about 35% are Herefords and 15% Shorthorns.

Queensland's beef cattle population stood at 9.19m. on 31 March 1973. Table 1, read in conjunction with the map of Queensland, shows the cattle distribution over the State. Cattle are widely spread with concentrations in the north-west, central and south-eastern areas.

Production of beef and veal, and slaughterings of cattle and calves in Queensland, over the last 5 years are shown in Tables 2 and 3 respectively. Production and slaughterings decreased markedly in 1969-70 and 1970-71 following the severe drought during these and the immediately preceding years. However, production and slaughterings had recovered strongly by the end of 1972-73 following good seasonal conditions and strong markets.

Until 1972-73, Queensland was the leading beef State in the Commonwealth producing between a quarter and a third of Australia's beef and veal.



Queensland's Beef Cattle Population, by Statistical Divisions.



TABLE 1

CATTLE POPULATION—Numbers of Beef Cattle in Queensland by Type and by Statistical Divisions 1972-73

Statistical Divisions	Beef Cattle Types					Total Beef Cattle	
	Beef Breed Bulls (1 year and over) No.	Beef Breed Bull Calves No.	Cows and Heifers (1 year and over) No.	Calves including Vealers (Under 1 year) No.	Others, Steers, Bullocks, &c. (1 year and over) No.	Numbers	Percentage
Brisbane .. .. .	482	157	10 088	4 588	4 803	20 118	0.2
Moreton .. .. .	7 355	2 149	200 478	100 721	120 675	431 378	4.7
Maryborough .. .. .	13 463	3 496	374 732	200 159	175 950	767 800	8.3
Downs .. .. .	17 488	5 327	469 285	291 301	205 540	988 941	10.8
Roma .. .. .	10 814	1 644	311 753	177 641	80 986	582 838	6.3
South-western .. .. .	6 765	651	177 952	74 944	56 158	316 470	3.4
Rockhampton .. .. .	30 344	6 758	781 841	427 603	409 464	1 656 010	18.0
Central West .. .. .	19 898	3 022	505 650	235 376	259 585	1 023 531	11.1
Far Western .. .. .	6 123	939	142 878	77 185	117 817	344 942	3.7
Mackay .. .. .	4 978	1 135	138 101	66 115	70 119	280 448	3.0
Townsville .. .. .	16 743	2 462	372 978	168 306	254 641	815 130	8.9
Cairns .. .. .	7 851	1 900	174 101	67 208	93 789	344 849	3.7
Peninsula .. .. .	2 848	414	62 229	20 913	28 301	114 705	1.2
North-western .. .. .	31 366	3 403	785 596	313 825	369 317	1 503 507	16.3
Total .. .. .	176 518	33 457	4 507 662	2 225 885	2 247 145	9 190 667	100.0

Source: Australian Bureau of Statistics.

TABLE 2  
BEEF AND VEAL—Queensland Production (carcass weight)

							Tonnes
Year	Beef	Veal	TOTAL	South Qld.	Central Qld.	North Qld.	
1968-69 ..	334 772	11 440	346 212	184 593	73 335	88 282	
1969-70 ..	303 984	10 758	314 742	184 498	57 957	72 288	
1970-71 ..	291 835	10 349	302 185	167 415	56 324	78 446	
1971-72 ..	334 418	10 395	344 813	190 965	62 691	91 155	
1972-73 ..	367 204	16 882	384 086	235 368	64 154	84 563	

Source: Australian Bureau of Statistics.

TABLE 3  
CATTLE AND CALVES—Queensland Slaughtering

							'000
Year	Cattle	Calves	TOTAL	South Qld.	Central Qld.	North Qld.	
1968-69 ..	1 500	323	1 823	1 118	313	392	
1969-70 ..	1 405	275	1 680	1 072	266	342	
1970-71 ..	1 325	266	1 590	991	245	355	
1971-72 ..	1 457	252	1 708	1 054	260	395	
1972-73 ..	1 676	329	2 005	1 335	383	386	

Source: Australian Bureau of Statistics.

TABLE 4  
BEEF AND VEAL—Australian and Selected States Production  
(carcass weight)  
'000 tonnes

Year	Qld.	N.S.W.	Vic.	Australia
1968-69 .. ..	346.2	220.9	216.8	936.7
1969-70 .. ..	314.7	278.3	254.0	1 012.5
1970-71 .. ..	302.1	282.9	308.1	1 049.4
1971-72 .. ..	344.8	305.7	336.5	1 167.9
1972-73 .. ..	384.1	416.4	416.5	1 437.9

Source: Australian Bureau of Statistics.



In 1972-73, N.S.W. and Victoria overhauled Queensland in the quantity of beef and veal produced. This followed greater enterprise diversification to beef and more intensive production methods in the more favourable environment of the southern States. In these, a much greater percentage of land has been placed under improved pastures and this has resulted in higher stocking rates and earlier turn-off of cattle.

The gross value of production of beef and veal in Queensland in the five years 1968-69 to 1972-73 is shown in Table 5 together with the corresponding total gross value of rural production in Queensland. As stated earlier, gross value of production in 1972-73 was \$266.5m., 27.8% of total gross value of rural production for Queensland.

TABLE 5

GROSS VALUES—Beef Production and Total Rural Production in Queensland

\$m.

Year	Gross Values	
	Beef Production	Total Rural Production
1968-69 .. ..	216.0	785.0
1969-70 .. ..	216.2	723.6
1970-71 .. ..	179.3	691.6
1971-72 .. ..	203.5	807.6
1972-73 .. ..	266.5	959.6

Source: Australian Bureau of Statistics

An important feature in the rapid expansion of the beef industry has been the continuing development of the beef-roads network. These good quality, all-weather roads, strategically placed in beef-producing areas, allow road trains to move cattle rapidly over long distances to rail-heads and markets. This enables younger turn-off of stock, avoids loss of condition in transit and provides for rapid agistment in times of drought.

## MARKETING

Marketing beef in Queensland and Australia is basically private enterprise, with a minimum of intervention and direction from Government authorities.

## Selling livestock

Most cattle in Queensland are reared and turned off for market from the same property on which they were born such as in coastal, central and southern regions.

However, in some of the less favourable regions, for example, the far west and the Peninsula, there is more emphasis on breeding cattle and rearing them to 'store' condition. They are then sold to graziers in areas better suited to fattening the cattle to final market condition.

Once the grazier has fattened his cattle to the age and weight requirements of the particular type of market he is supplying, he then has several avenues through which he can dispose of his fat cattle.

These are—

**AUCTION SALES.** The sale of cattle through a supervised saleyard by an auction system is the usual method by which the producer sells his stock. Along with larger saleyards adjoining, or not far removed from the major abattoirs in Queensland, smaller saleyards exist in most provincial centres in cattle producing areas.

Buyers at the auction may be representatives of processing organizations handling large quantities of meat for local and export markets, or they may be local butchers requiring only two or three beasts at a time.

Auctions are open to all interested parties. Bids are made for the whole animal, usually on the basis of visual appraisal by experienced buyers. A tendency in recent years, especially in southern markets, has been towards the installation of cattle scales or weighbridges which largely eliminate the guesswork, so that auctions can proceed on the basis of an exact liveweight.

The highest bidder normally acquires the animal unless the producer has stipulated a reserve price which the bid must reach or exceed.

Cannon Hill in Brisbane has the major saleyards in Queensland and usually acts as a barometer of prices for the rest of the State. Bids received are translated by livestock brokers into estimated dressed weight equivalents per kilogram, as this facilitates comparisons of price levels between different grades



of cattle and different selling centres. Average bullock prices over the last 10 years at Cannon Hill are shown in Table 6.

TABLE 6  
CANNON HILL SALEYARD—Average Annual Prices for  
Bullocks—1st and 2nd Export Quality—Estimated  
Dressed Weight

Year	Average Bullock Price Cents/kilogram
1963-64	40.0
1964-65	44.3
1965-66	52.3
1966-67	56.1
1967-68	57.3
1968-69	58.3
1969-70	60.3
1970-71	65.0
1971-72	65.9
1972-73	77.6

Source: Australian Meat Board

**NEGOTIATED PADDOCK SALES.** The producer may sell his cattle direct to a buyer while they are still on the farm. In this case, the price is negotiated between the two parties after inspection on the property.

This method is not greatly used as it is not always possible for a producer to seek out a buyer who wants exactly the producer's number and type of cattle at the time he wants to sell.

**WEIGHT AND GRADE.** Under this system, the producer has his cattle slaughtered on his own behalf, usually at a public abattoir. He then sells his meat 'on the hook' by the reasonably objective criteria of weight and grade of the carcass.

This method also is not greatly used.

### Abattoir operations

Once fat cattle have left the fattening areas, they are usually destined for processing through an abattoir. There are 31 abattoirs in Queensland, of which 26 are privately owned. These abattoirs are widely dispersed, mainly along the coastal regions and in their hinterlands, with a concentration in the south-east corner of the State.

The operations of the abattoirs are subject to certain controls under the *Meat Industry Act 1965-1973*. Under this Act, all meat slaughtered for consumption in Queensland is subject to inspection by meat inspectors of the Department of Primary Industries who check on standards of hygiene and disease-free condition of the cattle.

A full-time ante-mortem and post-mortem inspection service is maintained at all major abattoirs by State and/or Commonwealth meat inspectors. It is not practicable to maintain a full-time service at smaller country slaughter houses but these establishments must still be licensed, and are subject to periodic inspection by State inspectors.

Abattoirs are also required to meet minimum structural standards.

### Queensland Meat Industry Authority

The Queensland Meat Industry Authority (Q.M.I.A.) was set up under the *Meat Industry Act* in 1965. It is a statutory body with representatives from all sections of the meat industry, and has the broad directive to advise the Minister for Primary Industries on matters related to the meat industry and to take all steps which are deemed necessary or desirable for 'the protection, preservation and expansion of the meat industry in Queensland in the public interest'.

More specifically, the Q.M.I.A. is concerned with the provision, direction and administration of district and public abattoirs in the State. Several public and district abattoir areas have been prescribed under the Act to cover the provision of meat to the main areas of population. Seven areas have been declared. They are—

- The Metropolitan Public Abattoir Area which covers Brisbane
- Toowoomba Public Abattoir Area; Bundaberg Public Abattoir Area
- Ipswich District Abattoir Area; Mackay District Abattoir Area
- Rockhampton District Abattoir Area.
- Townsville District Abattoir Area.

Slaughtering for local consumption within each of these areas are controlled by a Board which operates publicly-owned abattoirs or private abattoirs licensed to operate as public meatworks. Such boards also conduct saleyards and public meat markets.

To help achieve healthy competition and efficient hygienic provision of meat to consumers, the Q.M.I.A. can regulate supply of meat within and movement into Abattoir Areas. Furthermore, butcher-shops within a declared Abattoir Area must obtain their supplies from the public abattoir.



However, the Minister for Primary Industries, on the recommendation of the Q.M.I.A., may grant 'consents' to operators at public abattoirs to introduce meat to their Abattoir Area from approved outside abattoirs to balance supply and demand.

A major objective of the Q.M.I.A. has been to centralize slaughterings in large efficient hygienically supervised abattoirs, gradually phasing out the smaller country slaughterhouses where it is difficult to supervise and maintain hygienic standards.

### **Local consumption**

In 1972-73, only 16.3% of Queensland's production of beef and veal entered the local market.

Most of this meat is processed through public abattoirs on behalf of wholesalers, or operators, who pay a service fee to the abattoirs to have their cattle slaughtered and dressed. The carcasses are sold to butchers, usually at public meat markets attached to the abattoirs. Some meat from export abattoirs also enters the local trade depending on location and market circumstances prevailing at the time.

The meat is then despatched to the individual butcher-shops or supermarkets where it is cut by the butcher into the individual cuts of meat desired by his customers. These shops retail meat to local consumers in normal over-the-counter sales.

All retail meat outlets and vehicles delivering meat to them are required to meet prescribed standards of hygiene and construction, and are subject to inspection under the Meat Industry Act.

Meat retailing in Queensland and Australia is characterized by a large number of proprietary butcher-shops which actively compete with one another. Retail price levels are determined solely by competitive pressures between these shops and by the demand and supply situation at any given time.

Per capita consumption of beef and veal in Australia in recent years has been relatively static at about 41 kg per annum.

### **Export marketing**

The spectacular growth which occurred in the Queensland beef industry in recent years was export-oriented. For this reason, the beef

industry has come to depend increasingly on overseas markets for the disposal of its growing surplus production.

In 1972-73, 83.7% of Queensland beef and veal production was exported compared with 65.6% in 1962-63.

Queensland's export beef is mainly processed through private export-oriented abattoirs where inspection of meat is carried out by Commonwealth meat inspectors who ensure that the high standard of hygiene set by overseas markets is complied with. However, public abattoirs such as Cannon Hill in Brisbane also produce significant quantities of export beef.

Most of Queensland's beef is exported in a boneless form. At the export abattoir, the bones, excess fat and other parts of the carcass not wanted by the export trade are removed and used in the production of fertilizer, stock-feeds, tallow and other by-products. The boneless meat is placed into cartons using different packaging methods depending upon the requirements of the market being serviced.

A large proportion is wrapped in plastic materials and packed as 'primal cuts' such as rumps, striploins and silversides, or in blocks of boneless manufacturing meat for hamburgers and sausages. The meat is then frozen and, once it is packed in cartons, it can be easily stacked and handled.

A recent trend was the rapid development of the chilled beef trade, especially with Japan. In this, quality table meat is kept at temperatures just above freezing which allows the meat to arrive at its destination in choice condition. However, the time limit from slaughter to consumer's table is between 6 and 8 weeks. This demands fast, efficient transit and marketing. For this reason, the trade has mainly developed with markets such as Japan which are relatively close to Queensland.

Another marketing trend has been the growing usage of refrigerated containers. These easily transportable units hold 12 to 15 tonnes of carton meat and have made great economies in the handling and distribution of export meat.

### **Australian Meat Board**

The Australian meat export industry is directed and influenced, and its long-term interests safeguarded, by a Commonwealth



statutory body called the Australian Meat Board (A.M.B.). The A.M.B. was reconstituted in 1964 into its present form and consists of representatives of meat producers, exporters and the Commonwealth Government.

The A.M.B. does not intervene directly into the export marketing of beef as this is mainly organized on a trader-to-trader basis between private exporters and importers according to market pressures. However, it does have an indirect influence through a system of licensing and the administration of various schemes such as the Diversification Scheme.

**LICENSING.** All meat exporters must be licensed with the A.M.B., and licenses are issued subject to satisfactory performance of export activities. Different licences are issued specifying the types of meat an exporter may handle and the destinations to which he may ship.

**DIVERSIFICATION SCHEME.** The U.S.A. has for a number of years been Australia's largest and most lucrative market. However, to protect its domestic beef industry, the U.S. administration may introduce quantitative restrictions in the form of import quotas when the volume of imports reaches a certain 'trigger point'.

For this reason, from 1968 to March 1973, the A.M.B. restricted exports to the U.S.A. through the diversification scheme. Under this scheme, to earn an entitlement to export to the U.S., exporters had to supply a certain quantity of meat to other markets. This arrangement achieved two objectives. Firstly, it limited Australian exports to the U.S. and, secondly, it achieved a diversification of outlets resulting in the development of a number of significant new markets.

A large part of the A.M.B.'s activities is concerned with promotion which it conducts in various overseas markets, especially Japan, through its network of overseas representatives. Promotion is also conducted on the domestic Australian market.

The A.M.B. is involved in conducting and sponsoring research into a wide range of problems within the meat industry. It is also involved with other matters related to the meat industry such as the National Beef Recording Scheme, beef carcass classification and travelling scholarships.

The activities of the A.M.B. are financed by a levy on cattle, sheep and lambs slaughtered in Australia.

### Overseas markets

Australia is one of the few countries in the world which has a large surplus of meat. In 1972-73, it was the largest exporter of meat in the world, supplying more than 60 countries. Beef and veal made up the greater proportion of these exports. Queensland is the major beef exporting State in the Commonwealth and in 1972-73 accounted for 36.8% of Australia's exports of beef and veal.

Demand for Australia's beef has been very strong in recent times with an apparent shortfall in world production for a number of years, at least up to the end of 1973. This strong demand led to very attractive prices for cattle which encouraged expansion and production in Queensland and Australia to satisfy these overseas markets.

A few markets dominate this trade, namely the U.S.A., Japan and the United Kingdom which, together, accounted for 86.3% of Australia's sales in 1972-73. (See Table 7.)

TABLE 7  
AUSTRALIAN EXPORTS—Frozen and Chilled Beef and Veal Exports to Principal Destinations  
(Shipped Weight)

Destination	Tonnes				
	1968-69	1969-70	1970-71	1971-72	1972-73
U.S.A. .. .. .	214 031	234 873	207 613	262 294	308 130
Japan .. .. .	14 898	16 537	30 246	45 436	86 507
U.K. .. .. .	14 450	27 861	31 144	42 321	102 302
E.E.C. (excluding U.K.) ..	118	561	1 044	1 505	7 642
Canada .. .. .	9 761	25 693	21 686	20 951	27 566
Other .. .. .	13 658	30 509	42 907	32 979	43 630
<b>TOTAL .. .. .</b>	<b>266 916</b>	<b>336 034</b>	<b>334 640</b>	<b>405 486</b>	<b>575 777</b>

Source: Australian Meat Board.



**U.S.A. MARKET.** The U.S.A. is the largest market and accounted for 53.5% of Australia's sales in 1972-73. The beef shipped to this market is mainly frozen, boneless, manufacturing beef intended for use in hamburgers and sausages.

Exports to this market have risen very strongly and increased by 85.5% between 1965-66 and 1972-73. This rate of increase would have been greater except that there was a danger of Australia's exports contravening the U.S.A. Meat Import Law designed to protect their domestic beef industry. For this reason, the A.M.B. introduced the diversification scheme in 1968 designed to regulate export to the U.S.A.

This scheme successfully limited exports to the U.S.A. However, in 1972, the U.S.A. administration lifted all import restrictions, and requested that all supplying countries provide as much meat as possible to help overcome a domestic meat shortage. Consequently, the A.M.B. has suspended the diversification scheme since March 1973.

**JAPANESE MARKET.** This market has shown spectacular growth over the last 10 years with shipments of beef and veal to Japan increasing twenty-fold between 1962-63 and 1972-73 so that, in 1972-73, Japan was Australia's second largest market for meat.

Australia dominates Japan's imports of beef and veal with approximately half of Australia's supplies coming from Queensland. Imports to this market are controlled by a Japanese government organization called the Livestock Industry Promotion Corporation (L.I.P.C.). The L.I.P.C. issues a global import quota based on what it regards as domestic requirements and the ability of exporting countries to supply. In recent times, Australia has supplied between 80 and 90% of this quota.

The A.M.B. has been heavily involved in promoting and advertising in Japan, and this has resulted in widespread recognition and interest in Australian beef in that country.

Chilled beef is especially suitable for the quality table meat market and accounted for 29.8% of Australia's shipments to Japan in 1972-73.

**U.K. AND E.E.C. MARKETS.** The U.K. for much of this century has been Australia's main customer for beef with various agreements between the two countries covering delivery of meat to that market. In recent years, however, the U.K. has not demonstrated the strong steady growth evidenced on such markets as the U.S.A. and Japan, and has fallen behind these two outlets.

In early 1973, Britain entered the E.E.C. and must now adopt the common agricultural policy and common external tariff structure of the community. Such changes are likely to be adverse to Australia's future prospects of supplying this market, although it should be noted that exports of beef to the E.E.C. in general have increased strongly over the last few years.

### **Current and future prospects**

Towards the end of 1973, demand from overseas markets for Australian beef levelled off and then weakened alarmingly during the first half of 1974, resulting in greatly decreased exports and a large fall in prices received by the meat industry.

A number of factors have led to this depressed demand. These include a domestic meat glut in the U.S.A. following a price freeze in 1973; unfavourable exchange rate variations of the Australian dollar; a world-wide adverse consumer reaction to the high meat prices of 1973; general government and private restraint in the face of uncertain economic conditions and balance-of-payments difficulties, especially in Japan and Europe, and increased production and protection of domestic beef industries in most countries which Australia supplies.

However, the underlying long-term demand-supply relationships which led to prosperity for the beef industry in recent years continue to apply.

In the long term, the Queensland beef industry should continue to grow strongly and remain a mainstay of the Queensland economy.

(Received for publication July 1974).



# Stock Fund aids animal disease control

by Officers of the Division  
of Animal Industry.

EACH year by 31 January, stock owners throughout Queensland are required to submit a return showing the number of stock owned by them on 1 January and to pay an assessment on them.

The reasons for this requirement are not always clear to owners and consequently some pay only with reluctance. An explanation of the history of stock assessments and the use to which they are put may help in understanding the reasons for this system.

Levying assessments is an old practice and goes back to the days before Queensland separated from New South Wales in 1859. The payment of assessments on sheep under Queensland legislation began in 1860 and on horses and cattle in 1872. However, payment on pigs was not introduced until 1953.

## Finance for disease control

The money collected in assessments is used to finance disease control and husbandry services to the major livestock industries. There is thus a direct return to the stock-owner from the amount he pays in assessments. These are paid into the Stock Fund where they attract a \$2 Treasury subsidy for every \$1 paid by stock-owners. It will be seen therefore that the public still contribute for the major part of the service provided.

Originally, the Stock Fund was used only for financing disease control activities and investigations, but some years ago its purpose

was widened to cover the work of all animal husbandry branches as well.

The major items of expenditure in disease control are—

- Investigating and controlling the diseases of all classes of livestock.
- Inspecting, treating and controlling travelling stock to prevent the spread of disease.
- Constructing and maintaining cattle dips at strategic centres so that stock can be moved from tick-infested to tick-free areas without fear of spread.

These activities are the responsibility of the Veterinary Services Branch staff who are located at strategic centres throughout the State.

## Research laboratories

The fund bears most of the costs incurred by the Department's two diagnostic and research laboratories, the Animal Research Institute, Yeerongpilly, and the Animal Health Station, Oonoonba, Townsville.

At these centres, infectious, nutritional and toxicological diseases of stock are investigated. This work involves examining thousands of specimens each year and adds greatly to the efficiency of the disease-control services.

The fund also supports the work of the husbandry branches which provide services to beef cattle, sheep and pig producers in the fields of breeding, feeding and management.

Performance testing and recording schemes are operating in the beef cattle and pig industries. With the use of objective measurement of fleeces, it is expected that a completely new approach can be made to selecting sheep.

Husbandry activities in the field are backed up by research conducted by the Husbandry Research Branch, which has its headquarters at the Animal Research Institute. The Husbandry Research Branch also makes use of field research stations working specifically on cattle at 'Brian Pastures' near Gayndah and 'Swan's Lagoon,' Millaroo, on sheep at the Toorak Field Research Station near Julia Creek, and the pastoral laboratory at Charleville.

Research on pigs is carried out at the Animal Husbandry Research Farm, Rocklea.



# Tobacco diseases and their control—1

THE number of diseases known to attack tobacco in Queensland has increased substantially in the years following the expansion and stabilization of the industry in the late 1950s and 1960s.

The most important of the newer diseases in north Queensland are the root and stem disorders known as black shank and bacterial wilt. In the tobacco growing areas of south-eastern Queensland a virus disease, tobacco vein banding, now commonly occurs.

Diseases such as blue mould, mosaic, frog-eye leaf spot and barn rots continue to be of major importance. In addition, several diseases generally cause minor damage.

Diseases may affect tobacco at any stage of development from the seedbed to the curing barn and storage. They may occur on the foliage or roots and stems.

## FOLIAGE DISEASES

### Blue mould

Blue Mould is a disease of the downy mildew type caused by the fungus *Peronospora hyoscyami*. It has been shown that two strains of the fungus exist in Queensland. In south-eastern Queensland, both strains have been present for many years. In north Queensland, the second strain was first recorded in 1972. Blue mould is a serious disease in all areas.

### Symptoms

**IN THE SEEDBED.** On small seedlings, infected cotyledons lose their normal green colour, and a grey or purplish down soon develops. When larger seedlings are infected, a yellowing or chlorosis of infected leaves precedes the appearance of the characteristic downy mildew. The chlorosis may be accompanied by a slight wilting.



Blue mould. A close-up of a plant affected in the field.

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by R. G. O'BRIEN, Plant Pathologist.

The tissues of the stem are later invaded by the fungus, which generally penetrates from the diseased lower leaves. The brown, internal discoloration characteristic of stem infection is readily found when such plants are dissected. Stem-infected seedlings are unsuitable for transplanting as they remain stunted, with brittle stems which may be easily broken by wind or during cultivation.

**IN THE FIELD.** When blue mould infection originates in the field, the infected leaves initially show large yellow spots, with the usual purplish down on the underside. As these spots age, they become brown and the dead tissue eventually drops out, either in the field or during curing. Severely infected leaves usually yellow, wilt and die very quickly.

It is common in such leaves for the fungus to penetrate through the veins and midribs to the internal tissues of the stem. Plants that become stem-infected develop resistance and subsequent infections may take the form of smaller spots and flecks or leaf puckering and vein distortion. Stem infected plants may, however, develop other obvious symptoms. Lodging due to weakness of the stalk is the most serious feature of the stem mould phase of the disease. Wilting and one-sided growth are other characteristics.

### Sources of infection

In Queensland, the fungus persists from one season to the next on volunteer and stand-over plants. Volunteer plants originate from seed shed from untopped plants or from seeding suckers. The growth of such plants and subsequent blue mould development on them is generally best where there is a source of water during the dry, winter period.

In south Queensland frost determines the survival of volunteer plants to a large degree. Conditions for growth are particularly favourable when irrigated small crops or field crops such as peanuts or maize follow a tobacco crop.

The blue mould fungus also infects capsicum and tree tobacco (*Nicotiana glauca*) and these plants must be considered as possible sources of inoculum.

It is possible that tobacco blue mould is seed-borne, the spores being carried either on the seed coat or on the capsule remnants invariably present in a dirty seed sample.

### Spread in the field

Blue mould is spread by spores which are borne in enormous numbers on the surface of an affected leaf, usually the lower surface. These spores and the minute branched structures which bear them compose the purplish down from which the disease derives its name.

The spores are produced when the relative humidity of the atmosphere is very high. Such conditions most often prevail during the early hours of the morning. As the atmosphere becomes drier, spores are shed and become airborne.

In north Queensland most are released between 7 a.m. and 11 a.m. In addition, they may also be dislodged by mechanical shock such as the jarring of a leaf by raindrops. The spores are carried in air currents but may also be transported on the bodies of insects, such as the moths of the tobacco leaf miner, or on the bodies or clothing of persons moving among tobacco crops.

The dispersal of airborne spores from any of the sources of infection mentioned results in scattered infections in previously disease-free fields. These initial infections are not always obvious and are frequently overlooked by growers. Subsequent spread within a field may result in all plants becoming infected within a period of four weeks.

This spread of mould from plant to plant may, and commonly does, take place in the absence of rainfall. Cool nights and heavy dews enable the fungus to multiply and spread. Severe outbreaks of the disease in which much of the leaf surface is affected are, however, associated with wet weather in the form of either storms or drizzly rain.

### Control

**DESTRUCTION OF SOURCES OF INOCULUM.** Since most infection originates from volunteer and stand-over tobacco plants, the destruction



of this source of infection is an essential part of a district control programme. To be effective, these plants should be eradicated throughout the district at the same time. *The Tobacco Industry Protection Act of 1965* specifies for each tobacco growing area the period during which tobacco must not be sown or transplanted.

These are—

1. Northern Region (Mareeba-Dimbulah, Ingham, from 1 November until 31 March of the following year.
2. Burdekin district, from 1 December until 1 June of the following year.
3. Bundaberg district, from 1 December until 1 July of the following year.
4. South-east district (Caboolture, Landsborough), from 1 January until 1 June of the same year.
5. Inglewood district, from 15 January until 1 August of the same year.

Legislation exists which authorizes inspectors to order the destruction of crops transplanted during the prohibited period and any crop residues.

**SEEDBED MANAGEMENT.** As blue mould may be seed-borne, it is necessary that only seed which has been treated with silver nitrate should be used. Such seed is produced by the Department of Primary Industries and is distributed by the Tobacco Growers' Co-operative Associations in north and south Queensland.

Fumigation of seedbeds with benzol vapour under gas-tight plastic or metal covers is the standard method used to prevent seedbed blue mould. Plastic covers are supported above the bed either on wires running the length of the bed or on iron hoops placed across the bed at approximately 1.5-metre intervals. Metal covers are made of galvanized iron and have dimensions of 3 m x 1.2 m x 0.3 m. A satisfactory seal is obtained by placing soil on the edge of the cover.

In north Queensland, the beds are enclosed overnight from 4.15 p.m. to approximately 6.30 a.m. During periods of cool, overcast

weather, the beds may be covered up to one hour earlier, that is, 3.15 p.m. In south Queensland, covering is generally delayed until 5.15 p.m. or later, depending on temperatures.

The benzol is evaporated from galvanized iron containers supported on stands at a height of approximately 15 cm above ground level. An adequate concentration of benzol vapour is obtained when a ratio of 70 cm<sup>2</sup> evaporating surface area to 1 m<sup>2</sup> seedbed surface area is maintained.

In practice, for a standard 1.2 m wide seedbed, one evaporating tray 13 cm x 10 cm x 5 cm should be used for each 1.5 m of seedbed. The trays should be evenly spaced along the centre line of the bed. A quantity of approximately 150 ml of benzol is needed for each tray and some liquid benzol should remain in the morning when the covers are removed.

Benzol treatment must begin approximately 10 days after the seed has germinated and continued until transplanting. It is desirable for all seedlings to be fumigated on the eve of transplanting. In Queensland, benzol treatment should be applied to each seedbed at least every third night. Seedlings should be dry when the treatment is applied because water lessens the efficiency of benzol vapour.

With reasonable care, plastic covers will be serviceable for at least two seasons. Since a gas-tight cover is required, they should be inspected regularly for cuts and holes. Damaged covers can be repaired with water resistant adhesive tape.

### Cultural practices

The intensity of blue mould in a field can be affected by factors apart from the weather, the chief of which is row direction. It has been found that the disease caused more loss where the rows were planted in an east-west direction, probably because one plant is shaded by its neighbour.

To date, there is no evidence that withholding irrigation water from tobacco reduces blue mould damage. In fact, the extension of the growing period resulting from this practice appears to contribute to losses from lodging due to stem mould infection.

## Protection of field plants

Several fungicides are now available to protect tobacco plants in the field against blue mould. The following points are considered important in using these fungicides.

**WHEN TO APPLY FUNGICIDES.** The first application should be made 7 days after transplanting. Regular applications after this are necessary to protect new growth and maintain a cover on older leaves. A spray interval of 7 days is recommended.

During periods of cloudy, overcast weather, the spray interval should be shortened to 5 days. The final spray application is made 7 to 10 days before the first harvest.

**METHOD OF APPLYING FUNGICIDES.** The most satisfactory equipment is the boom spray rig with droppers, fixed to a high clearance machine such as a 'Tricrop'. This may be used for all spray applications, although some growers prefer a single row spray rig attached to the front of a tractor when the crop is very small.

An offset boom with droppers will also be satisfactory on flat land but will give an uneven spray pattern on contoured or hilly farms. Boom sprays without droppers and tractor-drawn misting machines are not recommended as the leaf coverage provided by these units is poor.

Nozzle placement is important in obtaining maximum coverage. Two nozzles are placed over the row. The lowest nozzles on the droppers should be at ground level. As the plants grow taller, a second set of nozzles is placed above these at a distance equal to one-third of the height of the plant. If the crop develops to a height of 1.8 m, a third set should be added. Spray pressure in the range 400 to 700 kPa is adequate.

Plants should be sprayed only when leaves are not drooping. The early morning is best.

**SPRAY VOLUME AND DOSAGE OF FUNGICIDE.** The volume of liquid delivered by a spray rig depends upon the size and number of nozzles, spray pressure and speed of the machine. It must be increased as the plants grow.

By careful placement of nozzles, a high standard of leaf coverage may be achieved with volumes of 700 litres per ha applied to a full-grown crop. The spray volumes shown in Table 1 provide an indication of volumes required at different stages of crop growth.

The dosages of fungicides shown in Table 1 are the minimum quantities required to control blue mould when applied through an efficient spray rig. Growers should calculate their total fungicide requirements for each spray application from the dosage column. This should then be divided into equal amounts according to the number of tankfuls of spray required to cover the whole crop.

TABLE 1  
FUNGICIDE APPLICATION RATES

Age of Plants (weeks)	Suggested Spray Volume (litres/ha)	Minimum Dosage* of Fungicide (kg/ha)		
		maneb, mancozeb mezineb	metiram	zineb
1-3	180	0.56	0.62	1.05
4	250	0.80	0.90	1.50
5	450	1.40	1.58	2.60
6	600	1.90	2.14	3.56
Over 6	700	2.25	2.53	4.22

\* Quantities of fungicide apply to preparations containing the following levels of active ingredients: maneb 80%, mancozeb 80%, mezineb 70%, metiram 80%, zineb 65%.



## Resistant varieties

Tobacco cultivars with resistance to one strain of the blue mould fungus (*Peronospora hyoscyami* f. sp. *tabacina*) have been available in Queensland since 1969. Sirone was released in 1969 and C.S.I.R.O.-40 T in 1972. In north Queensland these remained free from blue mould until the 1972-73 season when a second strain (*Peronospora hyoscyami* f. sp. *hybrida*) of the blue mould fungus developed in the area. This strain, which reappeared in the 1973-74 season, is capable of causing severe losses through leaf mould and stem mould.

Growers in north Queensland who plant these cultivars should follow a regular fungicidal spray programme. In south Queensland, *Peronospora hyoscyami* f. sp. *hybrida* has been present for many years. In this district, growers must also use regular applications of fungicides.

Plant breeders are developing cultivars with field resistance to both known strains of blue mould.



Frog-eye leaf spot on a leaf in the field.

## Frog-eye leaf spot

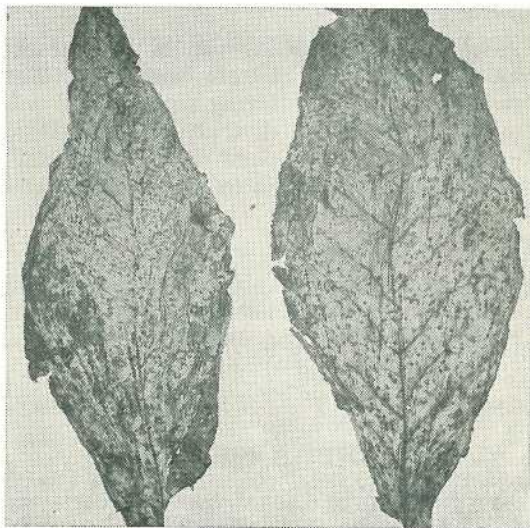
This disease is caused by a fungus, *Cercospora nicotianae*. In Queensland, it is commonly found in late planted crops in the northern districts and in rain-grown crops at Miriam Vale and Bundaberg. Its importance in northern Queensland has declined markedly since irrigation allowed crops to be grown outside the wet season.

## Symptoms

The spots show first on the lower leaves of seedlings or field plants. They are small, roughly circular, brown areas but, if only a few spots are present on a leaf, they are usually larger (up to 15 mm diameter) and more definitely rounded.

The centres of the spots bleach as they age to give the typical frog-eye appearance with a band of dark-brown surrounding a light-brown or grey centre. The minute spores of the fungus are produced towards the centre of each spot.

The fungus infects young leaves but the spots do not become visible until the leaves mature.



Frog-eye leaf spot—the barn spot phase.



As the plant ages, the disease moves upwards and eventually the tip leaves and the inflorescence may become spotted.

One aspect of this disease which sometimes puzzles growers is the development during curing of dark brown, irregular spots which develop on apparently healthy leaves. This is known as the barn spot phase of the disease. During the early stages of curing, temperatures and humidity are very favourable for fungus growth.

In addition, during the colouring process, certain physiological changes take place in the leaf which make it much more susceptible to disease development. The result is that incipient or very young infections in the green leaf develop rapidly.

By the time the temperature is high enough to inhibit or kill the fungus, the areas invaded have enlarged considerably and are seen as the dark brown spots.

### Sources and spread

Frog-eye may be carried over from one season to the next by means of contaminated seed or tobacco trash. Its development in seedbeds and field is favoured by hot humid weather.

### Control

All seed before sowing should be surface-sterilized with silver nitrate solution. The normal practice of sterilizing seedbed soil will eliminate any infection that may originate from diseased tobacco plant debris in the soil. Care must also be taken to avoid contaminating seedbeds with diseased leaves from barns, bulk sheds or fields.

The fungicide spray programme mentioned earlier for the control of blue mould will also limit the severity of frog-eye leaf spot.

## Brown spot

The causal organism of brown spot is the fungus *Alternaria alternata*. This disease is rarely of importance in Queensland. It is



Brown spot.

most likely to be found in late-planted crops in north Queensland and during warm wet periods in south Queensland.

### Symptoms

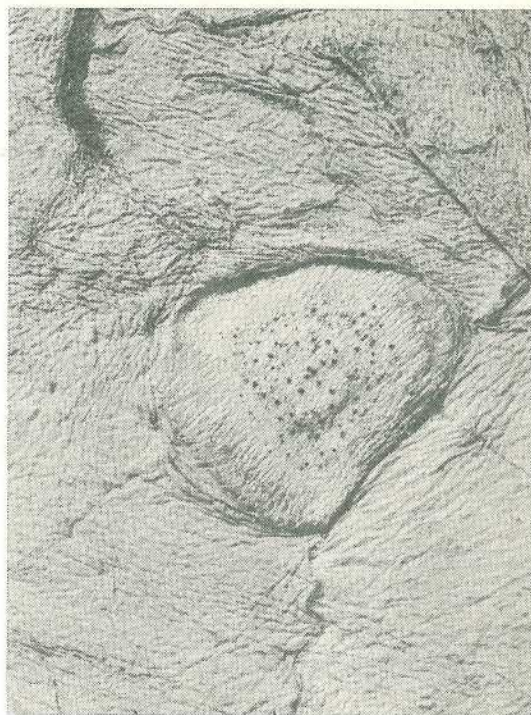
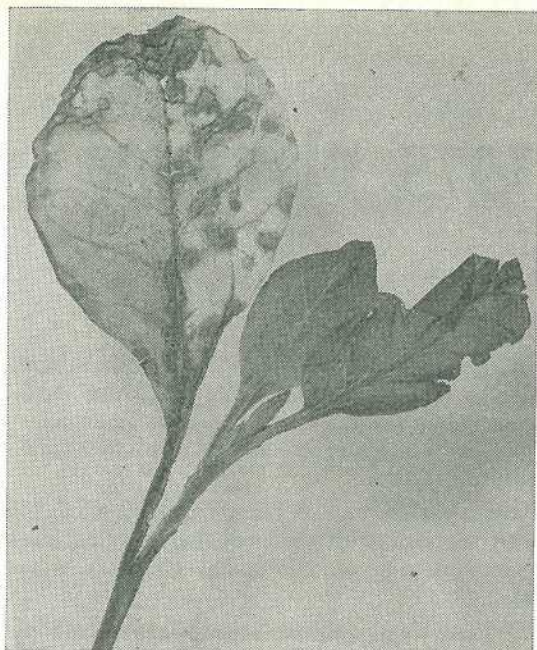
Brown spot lesions first appear on the lower, older leaves as small, circular, dark brown spots. As these enlarge they typically show concentric markings. These concentric markings and the dark-brown colour of the spots serve to distinguish them from frog-eye lesions.

Stem lesions can also be found developing from leaf scars. These are also dark brown in colour with concentric markings.

### Control

The disease is more likely to become a problem in crops which suffer a set-back of some kind. Growers should try to promote





*Ascochyta* leaf spot (left) and a close-up of a spot showing the small, black fruiting bodies (above).

steady crop growth by fertilizing and irrigating correctly.

The fungicidal programme recommended for the control of blue mould will also limit the development of brown spot.

### **Ascochyta leaf spot**

The causal fungus is *Ascochyta arida*. The disease is restricted in occurrence to the southern border area near Inglewood.

#### **Symptoms**

*Ascochyta* leaf spot is first seen as individual spots ranging in size from a pinhead to 5 mm in diameter. They have a translucent, greasy appearance but later expand and change to brown dead areas with irregular margins.

Spots may coalesce to form dead patches 15 mm or more in diameter. The brown centre

dries out and later turns ashy grey. Small, black fungal bodies are visible in the centre of the spots on close examination.

*Ascochyta* leaf spot is a disease of both seedlings and field plants. Field infections arise generally from planting seedlings showing infection in the seedbed.

#### **Control**

The causal fungus persists on standover tobacco crops and builds up on suckers arising from these. The destruction of such plants will limit the importance of this disease.

Fungicidal control measures in seedbeds using chlorothalonil 0.2% as a weekly spray has given excellent control under experimental conditions.

[TO BE CONTINUED]

# Oats varieties for 1975 plantings

by Agriculture Branch Officers.

MOST of the 280 000 hectares of oats sown each year in Queensland are used for grazing. Less than 12% of this area is given over to seed, hay and silage production.

The main oats plantings are south of the Tropic of Capricorn.

Oats are usually classified according to their rate of growth as either 'quick' or 'slow' maturing types.

The varieties Bentland and Minhafer are examples of quick-maturing types which have an erect plant habit, and high early growth rate. These often present grazing management problems under normal seasonal conditions.

Algerian and Camellia, on the other hand, have a slower growth rate and are semi-prostrate in habit. They are usually easier to manage in a forage sequence than the quick-maturing types.

Five varieties have been recommended this year, together with varieties that may be sown if seed of the recommended varieties is not available.

Where this problem arises, farmers should contact their local Department of Primary Industries office or consult the table of oat varietal characteristics to determine a useful alternative.

District recommendations are given in order of preference. Fertilizer recommendations and any further information should be obtained from the local D.P.I. officer.

## DISTRICT RECOMMENDATIONS

District (Shires)	Planting Months	Varieties	Planting Rates kg/ha
East Moreton Caboolture, Pine Rivers, Albert, Beaudesert	April-May	Saia, Bentland, Minhafer, Camellia, Algerian	RAIN-GROWN 40-60 (Saia lower end of range)
	June	Saia, Bentland, Minhafer	IRRIGATED AND SOD-SEEDED 50-90 (Saia lower end of range)
West Moreton Kilcoy, Esk, Gatton, Laidley, Moreton, Boonah	March-April	Saia, Minhafer, Bentland, Algerian, Camellia	RAIN-GROWN 40-60 (Saia lower rate)
	May	Saia, Minhafer, Bentland	IRRIGATED AND SOD-SEEDED 50-90 (Saia lower)
Near North Coast Landsborough, Noosa, Maroochy, Widee, Tiaro, Kilkivan (part)	April-May	Saia, Bentland, Minhafer, Camellia, Algerian	RAIN-GROWN 40-60 (Saia lower end of range)
	June	Saia, Bentland, Minhafer	IRRIGATED AND SOD-SEEDED 50-90 (Saia lower end of range)



**DISTRICT RECOMMENDATIONS—continued**

District (Shires)	Planting Months	Varieties	Planting Rates kg/ha
<b>South Burnett</b> Kilkivan (part), Kingaroy, Murgon, Nanango, Wondai, Rosalie-Cooyar only	Feb.–June	Camellia, Algerian	40–50
	March–June	Minhafer, Bentland	
<b>Central and Upper Burnett</b> Biggenden, Gayndah, Mundub- bera, Perry, Eidsvold, Monto	Feb.–April	Camellia, Algerian	30–50
	March–June	Minhafer, Saia, Bentland	
<b>Coastal Burnett</b> Gooburrum, Isis, Kolan, Miriam Vale, Woongarra, Burrum, Woocoo (limited application)	March–June	Minhafer, Saia, Bentland	30–50
<b>Capricornia</b> CENTRAL COAST Broadsound, Calliope, Fitzroy, Livingstone, Mirani, Nebo, Pioneer, Proserpine, Sarina INLAND Banana, Duarina, Bauhinia, Belyando, Emerald, Peak Downs	March–April	Camellia	40–50
	April–May	Bentland, Minhafer	
	February	Algerian	20–40
	March–April and May–June	Camellia	
<b>Near South West</b> Tara, Murilla, Taroom  Bendmere, Bungil, Waroo, Booringa  Balonne, Waggamba	March–June	Minhafer, Bentland	25–30 (35–late planting)
	March–April and June–July	Camellia, Algerian	20–25 (30–late planting)
	HAY April–June	Minhafer, Bentland	20–25
	March–July	Minhafer, Bentland Camellia, Algerian	25 20–25
	HAY April–June	Minhafer, Bentland	(30–35 late sowings)
	March–July	Minhafer, Bentland Camellia	20–25 (30–35 late sowings)
	Feb.–March March–June July	Algerian, Camellia Camellia, Bentland, Minhafer Camellia, Bentland, Minhafer, Algerian	RAIN-GROWN 36–45 IRRIGATION 55–66 SOD-SEEDED up to 80

## CHARACTERISTICS OF OAT VARIETIES

Variety	Growth to Flowering	Early Plant Habit	Growth to First Grazing	Frost Tolerance	Rust Resistance		Seed Colour	Awns	Tillering Ability	Grain Yield
					Crown	Stem				
<b>Recommended Varieties</b>										
Algerian ..	Sl	Prostrate	Sl	Good	S	S	Brown	Fine X	Good	Fair
Camellia ..	Med-Sl	Semi-prst.	Med-Sl	V. good	Mod R	S	Yellow	Few fine	Good	Fair
Saia ..	Med-Sl	Semi-erect	Med	Poor	S	S	Black	Med	Fair	Poor
Bentland ..	Med-Sl	Erect	Q	Fair	S	S	Yellow	Few fine	Fair	Fair
Minhafer ..	Med-Sl	Erect	Q	Fair	Mod R	R	Cream	Few strong	Fair	Fair
<b>Others</b> May be sown when seed of above not available										
Avon ..	Med	Erect	Med	Poor	S	V.S.	Cream	Nil	Poor	Poor
Belar ..	Med	Semi-erect	Med	Fair	S	S	Lt. brown	Strong*	Good	Good
Benton ..	Med-Sl	Erect	Q	Fair	S	S	Yellow	Fine	Fair	Fair
Cooba ..	Sl	Prostrate	Sl	V. good	V.S.	S	Lt. brown	Nil	V. good	V. good
Coolabah ..	Med	Semi-erect	Med	Good	V.S.	S	Cream	Strong*	Good	Fair
Fulghum ..	Q-Med	Semi-erect	Med	Good	V.S.	S	Lt. brown	Nil	Fair	Good
Garry ..	Sl	Semi-erect	Q	Fair	Mod R	S	Yellow	Few strong*	Fair	Fair
Klein ..	Sl	Prostrate	Sl	V. good	Mod R	S	Lt. brown	Fine X	V. good	Poor
Lampton ..	Sl	Semi-erect	Med	Poor	S	S	Lt. brown	Strong	Fair	Fair
Landhafer ..	V. Sl	Semi-prst.	Med	Good	Mod R	S	Brown	Fine X	Good	Fair
Rodney ..	V. Sl	Erect	Q	Fair	Mod R	S	Cream	Few strong*	Fair	Fair
Santa Fe ..	Sl	Prostrate	Sl	Good	Mod R	S	Cream	Nil	Good	Poor
Swan ..	Q	Erect	Q	Fair	V.S.	V.S.	Lt. brown	Few strong*	Fair	Good
Trispernia ..	V. Sl	Prostrate	Sl	Good	Mod R	S	Brown	Strong*	Good	Poor
P8642 ..	Sl	Semi-erect	Sl	Fair	Mod R	R	Lt. brown	Strong*	Good	V. good

Sl = Slow; Med = Medium; Q = Quick; V.Sl = Very slow; S = Susceptible; V.S. = Very susceptible; R = Resistant; Mod R = Moderately resistant; X = Awns on both grains; \* Strong awns indicated by twisted black base.



# Rapid pregnancy diagnosis for sheep

BY merely palpating the abdomen of ewes, it is possible to tell whether or not an animal is pregnant. This diagnosis can be made during the last 1 or 2 months of pregnancy.

The speed of handling enables this technique to be used on large flocks. It is envisaged that a husbandry procedure of this type could be particularly valuable to producers running sheep under extensive or semi-extensive grazing conditions.

## Technique

No special restraining apparatus is used, the assistant merely holds the ewe in a sitting position resembling the belly-blow at shearing. The operator then presses one hand against the left side of the ewe's abdomen and palpates the lower abdominal area of the right side with the fingertips.

By pressing the fingers against the lower abdomen the lamb is felt as a floating body which is pushed away and then located as it returns to the fingertips of the palpating hand.

This procedure was adopted since most unborn lambs could be most easily located on the right side, presumably because the rumen contents tend to push the reproductive tract towards this position.

The presence of an unborn lamb can be detected during the last 2 months of pregnancy, and the ease of diagnosis increases as the stage of pregnancy advances. The body condition of the animal also influences the ease of palpation. Ewes in store condition are easier to diagnose than those in forward store condition.

Withholding feed and water for 12 to 24 hours before diagnosis increases the ease of

by M. S. PRATT and P. S. HOPKINS, Husbandry Research Branch.



*By pressing his fingers against the lower abdomen, the operator can feel the lamb as a floating body.*

this procedure when the animals are more forward in body condition. There is, however, a slight risk of pregnancy toxæmia under these circumstances.

The animals used in the study were 3 to 6 months off shears and variations in staple length did not markedly influence the ease of diagnosis.

### How accurate is diagnosis?

This procedure was 80% accurate when the ewes were 3 months pregnant, accuracies of 85% to 95% were consistently obtained during the last 6 weeks of pregnancy. The accuracy of the method was detected by follow-up observations using an ultra-sonic blood flow detector and/or lambing observations.

### Speed of operation

The major limitation to the speed of operation is the rate at which the assistants can catch and hold the ewes. An experienced operator can handle 200 sheep an hour.

The technique has many practical advantages. These are likely to be highlighted in commercial flocks running under extensive grazing conditions in which nutritional restrictions are likely to cause high death rates among pregnant and lactating ewes and their offspring.

Possible uses include—

**1. CULLING NON-PREGNANT EWES.** This would enable a grazier to run his pregnant animals in the most favourable paddocks and, if required, drought fodder need be provided only for the in-lamb ewes.

If pregnancy diagnosis were undertaken in flocks at a time when most of the ewes were 90 to 125 days pregnant, this would offer the operator a chance of attaining a high degree of accuracy, avoid handling near birth and give the producer ample time to adopt preferential management practices designed to minimize ewe and lamb death rates.

**2. TO INDICATE THE STAGES OF THE REPRODUCTIVE CYCLE WHERE LOSSES ARE OCCURRING.** This method would allow the grazier to determine the pregnancy rate of his flock and thereby expose the size of the reproductive losses occurring at joining or soon after. At the same time, the grazier could also calculate the extent of lamb losses by comparing the number of pregnant animals with the number of lambs marked. Appropriate management procedures could then be adopted in future years to concentrate on improving reproductive rates.

**3. TO INCREASE THE NUMBER OF LAMBS BORN.** Pregnancy diagnosis could be used to advantage where a grazier wished to rejoin the non-pregnant portion of his flock approximately 3 to 4 months after mating had begun.

**4. FOR CULLING BARREN EWES.** By applying pregnancy diagnosis as an annual management practice, non-pregnant ewes could be identified by tagging. If the same animals were again judged non-pregnant in the following year, they could be classified as barren and culled.

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## CHEESE MARKETING BOARD

THE Minister for Primary Industries (Hon. V. B. Sullivan, M.L.A.) has announced the election of the following persons for appointment as growers' representatives on the Cheese Marketing Board for the 3-year term commencing 1 January 1975.

Voting at the ballot resulted as follows:

Desmond James Booth	84 votes
George Thomas Douglas	84 votes
Charles Peter Davis	79 votes

The unsuccessful candidate, Mr. Ferguson, obtained 62 votes.

Mr. Sullivan added that Messrs. Booth and Davis are sitting members and Mr. Ferguson is the retiring sitting member.



# Animal waste disposal problems

by G. D. STEWART, Poultry Husbandry Officer.

INTENSIFICATION of stock husbandry over the last few years has generally led to improved efficiency within the livestock industries.

However, the problems created by disposal of waste from intensive production are fast outstripping many of the advantages gained from this type of farming.

Some of the problems facing the intensive livestock farmer because of the production of animal waste are: unsavoury odours, fly breeding, ground and underground water pollution, destruction of soil fertility through changing salt and pH structure, dust pollution, and even noise pollution.

Pollution can be defined as the result of a causative agent or agents which destroy the purity or outrage the sanctity of the particular eco-system under review.

With the demand on food supply increasing in a geometric progression similar to population growth, the pressures exerted on the food-stuff producers to produce more and more basic resource materials will continue to cause intensification of all forms of agriculture.

Under our present form of agriculture, this need for increased production will result in the increasing use of fertilizers, pesticides and weedicides, and an increase in animal waste production.

As the earth has a finite amount of land and perhaps more importantly a finite amount of arable land, the past system of dumping wastes, both agricultural and industrial, over the land

can no longer be tolerated unless the environment-waste interaction can be perpetuated in a way that will not lead to destruction of the environment.

The urgency of the situation can be realised when one considers that the 3 000 million population of the world in 1960 is expected to have grown to about 7 000 million by the year 2000.

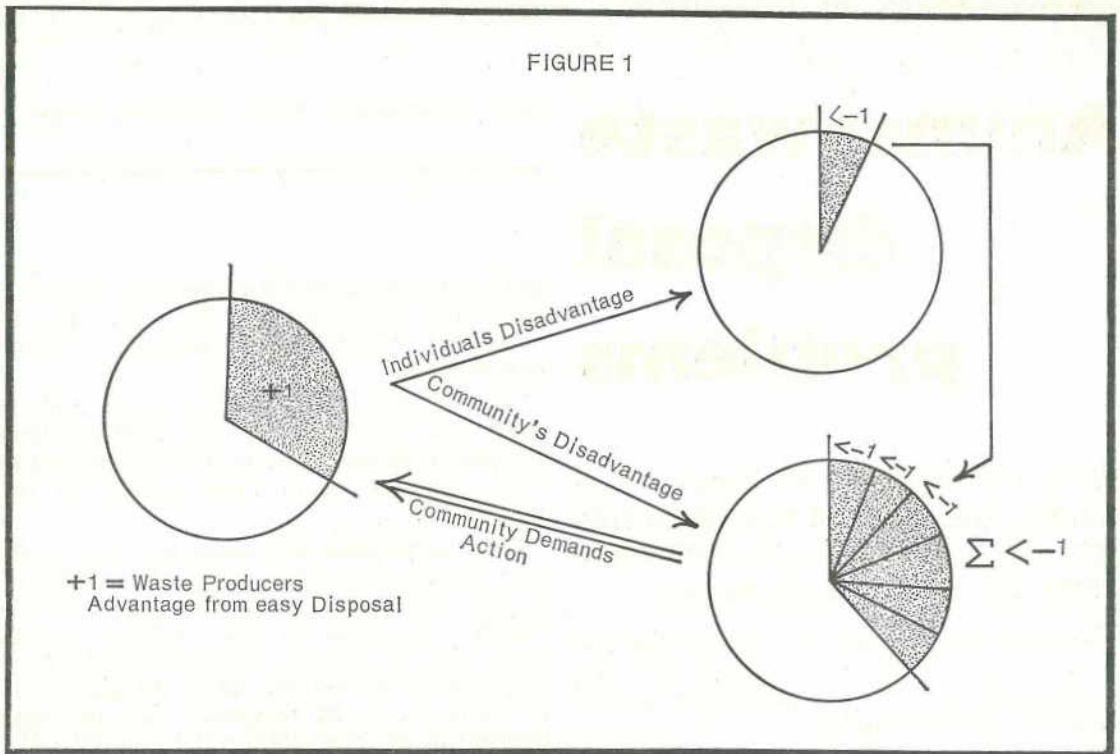
This population will mean that the world must produce more than twice the amount of food it is now producing. However, approximately two-thirds of the world's present population is already under-nourished or on the verge of starvation. So, if all the people on earth are to be adequately fed, the food demand by the year 2000 will be considerably more than twice the current production—perhaps four or five times present production would be closer to the mark.

One may well ask what this has to do with problems of intensive waste disposal. The crux of the matter is that, unless proper methods of waste disposal are adopted now and further developed with future agricultural intensification, our natural resources of land, water, and air will be down graded. This will eventually lead to a decrease in food production to a state where the world's population cannot be supported.

The old saying that 'matter cannot be created or destroyed' still holds, but the important concept is that it can be converted. Mankind throughout the ages has converted unusable resources to usable ones. This is the principle which must apply now to animal waste disposal.

It has been estimated that in the United States some 3 500 million tonnes of waste material are produced every year. Of this 2 000 million tonnes are the by-products of agriculture. The situation on a comparative basis in Australia is the same, but with a

FIGURE 1



greater percentage of agricultural waste to industrial waste.

Human nature being what it is tends to cause producers of waste to dispose of it in the manner which is of greatest convenience to them: often to the detriment of other people or the environment in general. It can be argued that, if the advantage for the waste producer to dispose of his product easily could be scored at plus 1, then the disadvantage of any one individual in the community which is affected would be significantly less than minus 1. This sort of reasoning has led to our present situation where it is not until the additive effects of all the less than minus 1s are greater than the waste producer's advantage that the community takes some firm action about the problem. (See Figure 1.)

In a responsible community situation, laws are made in an effort to prohibit individuals from overstepping the generally accepted code of living, so that all persons may live in reasonable harmony with others and maintain

the environment in which they live. Maintaining the environment is necessary if our descendants are to inherit anything of the world as we know it today.

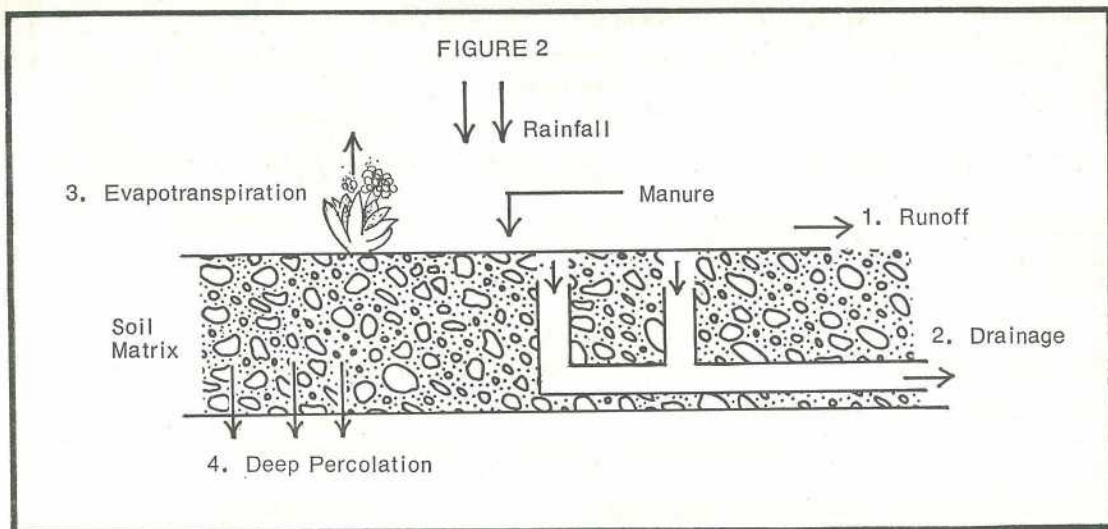
Waste producers in general have demonstrated clearly enough in the past that they will dispose of their wastes in the most convenient manner until such time as the community objects. This situation can be no longer tolerated if we are to maintain the environment in at least as good a condition as it is now.

### Environmental standards

As a result, local, State, and Federal authorities are now legislating for environmental standards to be maintained or improved when waste is dumped.

To be effective, legislation must be consistent from shire to shire and State to State. Advice from officers of the Department must be in accord with local, State and Federal legislation and a standard policy of pollution





guidelines needs to be formulated and distributed to all persons who are likely to require such information.

It is necessary to look at the aims of pollution control measures before a guideline policy can be adopted.

The Environmental Control Council of Queensland lists the following general requirements for waste disposal—

1. There must be no water pollution as defined by the Clean Waters Act.
2. There must be no nuisance from noise or smells.
3. There must be no risk to health from fly breeding.
4. There must be no damage to the land.
5. There must be compliance with town and regional plans and other legislation applying to land use.
6. Use of pesticides for insect control must be minimized.
7. Buildings and yards should not offend people who are not farmers.
8. Requirements should not unduly increase the cost of farm production and should be reasonably practicable.

Once the aims of pollution control are understood, the means of achieving them can be sought.

The intensive livestock industries which are causing the most concern at present are cattle, pigs, and poultry.

Animal waste consists of three main elements: water, organic compounds, and chemical nutrients.

It is generally assumed that soil can adequately degrade and assimilate the organic compounds as long as they are retained within the soil matrix for a sufficient length of time.

Losses may occur through four possible pathways, of which only one, evapotranspiration, hinders the transport of pollutants. The other pathways are: run-off, drainage, deep percolation.

Figure 2 shows the possible movement of rainfall on manure constituents on application to the land.

### Manure as fertilizer

When one considers the value of manure as a fertilizer, the three most important nutrients to consider are: nitrogen, phosphorus, and potassium.

The following table is designed to show some of the different characteristics representative of the various classes of wastes.

TABLE 1

	Beef Cattle	Pigs	Poultry Laying Hens
Daily Wet Waste Production/Animal/Day ..	36.0 kg (7-9% of 453 kg daily wt)	4.7 kg (5-9% of 68 kg body wt)	0.2 kg (10% of 2 kg body wt)
Moisture Content of fresh mixed manure (urine and faeces)	85%	82%	72%
N% Total Solids .. .. .	4.0%	5.6%	6.9%
P <sub>2</sub> O <sub>5</sub> % Total Solids .. .. .	1.1%	2.5%	4.6%
K% Total Solids .. .. .	1.71%	1.4%	2.1%

The differences in waste output and chemical composition for the various classes of stock has led to the development of the 'animal unit' classification. This system has been devised in an effort to reduce the chance of soil or ground water pollution given acreages of tillable land which are available for the spreading of animal wastes. The system has been developed in the United States and Canada. Tables 2 and 3 set out some of these recommendations.

TABLE 2

## ANIMAL UNITS BASED ON POLLUTION POTENTIAL

1 dairy cow	= 1 animal unit (365 days)
1 beef cow	= 1 animal unit (365 days)
2 beef steers	= 1 animal unit (365 days)
1 bull	= 1 animal unit (365 days)
10 market pigs	= 1 animal unit (175 days)
4 dry sows	= 1 animal unit (365 days)
1 horse	= 1 animal unit (365 days)
4 mature sheep	= 1 animal unit (365 days)
100 laying hens	= 1 animal unit (365 days)
1 000 broilers	= 1 animal unit (70 days)
300 pullets	= 1 animal unit (160 days)
300 turkey broilers	= 1 animal unit (85 days)

The suggested minimum land areas which should be available for manure spreading are shown in Table 3.

When considering the land spreading of manure especially in sludge form, overseas workers claim that certain factors should be taken into account.

TABLE 3

Number of animal units housed/ marketed per year (whichever is greater)	Minimum land area of site of new buildings for livestock or poultry production ha
Animal units or less 40 .. ..	16
Animal units	
41-60 .. ..	16
61-80 .. ..	16
81-100 .. ..	20
101-120 .. ..	24
121-140 .. ..	28
141-160 .. ..	32
161-180 .. ..	36
181-200 .. ..	40
201-220 .. ..	44
221-240 .. ..	48
241-260 .. ..	52
261-280 .. ..	56
281-300 .. ..	60
301-320 .. ..	64
321-340 .. ..	68
341-360 .. ..	72
361-380 .. ..	76
381-400 .. ..	80

Land-spreading should be avoided when the soil is saturated or when the soil temperature is below 4.5°C.

The spreading rate should at all times be lower than the instantaneous infiltration capacity of the soil, and the amount spread at any one time should not be such as to lead to degradation of soil structure through the formation of an impermeable cap.



The maximum amount of manure to be spread per hectare per annum should be decided by consideration of the permissible hydraulic and chemical loading of the soil concerned.

The maximum permissible chemical loading will be dictated by the crop or pasture type on which the manure is spread. The greatest loading rates are attained by intensive pasture production while cereals permit a much lower chemical loading rate.

The practice of spreading manure on sacrifice areas should be avoided because of the inherent danger of ground water pollution by the chemical nutrients supplied.

In planning a waste disposal programme based on land spreading, the following steps should be taken—

Estimate the maximum volume output of manure per animal space.

Obtain a chemical analysis of the nutrients in the manure.

Calculate the safe hydraulic loading of the soil to be used.

Estimate the quantities per hectare of nitrogen and potassium that will be removed in each crop or pasture upon which the manure is to be spread.

Collate these figures to ascertain the minimum land area required for the unit.

This type of calculation has led to the development of the 'animal unit' per land area concept described in Table 3.

In Australia, it has been said that it is cheaper to obtain nitrogen, phosphorus and potash from inorganic fertilizers than to spend time and money in removing manure and having the equipment to spread it over crops or pasture.

However, with the announced lifting of the subsidy on inorganic fertilizers for primary producers, coupled with the already expected price increase by the fertilizer manufacturers, farmers may take a much closer look at the use of animal waste as an economic source of plant nutrients.

The added advantage of animal waste as a fertilizer is that it supplies trace minerals for plant growth and organic matter to improve soil water holding capacity and soil structure.

Little is known about the effect under Queensland conditions, of land spreading manure in polluting soil, water and air.

If dry manure is spread by a machine which breaks up any clods and the spread area is immediately harrowed minimum air pollution from dust, odours and flies results.

Pollution of water by percolation depends on the soil type. However, many studies have shown that, in normal permeable soils, bacterial penetration does not usually exceed about 12 metres. Pollution by run-off is a problem and it is suggested that the minimum distance from a watercourse that manure should be spread is 100 metres.

Sunlight has a lethal effect, aside from that induced by drying, on organisms near the surface but not on those below.

In addition to the handling difficulties, it is becoming increasingly expensive to transport large quantities of used litter and manure from the production site to the dumping site. Hence the search for other methods of treatment and disposal.

Other methods of manure treatment are aerobic and anaerobic lagoons or ditches, thermal drying units, and composting methods.

## Ponding

The aerobic and anaerobic treatment units substantially decrease the amount of organic matter for disposal and reduce it to a form that is readily dispersed by irrigation. Evaporation can also decrease the volume of the material to be stored.

For correct functioning of ponds and ditches, it is advisable to have a fairly constant loading rather than intermittent loading as this can lead to malfunctioning of the system. The most common system of ponding employed in Queensland is a combination of aerobic and anaerobic ponds. The anaerobic pond allows the maximum breakdown before the effluent passes into the aerobic pond or ponds.

With the pond technique for breaking down manure, it is necessary economically to have a relatively large supply of cheap water.



## Composting

As far back as 1965, poultry litter was being successfully composted in the chicken house. The idea of inoculating poultry litter with selected micro-organisms is not new. These organisms are selected for the ability to break down urea, uric acid and other nitrogenous products in the excrement. This is the old story of conversion of usable raw materials into usable ones.

The litter, under the attack of the introduced micro-organisms, simultaneously loses moisture, nitrogen and other simple volatile compounds. The litter could therefore be kept dry, odour-free, and no substrate would be present to attract flies.

Re-use of the litter using inoculated compost as a stabilising factor is now common in many parts of the United States. This system is aerobic and water used to clean down the animal house is mixed in with the litter to initiate aerobic action. After the heat of composting has subsided, animals can be replaced on the litter.

## In-house fermentation

There has been some interest in deep pits for poultry houses. Under this system, a large concrete pit is constructed beneath the house so that the droppings fall directly into it. This type of treatment minimizes handling but it can cause severe odour problems. Studies have shown that birds subjected to this system may be confronted with an atmosphere relatively low in oxygen and high in ammonia, methane and carbon dioxide.

## Dehydration

Where only small areas of land are available for disposing of the waste at the production site, a system of dewatering or dehydration may be of value. In any operation which requires the removal of water from a product, the costs are high. However, if an assured market can be obtained for the dehydrated product, then the costs of production will be offset.

The demand for dried manure appears to be a seasonal one, especially in areas where very cold winters are experienced. Adequate storage facilities are costly to build and maintain. This emphasizes the need to establish a non-seasonal market for this type of product.

## Incineration

Burning should be regarded as a last resort as it not only destroys a potentially useful resource, but also has a high capital and operating cost. It can be a potential pollution hazard.

## Recycling

The recent shortages of protein sources have caused animal nutritionists to search for alternative sources of relatively cheap protein.

Research into recycling animal waste has been in progress for some years and the literature contains many reports on feeding waste back to livestock. The advantages of this system are evident as a continual recycling programme reduced the potential pollution and disposal problem.

This system, which is known as coprophagous nutrition, is now a fact. However, the aesthetic aspects of the situation have caused some controversy. Some of the more important problems with this system are—

1. Should the product be sterilized before recycling to avoid *Salmonella* contamination?
2. What levels of antibiotics are present?
3. What levels of copper are present especially in pig effluent?

For efficient use of animal waste as a feed ingredient, it should be used as soon as possible after it is produced because nitrogen is lost through the release of ammonia.

The value of dried poultry waste as a feed ingredient can be judged from the following figures:

Crude protein range	=	3-30%
Metabolizable energy	=	450 Kcalories/kg
Fibre	=	10-15%
Calcium	=	11%
Phosphorus	=	2%

Approximately one-half of the protein in dried poultry manure is digestible. Dried poultry manure is more valuable as a feed for ruminants than for poultry because the microbial population of the rumen can convert urea as uric acid into assimilable body protein. Single-stomach animals (monogastrics) cannot do this.



Levels of up to 25% dried poultry waste have been fed to hens without harmful effects. Taste panels have not been able to detect any difference in eggs from hens fed dried poultry waste and those fed normal-type diets.

Dried poultry waste must be considered as a new product or feedstuff available to primary industry and not just as animal excreta. It is a new feed ingredient with definite characteristics as to protein, calcium, phosphorus and so on.

After dehydration below 15% moisture content, the dried product does not cake or mould. It does not contain any pungent faecal odour even if it becomes completely saturated after processing. Pelleting is simple.

Dehydration costs vary depending on location, gas or fuel oil cost, hours of operation, and labour cost.

### Odour control

Intensive production and associated waste production have caused primary producers many headaches through complaints by neighbours on the downwind side of the particular livestock enterprise. It is a fairly common situation that the primary producer whose animals are causing the odour problem rarely smells the full extent of his own problem.

With the ever-increasing urban spread, the problems linked with odour complaint are very worrying for the established producer. Health inspectors do not consider who was in the area first and, as a result, intensive livestock producers often have to shift further out into the country or else spend large amounts of money on odour prevention methods.

Odour control is necessary, not only for aesthetic reasons, but also because the gases given off by manure heaps, ponds or ditches can be highly toxic. The *Canadian Veterinary Journal* in 1969 quotes an example of gas poisoning associated with intensive livestock production. The results were that 16 pigs died, five others were sick and one man fainted while another man was seriously ill.

The main gases produced from decaying manure are ammonia, hydrogen sulphide and carbon dioxide. The literature reports that the principal cause of keratoconjunctivitis in poultry is ammonia produced from faeces.

It has also been reported that susceptibility to Newcastle Disease is increased following prolonged exposure of birds to ammonia gases at levels as low as 20 p.p.m. Most people can recognize ammonia at a concentration of 25 p.p.m. in the atmosphere.

Odour reduction can be accomplished by efficient manure management. Some methods of odour reduction are described below—

**INCORPORATION OF HUMIC ACID INTO FEEDS.** Humic acid is defined as the alkali-soluble, acid insoluble fraction of humus. Nakano incorporated 0.1 to 0.2 weight per cent humic acid in poultry feed and within 10 days a substantial odour reduction was evident in the faeces. By 20 days, faecal odours were essentially eliminated. Similar results have been obtained with dogs in 30 days.

**RECYCLIC FEEDING.** This has been mentioned earlier. If the manure is immediately reused, the odour problem is reduced.

**ODOUR CONTROL BY CHEMICAL REACTION.** Basically, this system relies on reaction with strong oxidants such as potassium permanganate, chlorine, chlorine peroxide and ozone. Faith found that spraying cattle feedlot grounds with a 1% solution of potassium permanganate at 20.5 kg potassium permanganate per hectare three times a year effectively reduced odours from the feedlot operation.

Unpublished work of Launder shows that collecting poultry waste in a cold, dilute mixture of phosphoric acid effectively eliminates odours released from semi-liquid poultry waste.

Seltzer and his colleagues found that poultry waste treated with formaldehyde reduced ammonia production for periods of up to 28 days.

### Dead bird disposal

Poultry farm management must be geared for the quick removal and disposal of dead birds for the following reasons: to control disease, to prevent fly breeding, to minimize odours, to satisfy public health requirements, and to maintain neighbourhood acceptance.

Carcasses should be removed daily from the sheds. The problem then is how to get rid of them. Several disposal methods are available. These include—

**DIRECT BURIAL.** This is reasonable with small enterprises. The usual procedure is to have a slit trench dug about 0.5 metre at least wide and at least 1 metre deep. As carcasses and other wastes are daily placed in the trench, the earth is back-filled over the waste to prevent flies from breeding and odours from developing. At least 0.3 m of firmly-packed earth is required to cover the waste.

Problems with this type of disposal are rodents and dogs, high water tables and the possibility of ground water pollution.

**RECYCLE AS PIG FEED.** By law, all garbage piggeries must boil all food scraps and offal for at least 1 hour before feeding it to live-stock. This system is not recommended.

**CONTRACT TO A RENDERING PLANT.** Some farmers contract to supply dead birds to a rendering plant. On these farms it will normally be necessary to have some form of cold storage available to store dead carcasses until pick-up is due. Air temperatures lower than 4°C will prevent larvae growth and will permit temporary storage without nuisance.

**INCINERATION.** This is the best form of flesh disposal. If done properly there is no odour, disease, rodent, fly or water pollution problem, no land use and no transport involved.

**DISPOSAL PITS.** These are the simplest and oldest method of disposing of dead birds. A removable trap door is inserted above the pit which is dug to up to 10 m deep and generally

about 1.3 m in diameter. The top of the pit must be protected from surface water run-off. It is important to avoid digging the pits in very porous soils because of the possibility of ground water pollution. Lime is often added into the pit and this acts as a desiccant and also has bacteriocidal properties.

Disposal pits should not be dug in areas where the water table is likely to rise into the pit. The bottom of the pit should be at least 12 m above the water table if bacterial penetration into the water table is to be prevented.

## Summary

- The world's waste disposal problem is ever increasing as production increases in volume and intensification continues.
- Waste material should not be just considered for disposal but rather the aim should be to convert it to useful resource material.
- Indiscriminate spreading of manure over the land can lead to pollution of ground and underground water supplies, and degradation of soil fertility and structure.
- A plan for a waste utilization programme based on land spreading has been outlined.
- Odours from manure can be controlled by efficient manure management either by direct husbandry or chemical means.
- An efficient system for disposing of carcasses is required to stop disease spread and to curtail the pollution potential arising from carcass disposal.





# Onion thrips in the Lockyer

by K. J. GIESEMANN, Entomology Branch.

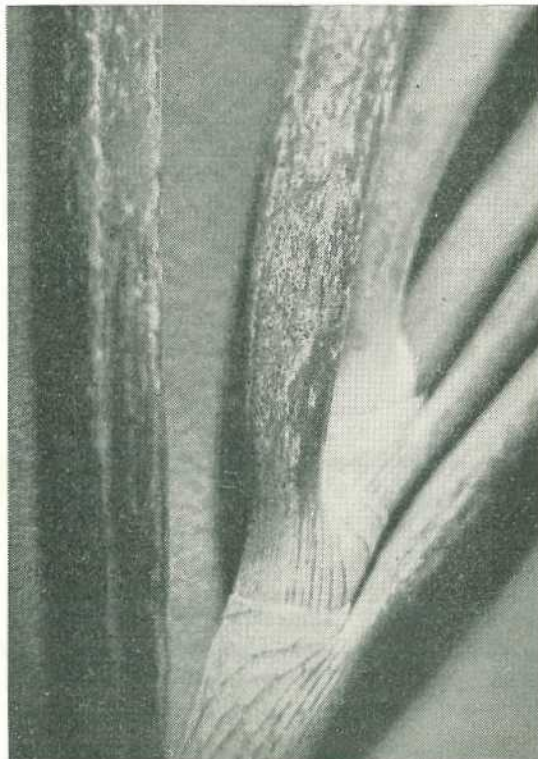
THE major insect pest of onions grown in the Lockyer district is onion thrips *Thrips tabaci* Lind. It may also infest related crops such as leeks and garlic.

The mature onion thrips are elongate insects about 2 mm long and carrying two pairs of narrow, fringed wings. They are darker in colour than the immature thrips which are a creamy-yellow colour. The immature thrips live and feed within the shelter of the leaf bases until the pre-pupal stage is reached. Then they move to the soil and pupate. When the adults emerge, they return to the plants to feed and deposit eggs. The entire life cycle of the thrips from eggs to adults takes up to a month.

Thrips feed on the leaves of the onions by rasping the plant tissue with their mouthparts and extracting the sap. Feeding occurs mainly on the newly formed leaves and, as these grow, the feeding punctures expand and elongate producing whitish spots and streaks.

If the pest activity has been intense, a silvery-white, stippled appearance will be noticeable on the leaves as the plants age. When thrips are present in large numbers, especially on young plants, these pests can cause severe injury and even kill onion plants.

In a crop grown for seed, the thrips may also attack the floral parts. As the flower head begins to open, the thrips move up the flower stem from the leaves and feed on the stalks of the florets. This may interfere with normal seed production.



The typical stippled effect caused by onion thrips.

## Weeds harbour thrips

Onion thrips may be found on a wide variety of plants including numerous weeds. Efforts made to control weeds both within and around the onion crop will assist in preventing a pest build up.

Under warm, dry conditions, thrips breed most rapidly and populations are usually greatest during a hot, dry spring which has followed a mild, dry winter. Winter temperatures in the Lockyer district restrict thrips breeding and the early crops are harvested during spring before appreciable plant injury occurs.

If adequate irrigation and sound farming methods are employed to maintain continued vigorous growth of the onions, then a profitable crop can be produced despite the presence of thrips and the use of insecticides will not

appreciably increase yields in either bulb or seed crops.

When insecticidal treatments are considered necessary, it must be remembered that the immature thrips are usually sheltered in the leaf bases, and any techniques designed to give maximum cover and penetration into these areas will improve control.

Omethoate at 500 g active constituent per hectare or methidathion at 300 g active constituent per hectare are recommended. A second application 7 to 10 days later may be required to achieve adequate control.

Common Name	Trade Name	% Active Constituent	Dosage a.c.	Product Usage
Omethoate .. .. .	Folimat .. .. .	80	500 g/ha	625 ml/ha
Methidathion .. ..	Supracide, Ultracide ..	40	300 g/ha	750 ml/ha

## Pasture subsidy scheme

PAYMENTS to dairy farmers in Queensland under the State Government's pasture subsidy scheme now have topped the \$4 million mark, the Minister for Primary Industries (Hon. V. B. Sullivan, M.L.A.) announced this month.

He said that, since the start of the scheme in 1966, 19 916 claims representing a subsidy of \$4 011 518 had been approved for payment up to 21 January this year.

The area of improved pastures involved was 134 809 hectares.

Mr. Sullivan said that 675 applications for subsidy had been approved to date in the first half of 1974-75, with the greatest number com-

ing from the East and West Moreton, Eastern Downs, Wide Bay and North Burnett districts.

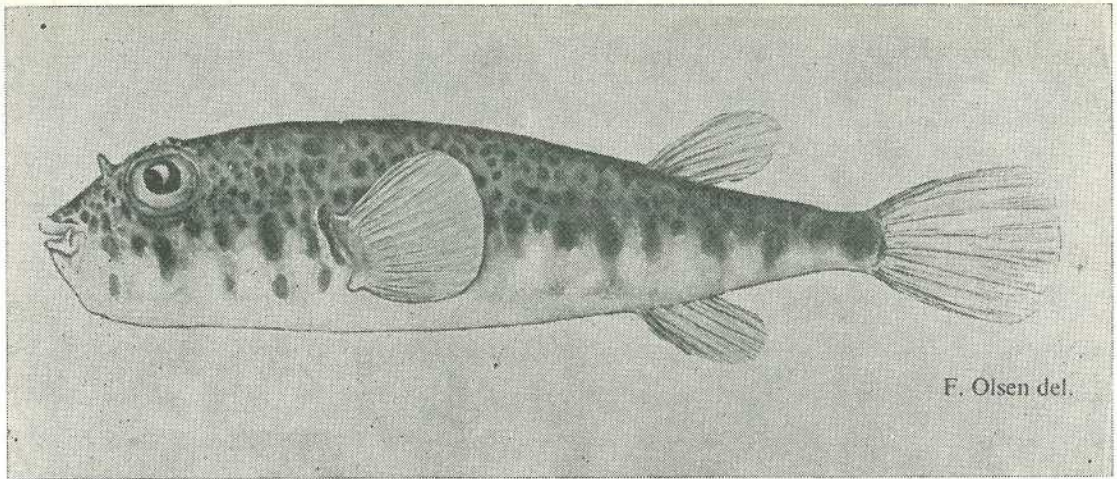
These applications covered an area of 5 266 hectares.

'In the initial year of the scheme 1966-67, there were 2 354 approvals (17 396 ha.) and, the following year, a peak of 3 700 (24 715 ha.),' the Minister stated.

'They continued within these two levels until 1973-74, when the total dropped to 1 869 (15 116 ha.). This was an excessively wet year.'

Mr. Sullivan added that the subsidy payment was calculated on the basis of \$34.60 a hectare, with seeding and fertilizer rates in kilograms.





*Toad fish.*

## Fish that are poisonous to eat

compiled by B. R. POLLOCK,  
Fisheries Branch.

MANY species of fish are taken in Queensland waters by commercial and pastime fishermen, and of these only a few are considered to be poisonous when eaten.

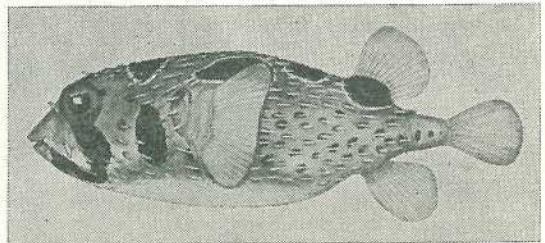
Periodically, cases of poisoning are reported, even though the recognition of toxic species is a simple matter.

The type of poisoning referred to in this article is that caused by eating any portion of the fish. It is not caused by spoilage of the fish due to bacterial action.

Two general categories of poisonous fish are recognized.

### **Puffer fish**

**POISONOUS PUFFER FISH.** This group includes fish such as the toad fish, sea toad, and porcupine fish.

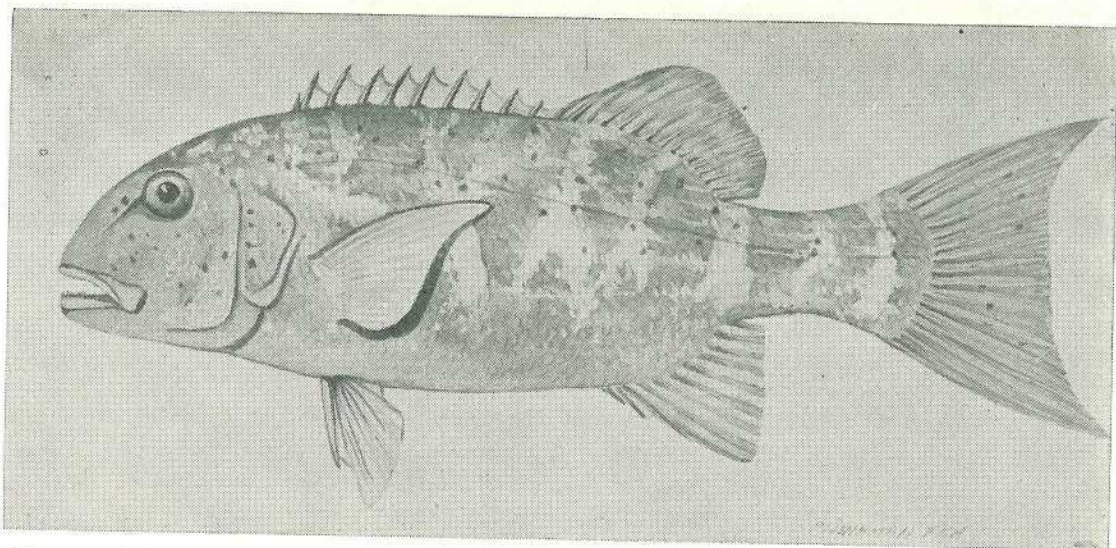


*Three-bar porcupine fish.*

An identifying characteristic of the group is their ability to inflate themselves by gulping in large quantities of air or water. The name puffer fish is given because of this habit.

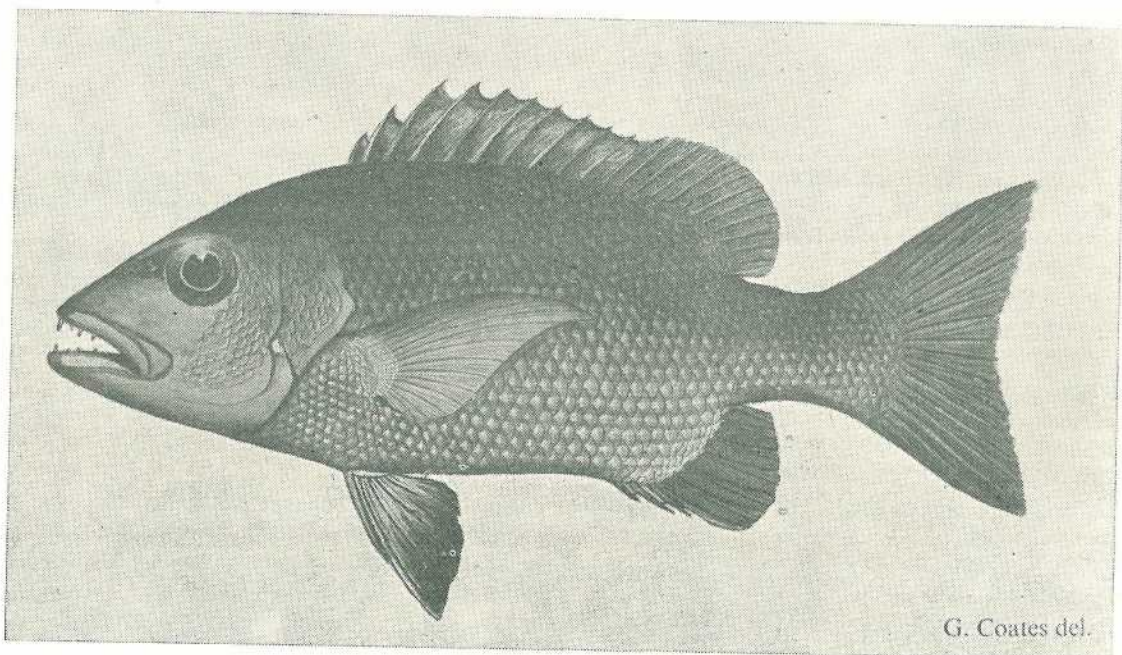
These fish are particularly common in estuarine and inshore waters and are often taken by pastime anglers on baited lines.





*Chinaman fish.*

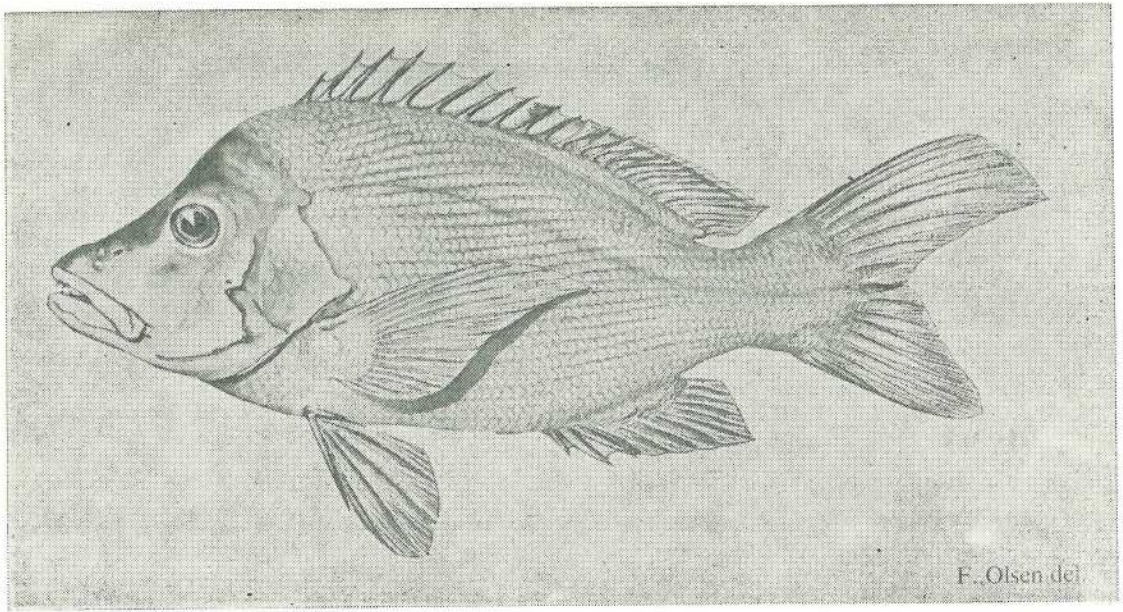
of swimming the fish will



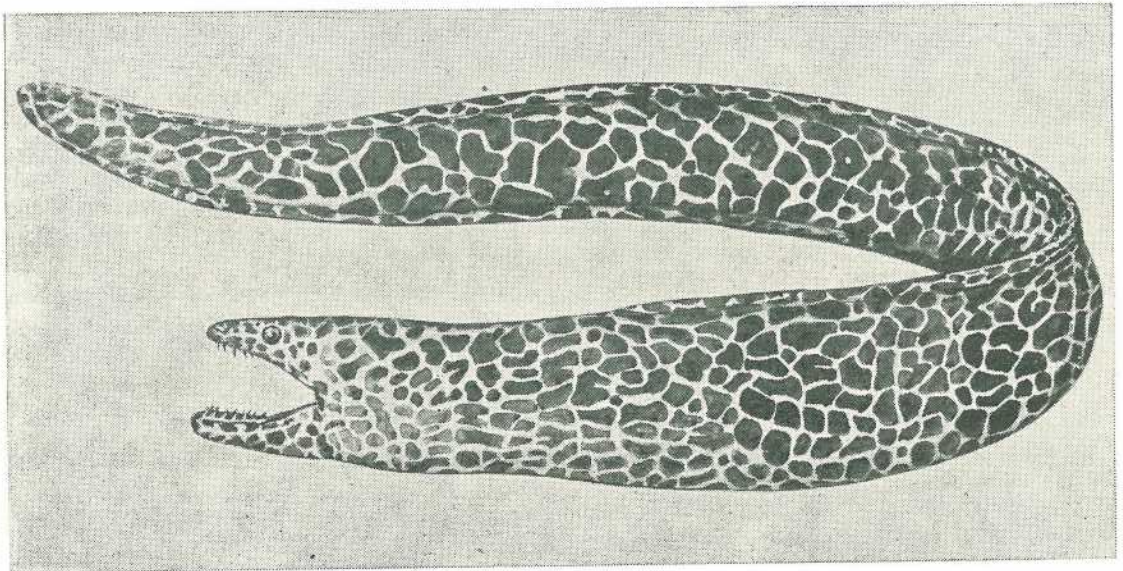
G. Coates del.

*Red bass.*





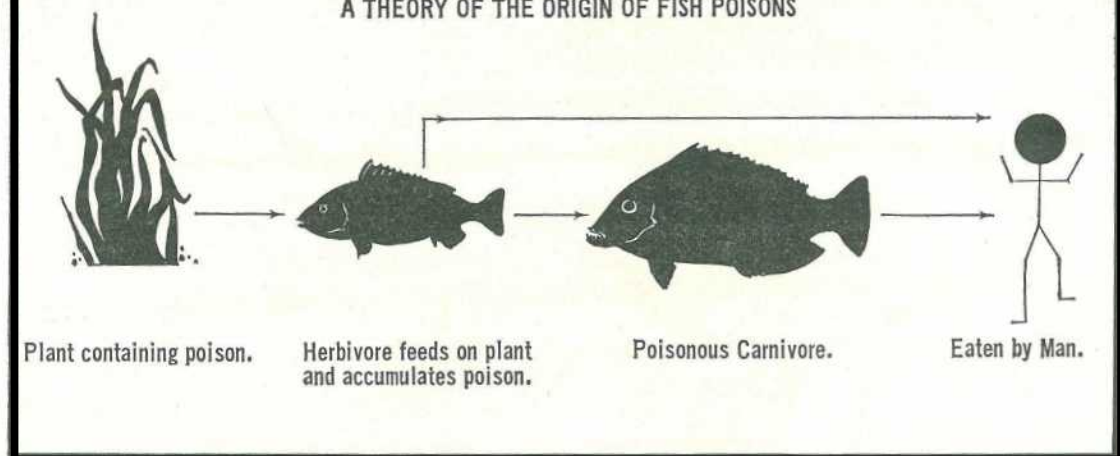
*Paddle-tail.*



*Moray eel.*



## A THEORY OF THE ORIGIN OF FISH POISONS



The tissues of puffer fish contain varying amounts of extremely potent toxins. The fish may be handled, care being taken to avoid the powerful teeth and, with the porcupine fish, the numerous sharp spines. Under no circumstances should any part of these fish be eaten.

The small toad fish is common on shallow mud or yabbie banks in estuaries along the eastern coastline. This species grows to 13 cm and is adept at changing its body coloration to blend with the surroundings.

The giant toado is a large species, growing to 1 m. Speculation has it that this was the fish which almost terminated Captain Cook's second voyage at New Caledonia in 1774. Eating this fish made the famous navigator and several of his crew violently ill. The three-bar porcupine fish is another member of the puffer fish group.

Despite the high toxicity of this group of fish, it commands the highest prices in Japan as food fish.

Puffer fish, called 'fugu' in Japan, are prepared and sold in special restaurants. Specially trained cooks are employed to prepare the fugu. Nevertheless it is still the primary cause of fatal food poisoning in that country especially among the poorer classes who fail to take the necessary precautions.

### Ciguatera

Food poisoning caused by an accumulation of toxins within the body tissues of fish is called ciguatera. This type of food poisoning is common in marine tropical waters throughout the world.

Ciguatera is not confined to a particular fish species or group. Usually, outbreaks of this type of poisoning are localized. One or more fish species in a certain area may be affected. Periodically, ciguatera may occur in any fish species and little is known about this phenomenon.

Speculation about the origin of the toxin is varied. The most popular belief is that the toxins originate in a plant such as algae, fungi, or bacteria. On eating this plant, certain small fish accumulate the toxin in their body tissues. When such fish are eaten by carnivorous fish the poison is passed on.

Most reported ciguatoxic fish are large, predacious species possibly because, in a short time, this fish acquires the toxin accumulated and concentrated by the smaller fish over its lifetime.

In Queensland, the incidence of ciguatera is uncommon, and is confined mostly to tropical reef waters. The species reported to cause poisoning are chinaman fish and red bass. At times, both types may be safe to eat, but from the view of public safety both species should be regarded as poisonous.



Red bass should not be confused with mangrove jack which is a highly regarded angling and table species. Red bass can be distinguished from mangrove jack because red bass possesses a pit on the head immediately in front of each eye. Red bass inhabits reef areas and the mangrove jack is caught in brackish, estuarine waters.

Other fish which may produce ciguatera in Queensland waters are paddle-tail and moray eels. These species have been reported as ciguatoxic in neighbouring countries so, in the interest of public safety, they should be regarded as poisonous.

### Symptoms

The patient's reaction depends largely on the quantity of toxin swallowed which, itself, varies according to the fish species. For symptoms to appear, the quantity of toxin must have reached a certain level in the body. Sometimes this threshold is reached after several meals of the toxic fish. In other cases one meal will cause symptoms.

The toxin produced by the puffer group is more potent than ciguatoxin, but both have caused human deaths.

Initial symptoms are prickling about the lips, tongue and nose, numbness and tingling sensation at the extremities of limbs, and headache. Depending on the quantity of toxin taken in, these symptoms may occur at any time from several minutes to one day after eating the poisonous fish.

Later symptoms may include nausea, vomiting, diarrhoea, fever, erratic pulse, reduced blood pressure, weakness in the muscles, and skin disorders such as itching, rash and blisters. In cases of severe poisoning, the nervous symptoms are particularly pronounced.

The victim may interpret cold as hot and hot as cold. Muscular co-ordination progressively deteriorates. Paralysis, convulsions and possibly death may follow.

### Treatment

If fish poisoning is suspected, seek a doctor's advice immediately. During the early stages of poisoning, vomiting and diarrhoea should not cause alarm as this will help eliminate the toxin. In fact, if vomiting has not occurred, it should be encouraged. Artificial respiration should be given if necessary.

Common Name	Other Names	Scientific Name	Food Poisoning Potential	Habitat
toad fish	toado, toad	<i>Spherooides hamiltoni</i>	extremely dangerous	estuarine shallow water
giant toad	sea toad, toad	<i>Gastrophysus sceleratus</i>	extremely dangerous	estuarine and inshore waters
three-bar porcupine fish	toad	<i>Dicotylichthys punctulatus</i>	extremely dangerous	estuarine and inshore waters
chinaman fish	galloper, thread-finned sea perch	<i>Symphorus nematophorus</i>	dangerous	tropical reef waters
red bass	kelp bream kelp sea perch	<i>Lutjanus coatesi</i>	dangerous	tropical reef waters
mangrove jack	red bream dog bream	<i>Lutjanus argentimaculatus</i>	not poisonous, an excellent table fish	brackish and estuarine waters
paddle-tail	red snapper	<i>Lutjanus gibbus</i>	reported poisonous overseas	tropical reef waters
moray eels	moray reef-eels	<i>Gymnothorax</i> spp.	reported poisonous overseas	tropical reef waters

# Beef from green panic-glycine

by L. WINKS, Beef Cattle Husbandry Branch;

LIVEWEIGHT gains in steers in excess of 650 kg per hectare per annum from green panic-glycine pasture have been produced on the Atherton Tableland.

Studies which have been under way on the Department of Primary Industries' Kairi Research Station since 1966 have demonstrated the potential of these pastures for beef production, but have highlighted many management problems.

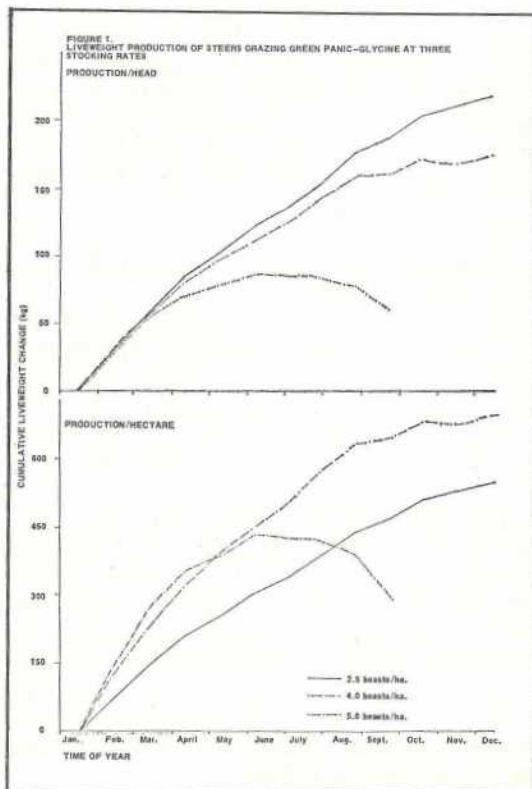
It is the aim of this article to consider these problems and some possible means of overcoming them.

The Kairi Research Station is situated 16 km north-east of Atherton on the shore of Tinaroo Lake and is representative of some 20 000 hectares of undulating country with an elevation of 600 to 750 m. The dominant soil type on the station and of the region is deep, red-brown clay-loam derived from basalt with some granitic intrusions.

The area enjoys a temperate climate with frosts occurring during the winter months. The mean annual rainfall is 1 220 mm, 75% of which falls between December and March.

## The pasture

Green panic (*Panicum maximum* var. *trichoglume*)-glycine (*Glycine wightii* cv. Tinaroo) pasture mixtures have been established on the station since the early 1950s. Since that time, a distinct growth pattern has been observed in the pasture.



This pattern of growth is determined largely by seasonal conditions—in particular, the onset of storm rains in the spring-early summer period, the incidence of frosts and soil moisture levels in early spring.



# on Atherton Tableland

and P. O'GRADY and G. CHAMBERS, Dairy Cattle Husbandry Branch.

Following the opening storm rains, nitrogen which has been fixed in the soil during the dry season becomes available and the green panic makes rapid growth. Dry matter production of 100 kg per ha per day has been recorded. This will support eight animals.

This growth continues during the summer, and growth of the associated legume is suppressed partially through competition for light. By late February, the grass has reached maturity and seed-heads appear. These seed-heads soon fall and the legume begins to show increased vigour because of reduced competition from the grass for light and nutrients.

During autumn, the legume makes rapid growth and some production in the grass also occurs.

The winter is a vital one for pastures of this type, as glycine is susceptible to frosting. With the onset of frost, the leaves soon become blackened and fall to the ground leaving bare stems. It is during the autumn-early winter that flowering of the legume occurs with resultant seed set.

This seeding is prolific and seed can make a significant contribution to the protein requirements of animals grazing the pasture.

The amount of spring growth obtained depends on the soil moisture levels. As soil moisture levels decline, the grass is the first to suffer as its shallow root system does not have access to the same range of soil moisture as the deep root system of the glycine. Normally, the grass component makes little growth during this time but the glycine will

continue to produce shoots while subsoil moisture levels are adequate. This situation continues until the storms begin, when rapid grass growth commences once more.

The overall picture is similar to that in most tropical areas: a rapid production of a huge bulk of material in summer and very limited production in the dry winter-spring period. Total dry matter production as high as 10 000 kg per ha per annum has been recorded with 80% of the production in the December-March period.

## Animal performance

As can be expected with such high levels of pasture production, these pastures support high levels of weight gain in steers at moderately high stocking rates.

The figure shows the average level of performance of steers grazing these pastures at stocking rates which are felt to straddle the most favourable level.

It is obvious from the figure that a definite pattern of performance exists, although it is not so pronounced as the growth pattern of the pasture. Rapid weight gains coincide with the flush of growth which follows the summer storms. This is understandable, as the pastures are succulent and highly nutritious and intake and digestibility are high. Gains at this time normally fall in the range 0.7 to 0.8 kg a day but rates as high as 1 kg a day have been recorded for short periods.

As the season advances, the rate of gain declines slightly although gains exceeding 0.5 kg a day may occur through the winter at moderate stocking rates. During the dry spring, rates of gain decline to low levels and, in dry years, weight losses may occur.

The duration of this period of loss, and the extent of the weight losses that occur, depend on the type of year and the stocking rates employed: the drier the year and the heavier the stocking pressure, the greater the nutritional stress.

Pastures of this type have supported weight gains at Kairi until they were almost completely bare. Quality of the diet is normally adequate, but available dry matter becomes limited at heavy stocking rates and the weight losses result.

This contrasts with the situation on native pasture areas in north Queensland where quality of the diet is the problem in spring as there is rarely a shortage of available dry feed.

Weight losses often occur immediately after the break in the season. This may result from spoilage of the standing feed by leaching of nutrients and mould development plus selective grazing of the green shoot by animals, with resultant scouring and loss of rumen fill.

### Carrying capacity

Initial studies at Kairi compared stocking rates of 2.5 and 1.25 steers per ha and it was found that pasture grew away from the animals during the summer. Much of the summer pasture production collapsed following maturity and was trampled.

In subsequent studies, it has been shown that stocking rate during the summer can be increased to 4.0 steers per ha without depressing animal performance greatly until May. During the winter and spring, the effect of the higher stocking pressure is felt and performance is lower than that of steers stocked at 2.5 steers per ha.

The spring period is critical for green panic-glycine pasture. Heavy grazing at this time reduces the legume percentage in the

pasture. With the decrease in the legume percentage, its contribution to the grass in nitrogen fixation is reduced, as is the resultant vigour of the pasture.

Research work has indicated that the performance of steers on grass-legume pastures is related to the legume component: the higher the legume percentage, the higher the animal performance. It is important to maintain a high legume component in the pasture to ensure adequate weight gains.

### Management strategies

It is obvious from the preceding discussion that pastures of this type face three major problems—

1. Use of the rapid pasture growth in summer.
2. Overcoming the feed shortage in spring.
3. Reducing the grazing pressure on the legume in spring.

A range of management strategies may be employed to overcome these problems, different strategies being best suited to certain situations. These are—

**CONSERVATION AND FEEDING BACK.** The logical solution seems to be: 'If you have too much feed at one time and not enough at another time, shift some of the feed across.'

This is a common practice in temperate areas. Some of the summer surplus is conserved and fed back during the spring to overcome the dry matter shortage which exists at that time. Conserved feed may take the form of: hay, silage, or standover pasture.

**Hay.** Good quality hay can be made from pastures of this type but experience has shown that the success rate is low. The hay-making process should be carried out in January-February, the wettest period of the year.

At that time, conditions are unsuitable for drying and the chances of obtaining periods suitable for hay-making are low. The use of a conditioner is essential to attempt to reduce to a minimum the time required for drying.



It is our opinion that conservation of the summer surplus as hay has limited application because of the unfavourable weather conditions when hay must be made.

*Silage.* A considerable volume of research has been conducted at Kairi into the conservation of the summer surplus as silage. Good quality silage has been made, but inclusion of molasses at up to 8% of the wet weight during the ensiling process is essential.

Problems do exist with ensiling tropical pastures as tropical pasture plants do not usually collapse and settle during ensilage. On the contrary, the silage tends to remain porous and extensive surface spoilage through fungal growth occurs unless the silage is made in air-tight silos.

Silage has an advantage over hay in that the programme can go on regardless of the weather. However, intake of silage with low dry matter content is also low and heavy wilting of the cut material to a dry matter content of 40% and above is recommended.

To reduce costs of feeding-out, it is preferable to self-feed the silage. This means that the silage must be made in or near the paddocks where it is to be fed out. Vacuum silage is now made on a wide scale, but the failure rate with tropical species can be high.

Silage-making makes heavy demands on labour and this limits its application. Both hay-making and silage-making involve the purchase of additional machinery on most farms. This is an added deterrent.

*Standover pasture.* An alternative to harvesting material and then feeding it back, with its attendant problems, is to allow the pasture to stand over in the field. An area can be heavily grazed from the storms until March, then closed up for grazing in spring. Some deterioration in quality of the pasture does occur while it is closed up, and this is aggravated when frosting of the legume occurs.

The seriousness of the frost problem will depend on the topography of the country and the incidence of frosts.

One of the important considerations with this method is that an area of pasture has to remain unstocked for a period during the summer or autumn-winter period.

As a result, some production may be forgone during this period, either because of increased stocking pressure on the remaining area with resultant reduction in animal gains or reduction in animal numbers to keep grazing pressure constant. This loss of production must be weighed-up against the advantage which may accrue during the spring.

**ALTERNATIVE FEED SUPPLIES.** An alternative approach to the problem is to introduce feed supplies from outside the area to overcome the spring trough. With this method, relatively high stocking rates are employed during the summer to make maximum use of the summer flush of feed as it is grown.

When the stress period approaches, feed is introduced from outside the area to increase the feed intake by the animals and to reduce the grazing pressure on the pasture. Some of the possibilities are: grain feeding, molasses feeding, maize stubbles, nitrogen-fertilized grass.

*Grain feeding.* Grain feeding is practised in many parts of Queensland, particularly to 'top-off' unfinished steers at the end of the pasture growing season. Digestive upsets can occur with grain feeding because of uneven distribution through the mob.

Many of the difficulties in feeding grain in the paddock can be overcome by using some form of grain self-feeder. (Designs that have been used with success have been described in the July and August 1967, September 1971, December 1972 and September 1973 editions of the *Queensland Agricultural Journal*.)

Feeding grain on the ground has been used with success in droughts to improve distribution and to reduce the incidence of bullying, but is not really ideal for this situation. In a grain-growing area such as the Atherton Tableland, availability of grain is not expected to be a serious problem. However, high costs of grain in recent years make this practice doubtful economically.

*Molasses feeding.* A much cheaper source of additional energy is molasses. This substance has the advantages that it can be handled in bulk, is readily available on the coast and is easy to feed out.

Open troughs can be employed and the molasses fed to appetite without fear of the type of digestive upsets experienced with feeding of grain in open troughs.



The phosphorus content of molasses is low, and it is advisable to include a phosphorus supplement in the molasses. Mono-ammonium phosphate (M.A.P.) at 1 kg per 100 kg molasses is satisfactory. Finely ground M.A.P. remains in suspension better than the granulated material and may be preferred.

Intake of molasses in steers can be 4 to 7 kg per head per day and the dung of the animals will be quite loose.

A study is at present under way on the Kairi station to examine the value of feeding molasses to steers grazing these pastures.

*Maize stubbles.* Research at Kairi has shown that lasting, worthwhile benefits are obtained from including a pasture phase as a rotation with maize growing. Increases in yield of maize and reduction in weed population are benefits that result.

Grazing these pastures with beef steers is one easy way of using the dry matter produced. The pasture is normally sown under the last maize crop on the area during the final working of the maize. When the crop has been harvested, the stubble that remains, plus the glycine and green panic that have grown, provide feed for steers grazing adjacent pasture areas. In addition, some grain which is missed by the harvester remains on the ground and will be eaten by stock.

In an observation at Kairi, steers grazing a maize stubble paddock for 36 days during September-early October at a stocking rate of 2 beasts per ha gained at the rate of 0.4 kg a day. This allowed the adjacent pasture area to be spelled at the critical time.

The method is limited in application to maize farms and is affected by frosting of the legume. In addition, grazing is for a restricted period only. The grazing period cannot be prolonged as over-grazing will seriously reduce the stands of the newly-established pasture.

On areas where no pasture has been planted, time is required to work the ground for the following maize crop.

*Nitrogen-fertilized grass.* On the wet coast of Innisfail, an area of nitrogen-fertilized pure grass pasture has been used with a grass-legume pasture for grazing during the winter-spring period to reduce the grazing pressure on the grass-legume area. A similar system could be used on the Tableland.

Some information on the potential of pangola and kikuyu grasses for use in this situation was obtained at Kairi in 1968-69. Both of these pastures were capable of supporting stocking rates of four to eight beasts per hectare for extended periods with the animals making weight gains throughout.

Pangola grass fertilized with 300 kg of nitrogen per hectare gave excellent results and could play an important role. Rust and aphids are pests which are active in pangola grass. For this reason, signal grass (*Brachiaria decumbens*) is now being investigated.

In situations where irrigation water is available, this method of reducing the spring stress period will have greater potential. Costs of nitrogen fertilizer and irrigation water, if applied, will have to be weighed up against the advantages which result.

**STRATIFIED BUYING.** The most practical solution to the problem is possibly stratified buying. The aim with this system is to have a range of animals, in terms of weight and condition, on the pasture at the beginning of the wet. The heaviest animals are marketed progressively during the wet as they reach slaughter weight and condition.

This allows the grazing pressure to be reduced steadily as the season advances, with heavy pressures during the wet when this is desirable and light pressures during the dry.

The type of steers bought depends on the weight and condition of those already on the pasture. If an unstocked area were to be stocked in December-January, a range of steers from 200 to 350 kg liveweight is best purchased. The heaviest animals can then be marketed in April-May at a liveweight of 430 kg, dressing 220 to 230 kg.



This reduces the stocking pressure at a time before conditions become critical. By removing the heaviest animals, reduction in stocking pressure is greater than the reduction in numbers of animals suggests. Further animals are turned off as the season advances.

It seems, at this stage, that a system combining a couple of alternatives, for example, stratified buying plus outside sources of feed, is preferable. However, the choice of method will depend on the individual property situation.

### Other factors

Some other factors that must be considered in a beef-raising operation are—

**ROTATIONAL GRAZING.** Most of the preceding discussion has dealt in detail with various aspects of pasture management. The aim of the whole operation should be to keep costs to a minimum. Fencing should also be minimal. However, to maintain a satisfactory legume-grass ratio, it may be necessary to employ rotational grazing.

Very little detailed information is available on the benefits of rotational grazing in tropical grass-legume pastures.

Research on the wet coast has shown marginal advantages in liveweight gain to rotational grazing over set-stocking. However, the study lasted for only a short time and long-term effects are not known. Under the circumstances, it is probably wise to use rotational grazing on these grass-legume pastures.

**CLASS OF STOCK—Breed.** Comparisons between different breeds of steers at Kairi have shown that Friesian steers gained more weight (210 kg) in 12 months than Brahman cross (180 kg) and Shorthorn (170 kg) steers. However, carcasses of the Friesians normally carry less finish at the same carcass weight than the beef steers. This may result in lower price per kg.

Depending on purchase price and availability of steers, it seems that Friesians may be a better economic proposition at this stage. Some prejudice against Friesians seems to exist among butchers, but this can possibly be overcome.

**Age.** For the past 8 years, information has been collected on performance and age of cattle at Kairi. These figures indicate that younger cattle tend to make more rapid weight gains on these pastures than older animals.

In addition, a greater number of the younger, lighter animals can be carried on a given area so that gain per hectare is much higher. Buying weaner steers finishing as light butchers' steers suitable for the local trade should probably form the major part of the enterprise. Older, heavier cattle are best purchased only to consume the summer surplus and give a quick turn-off under normal circumstances.

It is obvious that high levels of beef production are possible on glycine-green panic pastures on the Atherton Tableland. The management system chosen will have to be tailored to the particular situation. It is essential to keep in mind at all times the ultimate goal, that is, producing a marketable animal while retaining a viable pasture.



# Tuberculosis-Free Cattle Herds (As at 21 February, 1975)

## ANGUS

Corden, E. B., Netherby, Warwick  
Crothers, H. J., "Mooreenbah", Dirranbandi  
Mayne, W. H. C. & Sons, "Gibraltar", Texas

## A.I.S.

Cox, T. L. & L. M. J., Seafeld Farm, Wallumbilla  
Evans, E. G., Lauraven A.I.S. Stud, Maleny  
Henry, Mrs. K. & Sons, "Tara", P.O. Box 4, Cambooya  
H. M. State Prison Farm, Numinbah  
Klein Bros., Kapleton A.I.S. Stud, Ma Ma Creek, via Grantham  
Lawley, E. D. & Sons, Arley A.I.S. Stud, Maleny  
Marquardt, C. R. & J. L., Cedar Valley A.I.S. Stud, Wondai  
Martin, J. P. & R. J., Kentville, via Forest Hill  
Middleton, C. W., Airton Vale, Cambooya  
Mitchell and Mulcahy, Rosenthal  
O'Sullivan, P. W., "Navieigh", M.S. 371, Greenmount  
Pagel, E. E., and Hayes, E. M., Trafalgar Stud, Tarampa, via Lowood  
Queensland Agricultural College, Lawes  
Ross, W. & Co., M.S. 23, Rosewood  
Schelbach, N. N. & Co., Allanview Stud, Warwick  
Siebenhausen, J. & S. C., "Meniton", M.S. 195, Pittsworth  
Thompson, W. H., "Alfa Vale", Nanango  
Vohland, A. R., Bevallan, Stoneleigh, M.S. 150, Pittsworth  
Weiler, L. G., Prairie Plain A.I.S. Stud, M.S. 765, Allora

## AYRSHIRE

Goddard, B., Inverell, Mt. Tyson, via Oakey  
Scott, J. N. & Son, "Auchen Eden", Camp Mountain

## BRAFORD

Bowden, W. H., "Brendale", South Pine Road, Strathpine  
Thompson, M. A. K., "Glen Kyle", Buderim

## FRIESIAN

Behrendorff, E. C. & N. G., Inavale Friesian Stud, M.S. 786, Boonah  
Evans, P. J., M.S. 28, Dragon St., Warwick  
Guppy, N. J. & H. M., Bil Bil Road, Nambour  
Hickey, K. A. & M. R., Bunya  
Lobley, N. E., "Neloby", Mt. Pleasant, via Dayboro  
McWilliam, A. A., Oatlands Stud, M.S. 918, Toowoomba  
Martin, R. J. and E. L., Kentville, via Forest Hill  
Panzram, J. & K., Bienenheim, via Laidley  
Queensland Agricultural College, Lawes  
Stumer, A. O., Brigalow, Boonah  
Vonhoff, A. R. & D. G., M.S. 918, Toowoomba

## GUERNSEY

Dionysius, R. L. & L., Warana Stud, M. S. 1796, Proston  
Erbacher, J. P. & M. M., "Leafmore", Hodgsonvale  
Hopper, G. T. & H. W., Ellendean Guernsey Stud, Maleny  
Wilson, R. A. and M. R., "Okeden", Proston

## HEREFORD

Hill, W. W. & P. C., "Mathalla", Dirranbandi  
Panorama Stud Pty. Ltd., M.S. 765, Allora

## JERSEY

Conochie, I. S., Brookland Jersey Stud, M.S. 461, Kalbar  
H. M. State Prison Farm, Capricornia Stud, P.M.B. 11, Rockhampton  
H. M. State Farm, Palen Creek  
Lau, J. F., "Rossallen", Goombungee, Toowoomba  
McDonald, R. G., "Buffelvale", M.S. 807, Mundubbera  
Paulger, S. & S. M., "Advale", Kenilworth  
Postle, R. S. & G. C., "Yarallaside", Pittsworth  
Queensland Agricultural College, Lawes  
Snare, A. E. & Son, Laidley Park Stud, Laidley, 4341  
Spessor, O. W., Carnation Jersey Stud, Mt. Walker Rd., Rosewood  
Todd, J. R., Aberfoyle, Laravale, via Beaudesert  
Vohland, A. R., Bevallan, Stoneleigh, M.S. 150, Pittsworth  
Waite, H. M., M.S. 182, Laidley  
Westbrook Training Centre, Westbrook

## POLL HEREFORD

Anderson, J. H. & Sons, "Inverary", Yandilla  
Christensen, B. L. & M. O., "Elavesor", Rosevale  
Morris, H. J. & D. I., Gaiview Stud, Clifton  
Nee Nee Pastoral Co., Dirranbandi, 4392  
Stiller, N. L., "Vine Veil", Guluguba

## POLL SHORTHORN

Leonard, W. & Sons, "Welltown", Goondiwindi  
Pointon, R. B. & S. C., "Wywurri", M.S. 780, Kingaroy

## BRAHMAN

Queensland Agricultural College, Lawes  
The Cherokee Group Brahman Cattle Co., Tanby

## SANTA GERTRUDIS

Barbara Plains Grazing Co., Barbara Plains, Wyandra  
Central Estates, Comet Downs, Comet

## SHORTHORN

Pointon, R. B. & S. C., "Wywurri", M.S. 780, Kingaroy

## DROUGHTMASTER

University of Queensland, Veterinary School, St. Lucia



# Formula for ordering day-old chicks

by J. S. SLOANE, Agricultural Economist.

**MOST** poultry farmers estimate the number of day-olds they require by trial and error.

They know their expected rearing losses and they know the percentage of extra birds the hatchery will supply. Using these details, they then have to calculate the actual number of chickens to order so that they will have enough point-of-lay pullets to replace a batch of layers which have reached the end of their productive life.

With the implementation of Hen Quotas, many growers are faced with a major reorganization of their farms. They need to know the total number of layers, the number of batches of point-of-lay pullets to introduce each year, and so on. To calculate by trial and error the number of birds to order for each of the many alternative farm plans can be an extremely tedious process.

## The solution

There must be a simple method of approach, a formula, a graph or a table; and there is. For those who like formulae, and very few of us do, the 'chick number formula' is included as an appendix.

For the rest of us, the majority of us, the 'chick number reckoner' is provided. Keep this Ready Reckoner somewhere handy. All you need to do is plug into the Ready Reckoner the number of birds you require in the laying shed, along with the percentage of rearing losses you expect on your farm.

Rearing losses should include all bird wastage: deaths, culls and cockerels. Rearing losses should be expressed as a percentage

of birds landed on the farm—the number ordered plus the extra birds supplied by the hatchery.

## Expected losses

What percentage rearing losses should be expected? Growers who have been rearing their own chickens will be able to draw upon their past experience. For poultry farmers new to the pullet rearing business, the Queensland Department of Primary Industries' Poultry Accounting Scheme rearing results are of some help, so are the Queensland Random Sample Layer Test results.

In the Accounting Scheme, total losses ranged from 5 to 21% (percentage of birds landed) with an average of 10.7% between 1969 and 1973. These are the results for 280 000 birds in the 75 separate commercial flocks recorded so far.

Similarly, average rearing losses for the 1969-70 to 1972-73 Random Sample Tests were 10.6%, with a wider range of 1.3% to 32.7%. Also, the variation in rearing losses between strains is given in the Random Sample reports.

The recent introduction of a vaccine to prevent Marek's disease has markedly reduced deaths from this disease during the rearing stage. Vaccination is rapidly becoming standard practice in pullet rearing and, because of this, the above estimates of losses are likely to be on the high side. Growers should take this into account when forecasting losses.

## Extra day-olds

Currently, the hatcheries supply 4% extra day-old chickens in addition to the number ordered by the grower.

## THE CHICK NUMBER RECKONER

NUMBER OF DAY OLDS THAT MUST BE ORDERED  
(Assumes 4% Extra Birds are Provided by the Hatchery)

Number of Layers Required	Expected Rearing Losses (as % of Birds Landed): % Deaths + % Culls + % Cockerels													
	5%	6%	7%	8%	9%	10%	11%	12%	13%	14%	15%	20%	25%	30%
50 .. ..	51	51	52	52	53	53	54	55	55	56	57	60	64	69
100 .. ..	101	102	103	105	106	107	108	109	111	112	113	120	128	137
500 .. ..	506	512	517	523	528	534	540	546	553	559	566	601	641	687
1 000 .. ..	1 012	1 023	1 034	1 045	1 057	1 068	1 080	1 093	1 105	1 118	1 131	1 202	1 282	1 374
5 000 .. ..	5 061	5 115	5 170	5 226	5 283	5 342	5 402	5 464	5 526	5 591	5 656	6 010	6 411	6 868
10 000 .. ..	10 121	10 229	10 339	10 452	10 566	10 684	10 804	10 927	11 052	11 181	11 312	12 019	12 821	13 736
One Bird Ratio	1-0121	1-0229	1-0339	1-0452	1-0566	1-0684	1-0804	1-0927	1-1052	1-1181	1-1312	1-2019	1-2821	1-3736

### How to use the Reckoner

An example provides a convenient method of illustration—

**EXAMPLE:**—You require 5 150 layers in the laying shed. In the rearing shed, you expect to lose 10% of the day-olds landed on your farm (the number landed equals the number ordered plus 4% extra birds supplied by the hatchery).

Use the Ready Reckoner to estimate the number of day-olds that must be ordered to fill the laying shed.

From the Ready Reckoner, when rearing losses are 10%—

To give you 5 000 layers you must order 5 342 day-olds  
and for 100 layers order 107 day-olds  
and for 50 layers order 53 day-olds

TOTAL for 5 150 layers order 5 502 day-olds

So, you would need to order 5 500 day-olds if you wanted 5 150 layers for transfer to your laying shed.

Alternatively, if you own a calculator or a slide rule, you can use the ONE BIRD RATIO given at the foot of the Ready Reckoner.

$$\begin{aligned} \text{Number to order} &= 5\,150 \times \text{One Bird Ratio} \\ &= 5\,150 \times 1.0684 \\ &= 5\,502 \end{aligned}$$

All figures given in the Ready Reckoner hold true only as long as the hatcheries supply 4% extra day olds. If there is a change in the percentage of extra birds supplied, then the whole table must be recalculated. But, the CHICK NUMBER FORMULA would remain unchanged.

### APPENDIX

#### THE CHICK NUMBER FORMULA

$$\text{Number of day olds to order (Y)} = \left( \frac{1}{1 - \frac{L}{100}} \times N \right) \frac{1}{1 + \frac{E}{100}}$$

Where:—

N = Number of layers required in the laying shed

E = % extra birds supplied by hatchery

L = % rearing losses (% of birds landed)

using the previous example:—

$$\begin{aligned} Y &= \left( \frac{1}{1 - \frac{10}{100}} \times 5\,150 \right) \frac{1}{1 + \frac{4}{100}} \\ &= \left( \frac{1}{0.9} \times 5\,150 \right) \frac{1}{1.04} \\ &= 5\,722 \times 0.9615 \\ &= 5\,502 \end{aligned}$$



# Measurement system to judge beef carcasses

CARCASS competitions are part of the beef scene in Queensland, and a valuable part.

The basic aim of carcass competitions is to advise cattle producers and other interested parties, and for them to assess—

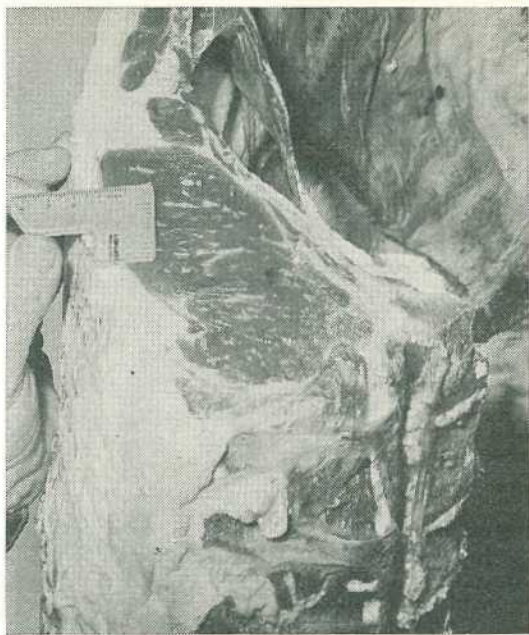
- Current market requirements.
- Their breeding and management policies.
- The relationship between live animals and their carcasses.

Judges and Show Societies have a responsibility to make these competitions as effective as possible.

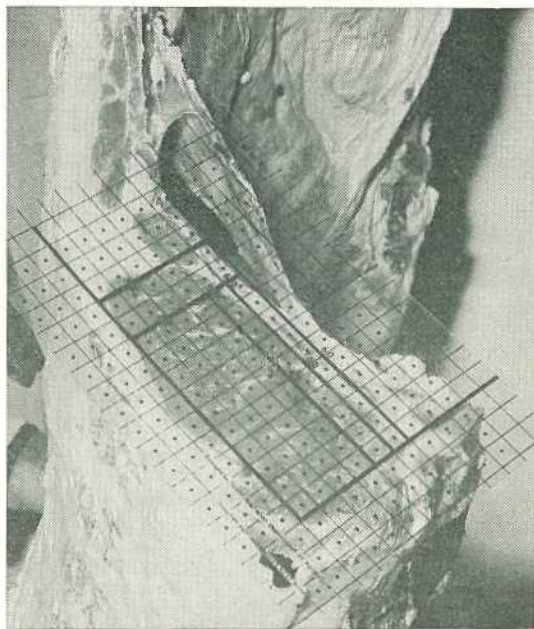
Traditionally, carcasses were judged by visual appraisal: by eye alone. This has some drawbacks. Results obtained at different places and at different times cannot be compared. The result of this sort of 'eyeball' judging is entirely an expression of the judge's opinion.

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by W. R. RAMSAY, Senior Meat Quality Officer.



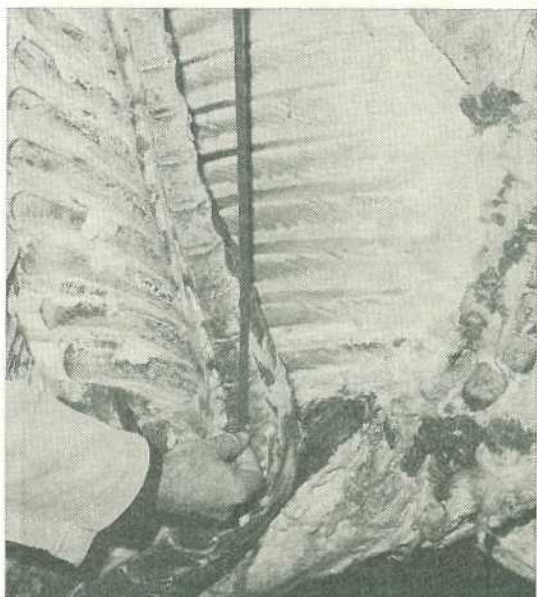
*Measuring the fat over the eye muscle allows the total fat in the body to be calculated. Points are allotted for the amount of fat—maximum score 20 points.*



*Measuring the area of the eye muscle. The weight of any muscle indicates the amount of muscle in the carcass.*



*Measuring the length of the eye muscle. The area and length of the eye muscle give an indication of carcass quality—maximum score 50 points.*



*Another view of measuring the length of the eye muscle.*

In recent years, the efficiency of this type of judging has been studied scientifically. It has been widely found to be associated with inconsistencies and irregularity of results.

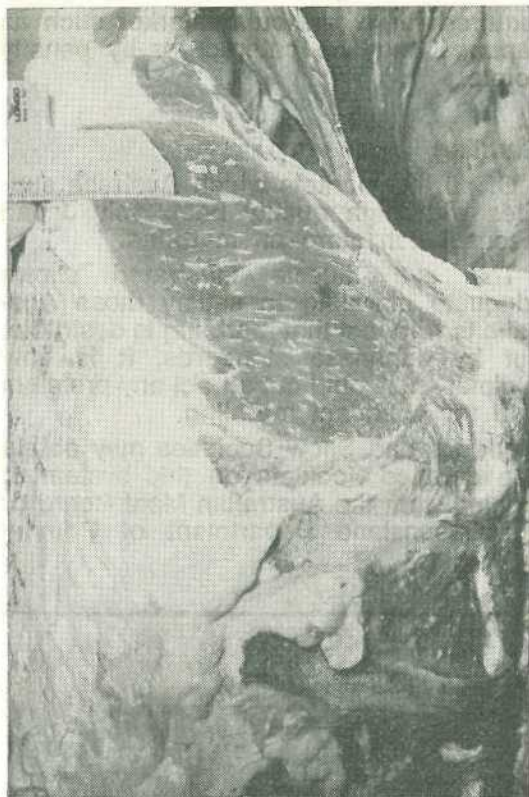
Measurement systems for judging the merits of beef carcasses have been produced and tested over several years. These have advantages over visual appraisal in being objective and consistent. They allow objective recording and comparison of results.

Recently, the Australian Meat Board decided that it would provide no prize money for any new beef carcass competitions unless these are judged by a measurement system.



*The amount of muscle and fat in the rib area are assessed. The maximum of five points is given for maximum muscle with optimum fat.*





*Japan places much store on marbling. The marbling in this eye muscle is not sufficiently abundant to attract a premium price on the Japanese market.*

### **Appraisal system**

The Australian Beef Carcass Appraisal System (A.B.C.A.S.) was devised by a panel of scientists skilled in carcass composition and butchers of wide experience in the trade. This system of carcass appraisal has been in use since 1968.

The aim of this system is to place carcasses in order of merit based on their estimated value. Commercial value of carcasses is based on an estimate of yield of salable meat and other carcass characteristics which make it visually attractive to the buyer.

For this reason A.B.C.A.S. is not wholly a measurement system: 30 points out of a possible 100 are allocated to those

'carcass characteristics which make it visually attractive to the buyer' (for example, colour and texture of fat, colour and texture of muscle).

At present these must be assessed visually because it is impossible for all practical purposes to measure them objectively. The remaining 70 points are allocated to characteristics which determine the yield of salable meat.

While A.B.C.A.S. is much more widely known and used in southern Australia than in Queensland, it has been tested here. Not only is it efficient and practical, but of all the systems of judging tested it relates best to yield of salable meat.

A.B.C.A.S. is not regarded as a fixed and forever perfect system. It is kept under review by an expert committee of the Australian Meat Board and it will be modified from time to time as new knowledge or trade requirements arise.

A.B.C.A.S. is not the only measurement system of judging available, but it has a lot going for it. It is recommended by the Australian Meat Board and the State Departments of Agriculture. Carcass judges and Show Societies should seriously consider using it and writing it into their competition schedules.

### **Commercial value**

This system places carcasses in order of merit according to their commercial value which depends on yield of salable meat and characters which make carcasses attractive to buyers.

Yield of salable meat depends on—

- optimum fat content
- amount of muscle

Factors that make carcasses visually attractive to buyers are—

- Distribution of fat over cuts of meat and in the depots (kidney knobs, channel fats, cods). Enough is needed, too much is wasteful. Points are deducted from the maximum of 15 if fat is too light or excessive.



- Colour and texture of fat. Colour is appraised by eye (white excellent to yellow poor).
  - Colour and texture of muscle. (Maximum five points).
  - The amounts of muscle and fat in the rib area are assessed. The maximum of five points is given for maximum muscle with optimum fat.
- Texture is assessed by feel. A crumbly or oily texture is penalized (maximum 5 points).
- The total points come to 100.

### Penalty points

Penalty points are provided for and may be applied at the discretion of the Show Society. For example, if marbling is

required for a particular market such as Japan, it may be catered for by penalty points.

### Marbling

Of all the markets which Australia supplies with high quality beef, only Japan places much store on marbling.

The eye muscle illustrated shows adequate marbling to satisfy those Australians who feel that marbling is desirable. But by Japanese standards, it is only minimal and would not attract any premium paid for abundant marbling.

Judges and Show Societies may obtain free detailed booklets on this system of judging from the Australian Meat Board or the Queensland Department of Primary Industries.

## Caution need in locust control

LANDHOLDERS should not be too hasty in applying sprays to control locusts.

This warning was given by the Minister for Primary Industries (Hon. V. B. Sullivan, M.L.A.).

Mr. Sullivan said that, although numbers of spur-throated locusts were active in the Moreton Districts, they had caused little significant damage to date.

'I realize that farmers will be concerned at the presence of locusts in their districts but there is no advantage to be gained from premature attempts to control the pests,' said Mr. Sullivan.

It would be better for farmers to maintain a close watch on their crops and take action when locust populations reached levels that caused economic damage. Departmental officers would be ready at all times to provide growers with advice on control measures, said Mr. Sullivan.

The Minister also advised against the stockpiling of large quantities of insecticides and against panic buying.

'Present indications suggest that chemicals will not be in such short supply as was formerly believed,' he said.

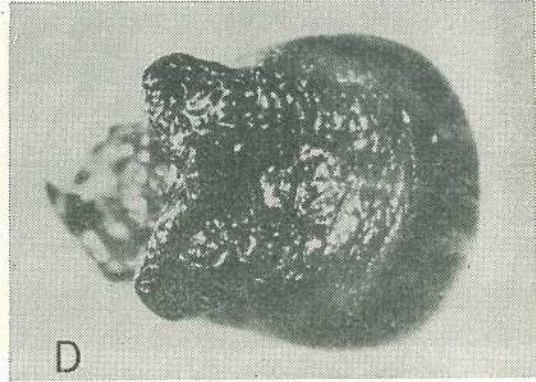
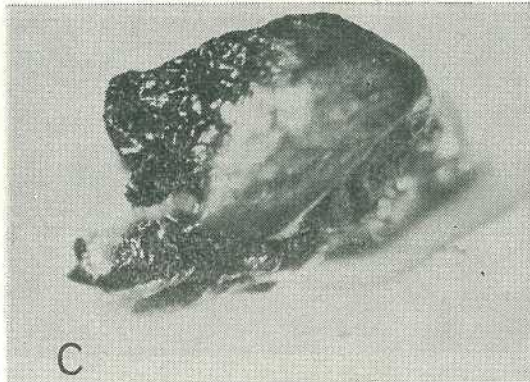
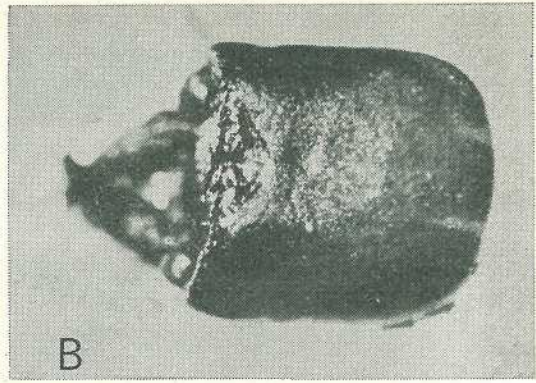
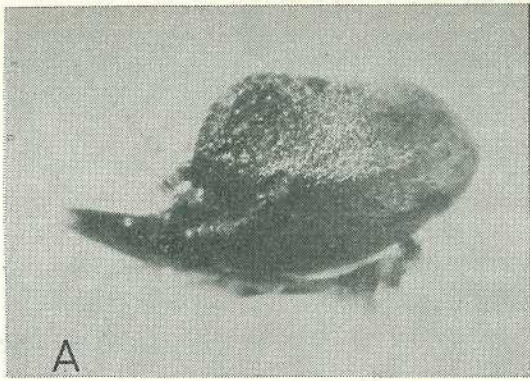
District Committees should not experience difficulty in obtaining adequate stocks of chemicals when they are needed.

Mr. Sullivan also pointed out that an assessment of a locust infestation by a Departmental officer was needed before insecticides could be issued and reimbursement claimed.

In situations involving high-value cash crops where spraying would have been required for pest control in any case, growers should not anticipate significant reimbursement under the locust control programme.

In a plea for district co-operation, the Minister urged all landholders to report of any sign of locust activity to their District Plague Grasshoppers Destruction Committee where one existed or to their local Departmental officer.





The highly magnified heads of soldiers of the native drywood termite (A,B) and the West Indian drywood termite (C,D).

# West Indian drywood termite in Queensland

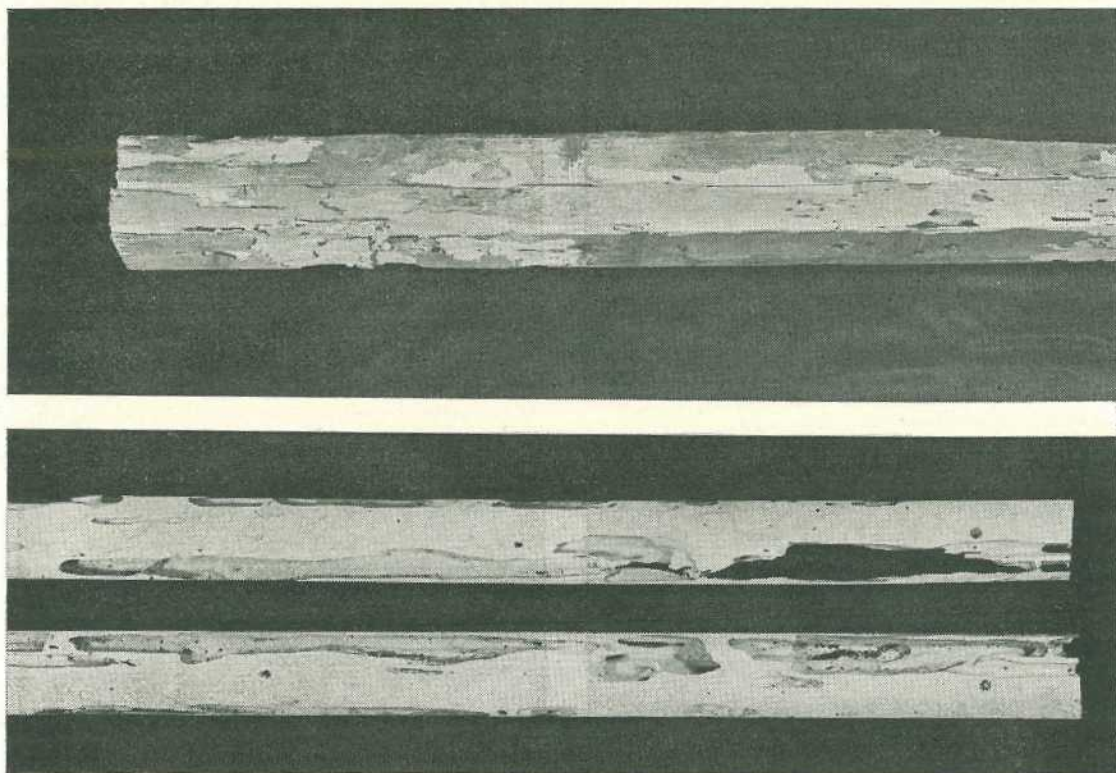
by N. W. HEATHER, Entomology Branch.

IN 1966 termites from an old house in Maryborough undergoing renovation were identified as the West Indian drywood termite\*, the most destructive known drywood termite species.

The house had been severely damaged although it was not clear when or how the infestation had originated. However, the house had been built of locally grown timbers some 60 years previously and the infestation must have originated either in a wooden article brought from an overseas country in which the termite occurred or from another local building infested in this way.

\* *Cryptotermes brevis* (Walker)





Part of a doorpost attacked by the West Indian drywood termite. Top: outer view. Bottom: internal view showing frass in clean-walled galleries, a characteristic of all drywood termites. (Forestry Department picture).

The situation in Maryborough has been confused by the widespread presence of a native drywood termite†. The two species are similar in appearance and in the damage they cause, but the overseas species has been shown to be much more destructive, hence the extreme concern.

Surveys of almost 1 000 houses in the locality of the first finding revealed several groups of affected houses, each of which was fumigated to delay further spread. Because a period must elapse between commencement of an infestation and its detection, fumigation of houses found to be infested could not entirely prevent further spread.

† *Cryptotermes primus* (Hill)

The Commonwealth Government and the Queensland Government are collaborating in an extensive fumigation programme to eradicate this insect from Maryborough and to check that it has not become established elsewhere.

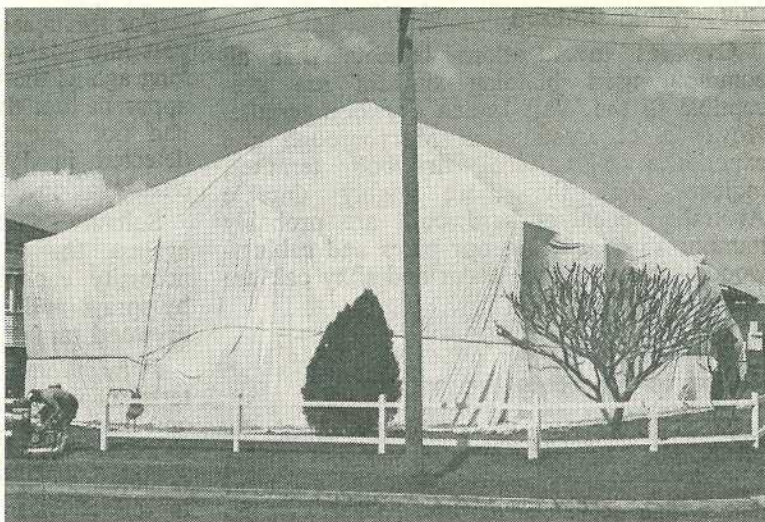
### Origin and distribution

The West Indian drywood termite is native to the Central American region but has spread to warmer countries along the trade routes of the world. It has become a major pest in some Pacific islands and coastal South Africa.

Wooden items as small as knife or tool handles can harbour an infestation and furniture is very commonly infested. This indicates the ease of transporting an infestation. It is in this important way that drywood termites differ most from the perhaps more familiar subterranean termites.



A house enveloped in gas-proof sheeting for fumigation with methyl bromide. (Forestry Department picture).



### Characteristics

The West Indian drywood termite is typical of drywood termites generally. All excavate clean walled galleries in affected timber. Unlike the subterranean termites, they need no connection to the soil for a moisture supply.

A further difference from subterranean termites is in the social structure of their colonies. Individual colonies tend to be small and queens are numerous. They do not have enlarged bodies although they are of a darker colour than workers. Workers are actually juveniles and eventually become either winged reproductives or soldiers.

Probably the most characteristic feature of drywood termites is the presence of fine dry granular frass (excreta) in the galleries. This runs freely when galleries are opened and can frequently be seen under affected wood, having been ejected by workers. Drywood termites cannot bridge large distances between pieces of susceptible timber and usually move only to undamaged timber which is in contact, for example, from floors into tables and chairs by way of the legs.

As with all termites, new colonies are initiated by winged adults which leave parent colonies in the early evening at certain times

of the year, usually in early summer. They are weak fliers and are attracted to nearby lights where they pair, lose their wings, and seek a suitable site for a new colony.

A favoured site is the emergence hole of a borer such as the Queensland pine beetle<sup>‡</sup> or the powder post beetle<sup>§</sup>. Establishment of a new colony takes more than a year and usually up to 3 years elapse before it produces winged reproductives. Dispersal between adjacent houses would probably be more common in this way than in items of wood.

### Symptoms of attack

Where attack is well advanced, galleries can usually be detected by tapping or probing. The presence of frass under affected wood is a further good indication of attack. Affected wood must be split to confirm the infestation.

This is also necessary for collecting specimens to formally identify the West Indian species which differs from the native species in the form of the soldier.

<sup>‡</sup> *Calymmoderus incisus* Lea

<sup>§</sup> *Lyctus brunneus* (Stephens)



### Susceptible timbers

Overseas investigations indicate that all commonly-used building timbers are susceptible to the West Indian drywood termite. However, observations at Maryborough and experience with local drywood termites, indicate that the more highly durable Australian eucalypt hardwoods are probably immune to attack, but our pines and cabinet-woods such as maple, cedar and silky oak are very susceptible.

### Action to eradicate the species

From the history of establishment of the West Indian drywood termite in South Africa and other overseas countries, it is apparent that a long delay occurs between entry of the species into a country and development of a serious pest problem. In South Africa 30 years elapsed.

For this reason, it is likely that entry of the pest into Maryborough may have occurred as long ago as the time of the 1939-45 war. It is apparent that the infestations at Maryborough had not reached a critical stage when first detected in 1966 and thus there is every chance of successful eradication.

Suitable quarantine eradication measures against the West Indian species are of necessity considerably different from control by sprays and injection normally used against drywood termites.

Fumigation is essential to ensure that all termites within a building are killed at once and fumigation of adjacent buildings is equally necessary in case there are small, undetected colonies resulting from spread by flight of reproductives.

The fumigant most commonly used is methyl bromide and the entire building is first cocooned in gas proof sheeting.

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## Horse imports from United Kingdom

A Maryborough Divisional Veterinary Officer (Mr. C. R. Hass) is in the United Kingdom supervizing the transport, by air, of a consignment of horses being imported into Australia.

Announcing this, the Minister for Primary Industries (Hon. V. B. Sullivan, M.L.A.) said air-freighting of horses from the U.K. and Ireland had been permitted since 1 December 1972, provided that aircraft used a prescribed route.

Travel by air was designed to obviate possible exposure to African horse sickness when travelling via the Cape of Good Hope or equine encephalomyelitis if travelling via Panama.

Previously, horses could be imported only by sea.

Mr. Sullivan said that, with such consignments, the Commonwealth Health Department required that an official veterinarian from Australia go to the U.K. to check all animals before embarkation to ensure freedom from disease and to supervise them during flight.

Veterinarians from each of the States and the Northern Territory already had undertaken one such visit.

'The Commonwealth Department advised that a further consignment of horses was expected to be ready for departure and asked that Queensland, in its turn, make a veterinary officer available to accompany it,' the Minister stated.

'Mr. Hass is a quarantine officer and the assignment provides valuable experience not otherwise available.

'Travelling costs and expenses are borne by the importers.'



# Aneilema and Murdannia

by BERYL A. LEBLER, Senior Botanist.

THREE native herbaceous plants, closely related to Wandering Jew, known by most gardeners, begin to bloom in early summer.

Two have white flowers and are species of *Aneilema*. They grow in rain-forests, along road edges, on shady banks beneath shrubs and ferns, or along creek banks.

The third is *Murdannia graminea* which has lavender to violet flowers. It grows in grasslands and in open eucalyptus forests among grass. This plant frequently appears in lawns of houses in outer Brisbane suburbs bordering on the mountain ranges.

The name *Aneilema* is derived from the Greek prefix *an* meaning without, and the Greek word *eilema* meaning a veil or covering. It refers to the fact that the inflorescence is not included in a spathe; that is, it is not sheathed by an oblique leafy bract.

*Aneilema* species are always weak herbs with ascending or erect flowering stems. Their leaves are alternate with bases which sheath the stems. The flowers are small and, in most species, are arranged in terminal panicles with a small concave bract beneath each pedicel.

Each flower consists of three sepals, three spreading petals, usually six stamens, and an ovary containing three cells. Sometimes both the number of stamens and the cells in the ovary are reduced by abortion. The sepals are green and the petals white and very delicate in texture.

In most species, three of the stamens are perfect and produce pollen, and the remainder are staminodes. The filaments are glabrous. The ovary in most species consists of three cells, but one cell can be much smaller than the others and contains imperfect ovules, or the ovary can be two-celled.

The fruit is a capsule which is nearly globular or oblong-ovoid in shape and opens in valves. The seeds are mostly cubical and are usually covered with wrinkles.

Two species are found in south-eastern Queensland: *Aneilema acuminatum* and *A. biflorum*.

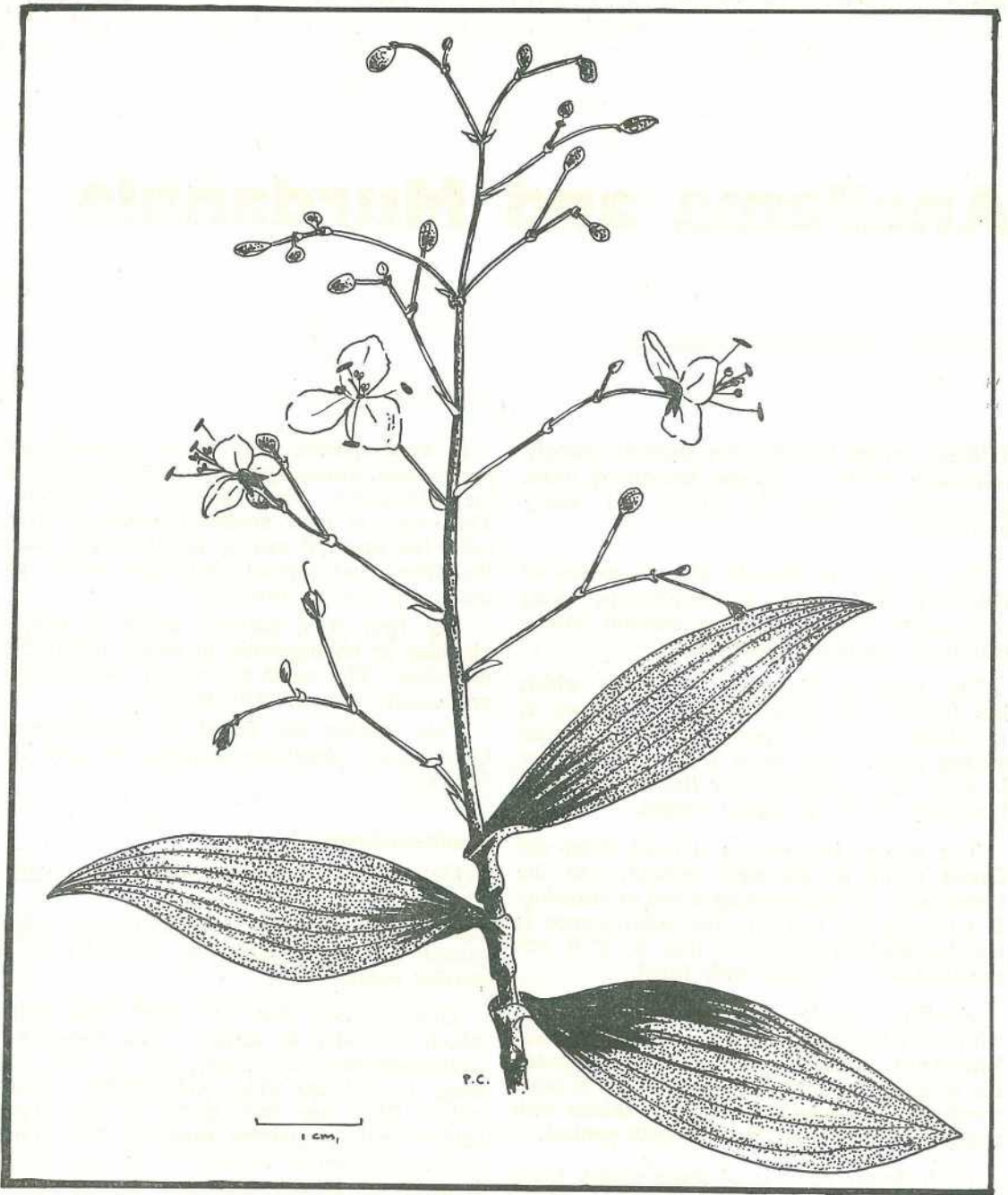
## **Aneilema Species 1**

COMMON NAME. None (*Aneilema acuminatum*).

The specific epithet is a Latin word which means tapering abruptly or gradually to a narrow point.

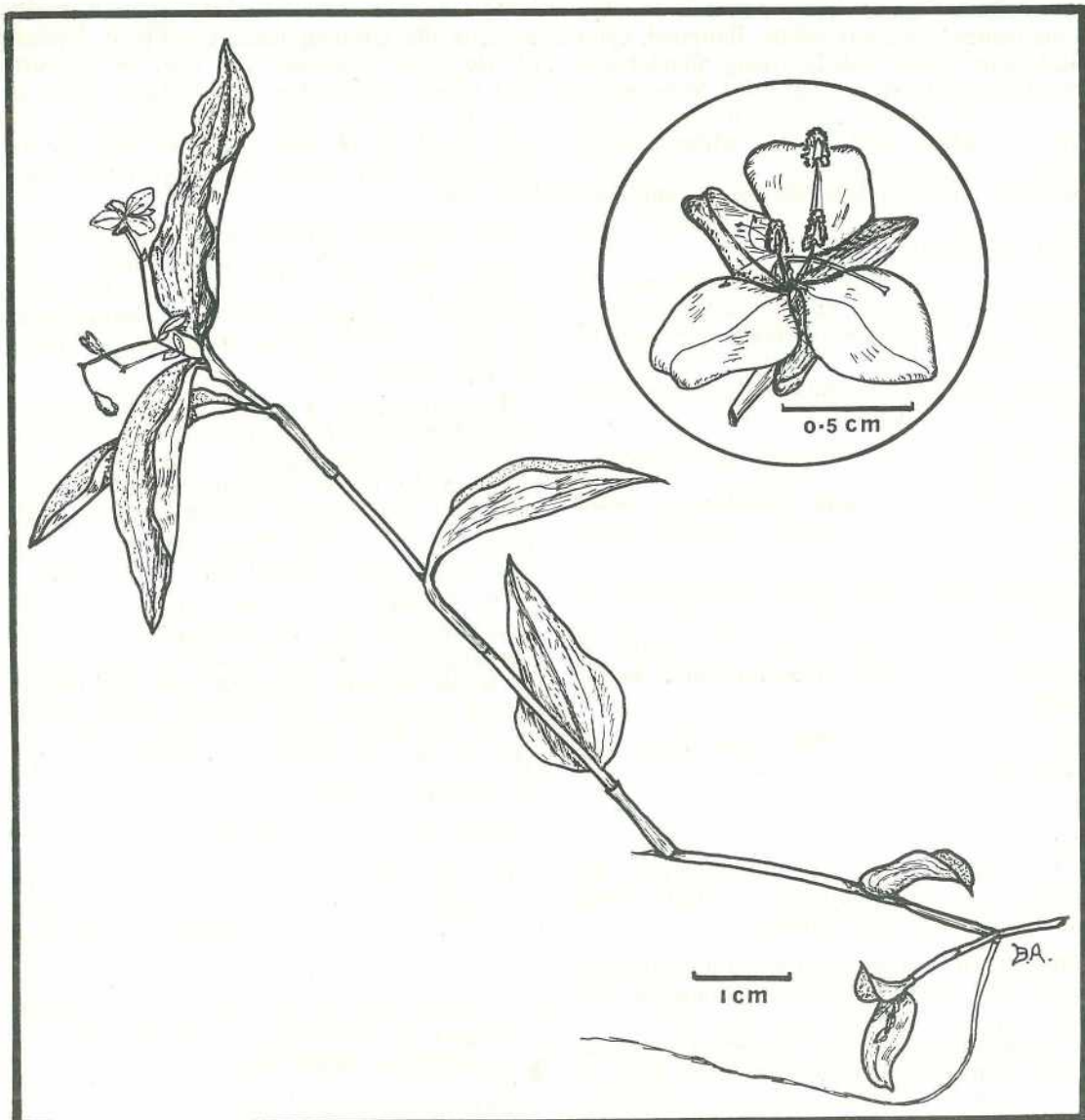
DESCRIPTION. This is a herb with stems which are wiry in texture. The leaves are ovate-lanceolate in shape, 3.5 to 7.5 cm long, 1 to 2 cm wide, and end in a blunt point. They are dark green on the upper surface, pale grey-green beneath. The upper surface is rough to the touch when it is rubbed from the tip towards the base. This is caused by minute raised dots.

On the upper surface the midrib is the most prominent vein. Two secondary veins can be seen on the lower surface, curving outwards from the midrib and in towards the



*Aneilema acuminatum*





*Aneilema biflorum*

tip. A short petiole connects the leaf to a rusty cylindrical sheath 1.5 cm long surrounding the stem. Short spreading hairs on the surface of the sheath give it this rusty appearance.

The ends of the stems are erect and reach a height of 30 cm or more. In this part of the plant, the leaves are sometimes crowded together. The stem ends in a delicate-looking

panicle with many fine branches and flowers on thread-like pedicels. Only a few fragile flowers are open at a time, and never more than one on any branch of the panicle.

The three sepals are green, edged and tipped with purple. When the flower opens, the sepals fold back along the pedicel. The petals are twice as long and are white. In outline the flower shape is triangular, each petal also being triangular, with a very short narrow claw at the base and a rounded apex.

Each flower is more than 1 cm in diameter. In the centre is a short, white, flattened, cylindrical ovary which ends in a long, slender style curved abruptly out to one side. Surrounding the ovary is a ring of stamens, three with long white filaments and large, white, perfect anthers. These are opposite the sepals. The staminodes are opposite the petals and have shorter, white filaments and kidney-shaped yellow staminodes.

The long white style and the stamens, the filament of one often being shorter than the others, give the flower a delicate lacy appearance. The fruit is a flattened capsule and contains seeds whose outer surface is covered with warty wrinkles.

**FLOWERING TIME.** Summer and autumn.

**HABITAT.** In or near rain-forests, along road edges, on shady banks or along creek banks.

**DISTRIBUTION.** This plant is found only in New South Wales and Queensland, in the coast and adjacent plateaux, from as far south as the Shoalhaven River to as far north as the Mulgrave River.

**GENERAL REMARKS.** This plant grows only in Australia.

### **Aneilema Species 2**

**COMMON NAME.** None (*Aneilema biflorum*). The specific epithet is a Latin word meaning having two flowers.

**DESCRIPTION.** This plant is a rather insignificant, weak herb with slender branches that creep over the ground, rooting at the nodes and sending up short, erect, flowering branches. In luxuriant growth, these can be as high as 15 to 20 cm, but more often are only half that height.

The leaves are dark green, ovate-lanceolate, 2.5 to 3.5 cm long and 1.5 cm wide. They end in an acute point. Beneath each short petiole, a brown-tinged leaf sheath extends down the stem 0.8 cm. The midrib is the only prominent vein on the upper surface and shows as a lighter green line.

The lower surface is dull pale green. One or two parallel veins can be seen on either side of the midrib. In certain lights they can sometimes also be seen on the upper surface.

The inflorescence is terminal and rarely exceeds the terminal leaf. Usually it consists of two short branches, each with two flowers. The white flowers are the smallest found in these three plants. They are 0.8 cm wide, with pale green sepals less than half the size of the petals. The sepals are cupped and have blunt tips.

The staminal filaments are white and three fertile stamens with large white anthers stand erect on one side of the ovary. On the other side are three much smaller and more slender staminodes which curve outwards, following the line of the sepals.

The white style is shorter than the stamens and is bent outwards at a sharp angle between two of the fertile stamens. The lobe of the ovary on the side of the staminodes is smaller and does not contain perfect ovules. Each flower is on a pale green pedicel 0.3 cm long, with a short, cupped bract at its base.

The flowers are triangular in outline, each petal with a short, broad claw at the base and a rounded tip. When the flower first opens, the fertile stamens are erect, with the middle stamen opposite a petal, and the others opposite sepals. The anthers shed their pollen soon after the flowers open. As the flowers fade the stamens decline against the petals.

**FLOWERING TIME.** Summer to autumn.

**HABITAT.** It grows in the same habitat as *A. acuminatum*, often alongside it, and can form a carpet over moist banks or roadsides.

**DISTRIBUTION.** This has a very restricted distribution from as far south as the coastal tablelands of northern New South Wales to as far north in Queensland as Gympie.

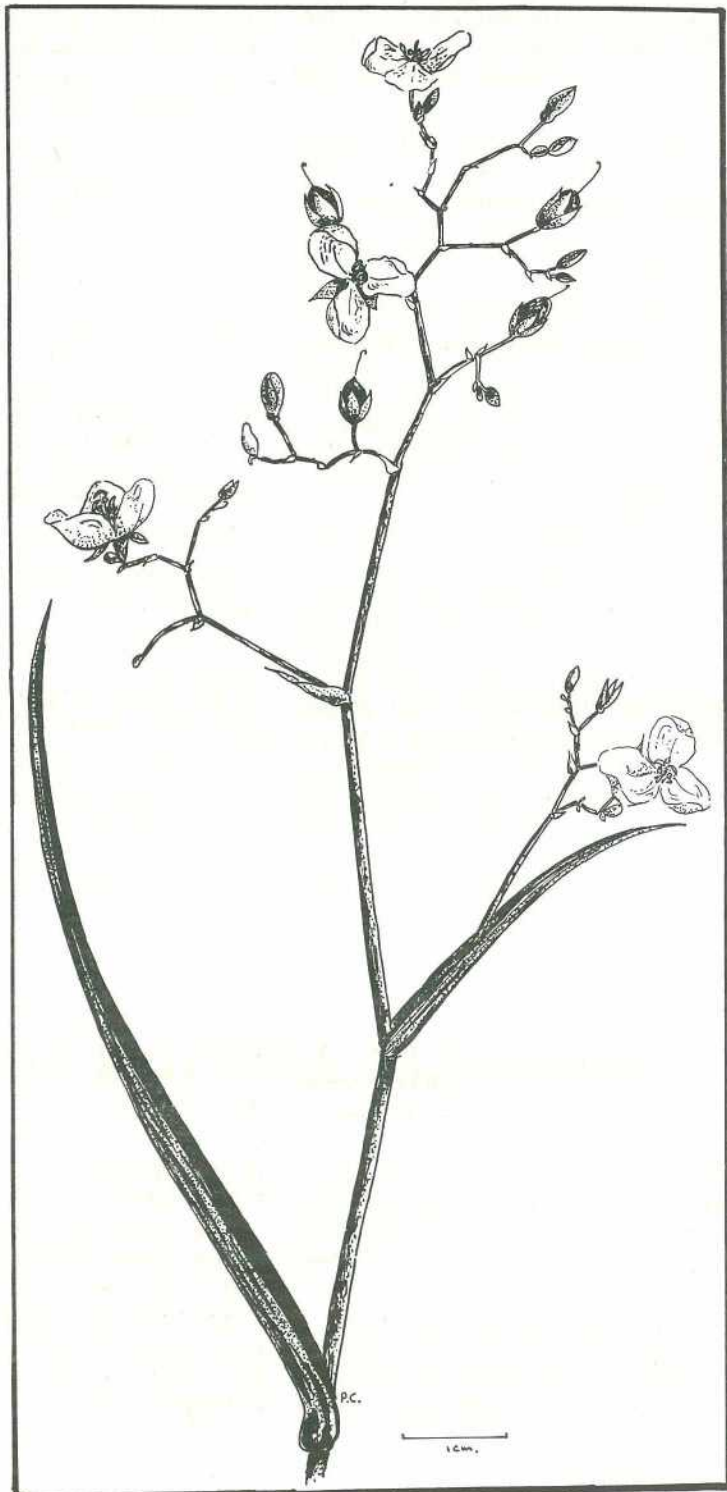
**GENERAL REMARKS.** This also is found only in Australia.

### **Murdannia**

**COMMON NAME.** None (*Murdannia graminea*).

The name *Murdannia* was first used by J. F. Royle, a British surgeon and naturalist. He lived in India for 32 years and in 1837 published his book 'Illustrations of the botany of the Himalayan Mountains'. The genus was





*Murdannia graminea*

January-February 1975

Queensland Agricultural Journal

99

named in honour of 'Murdan Aly, who collected many plants described in this work.' The specific epithet is a Latin word meaning grassy or grass-like.

**DESCRIPTION.** This is a herb with a white, fleshy, thickened, tuberous root from which a tuft of grassy leaves develops. At the time of flowering, an erect stem emerges from the centre of the tuft with the basal leaves sheathing the stem. The sheath can be up to 2.5 cm long. The leaves are glaucous and are concave.

A sparse covering of short white hairs covers the lower surface, and a scattering of hairs can also be found on the upper surface. The basal leaves can be as long as 23 cm and 1 cm wide and end in a blunt point. The erect stem can be 60 cm long but is usually much shorter. It is firm in texture but not wiry.

The terminal branched panicle is subtended by a shorter reduced leaf with bracts of a similar form beneath each branch of the inflorescence and very tiny bracts beneath each flower. Between the base of the stem and the panicle there are usually several leaves with sheathing leaf bases tinged with purple.

The flowers are between 1.5 and 1.75 cm wide. The sepals are green, tinged with lavender, 0.6 cm long, pointed and keeled. The widely spreading petals are 0.8 cm long and

approximately the same width with a very short claw at the base and a rounded tip.

All of the stamens have bearded filaments of a deeper tone than the lavender to violet petals. Long, thread-like, purple hairs stand out at right angles to the filaments to form the beard. The stamens are more densely bearded than the staminodes. The fertile stamens are opposite the sepals and are twice as long as the staminodes, which are opposite the petals.

The sterile anthers on the staminodes are hastate and bright yellow. Fertile anthers are white and have begun to shed the pollen before the flower opens. The pale green, three-lobed ovary is almost as long as the staminodes and the pale lavender or white style bends out abruptly to one side.

**FLOWERING TIME.** Summer to autumn.

**HABITAT.** In sandy soil among grass in open eucalyptus forest.

**DISTRIBUTION.** It is found in New South Wales as far south as the Hunter River to as far north as Babinda in Queensland and also in the Northern Territory.

**GENERAL REMARKS.** Although the flowers are lavender on the coastal plains, on the Darling Downs they are blue.

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## TOWNSVILLE ABATTOIR BOARD

A Townsville district grazier, Mr. L. J. J. Turner, has been appointed a member of the Townsville Public Abattoir Board to fill the vacancy caused by the death of Mr. H. G. Cox, of Inkerman.

Announcing this, the Minister for Primary Industries (Hon. V. B. Sullivan, M.L.A.) said Mr. Turner had been chosen from a panel

of names of beef producers submitted by the United Graziers' Association of Queensland.

The panel had been recommended to the U.G.A. by the Graziers' Association of Central and Northern Queensland.

Mr. Sullivan added that Mr. Turner would serve the remainder of the term of the late Mr. Cox, which was due to expire on 6 October 1976.



# Brands and earmarks for Qld. stock

by K. M. VERNON, Registrar of Brands.

THE LARGE livestock numbers in Queensland make it necessary for stock-owners to have a convenient and reliable means of identifying their animals.

For those wishing to mark their stock, a system of registration of brands and earmarks is in operation.

The success a stock-owner achieves from branding depends largely on his carrying out the branding and earmarking in accordance with the requirements of the 'Brands Act'.

In 1872, the original Brands Act of Queensland was proclaimed with its objects the recovery of stray and stolen stock, the prevention of cattle and horse stealing, and the detection and conviction of horse and cattle stealers.

The value of brands and earmarks as an aid in disease control was also recognized early by legislators who incorporated the provisions of 'The Sheep Brands Act of 1876' into 'The Diseases of Sheep Act of 1890'.

After 31 March 1974, all cattle of a live-weight exceeding of 100 kg must bear one brand before being sold. Although it is compulsory to brand cleanskin cattle offered for sale, crossbranding is still at the discretion of the owner.

It is not compulsory to earmark cattle nor is it necessary to brand horses or brand or earmark sheep and goats.

Provision exists in certain circumstances for persons or classes of cattle to be exempted from sale branding. Each application is determined on its merits by the Minister for Primary Industries.

Registration of tattoo brands, pig brands and paint brands used for temporary identification of cattle and horses is not necessary.

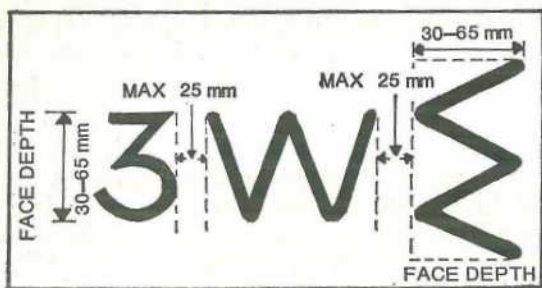
Age, stud or herd book numerals used by the breeder or first brander in conjunction with his registered brand are not required to be registered.

Ear tags may be used, but they must be inserted so that they do not interfere with earmarks.

To avoid confusion, before brands and earmarks are allotted and registered, consideration is given to the brands and earmarks already in use by near neighbours. These details must be supplied by the person applying for registration.

## Horse and cattle brands

A horse and cattle brand is registered for use anywhere in Queensland, but initially for use on a property specified by the applicant. Its use elsewhere in the State depends upon the brand not conflicting with brands already in use in that locality.



Brand size and spacing of characters (figure 1).

In 1872, Queensland adopted a system of registering brands consisting of two letters or characters and one numeral.

The demand for brands has necessitated some variation in the letters and characters, but the basic system of 'three-piece' brands has been retained. It is, however, possible to register a symbol brand for use in addition to or instead of a three-piece brand.

Under the Brands Act, a **symbol brand** is defined as any horse and cattle brand consisting of a device or pattern as the registrar approves, and which can be briefly described in writing. In the latter part of the 1890s, much attention was directed to the effect branding had upon the value of horses bred for export and on the market value of the hides of store cattle.

It was then contended that a symbol brand would be smaller and less damaging than the brands generally in use. As a result, symbol brands were introduced. To distinguish between brands registered in other States, all Queensland symbol brands were, and still are, required to include a dot to the right of and in line with the lower part of the device or symbol.

This is an example—



Before the introduction of the present system, it was not considered strange to see an animal branded in large letters with the

name of the owner. It is recorded that, at one time, such brands as NOLAN AND LAPPY and MOLONEY were in use.

### Branding instruments

Owners should, in their own interests, ensure that their irons are manufactured correctly. At the time of imprinting, all characters in a three-piece brand must have a face depth of not less than 30 mm or more than 65 mm. The space between the imprinted characters must not be more than 25 mm. Face depth is determined on the vertical height of the character. Face depth of a sideways letter is determined with the letter in the vertical position.

The method of determining brand size and the spacing of characters are shown in the illustration. Measurements are shown in figure 1.

All three-piece brands with a sideways letter as a component are required to have the sideways letter permanently affixed to another character in the brand. This is aimed at minimizing the incidence of incorrect branding through the sideways letter being imprinted incorrectly.

The face depth of a symbol brand, when imprinted, must be not less than 30 mm or more than 80 mm.

A brand must be imprinted in accordance with the description on the certificate of registration and no distortion or modification is permissible. In some letters and numerals, bars (serifs) are attached to the extremities as an aid in the detection of altered brands.

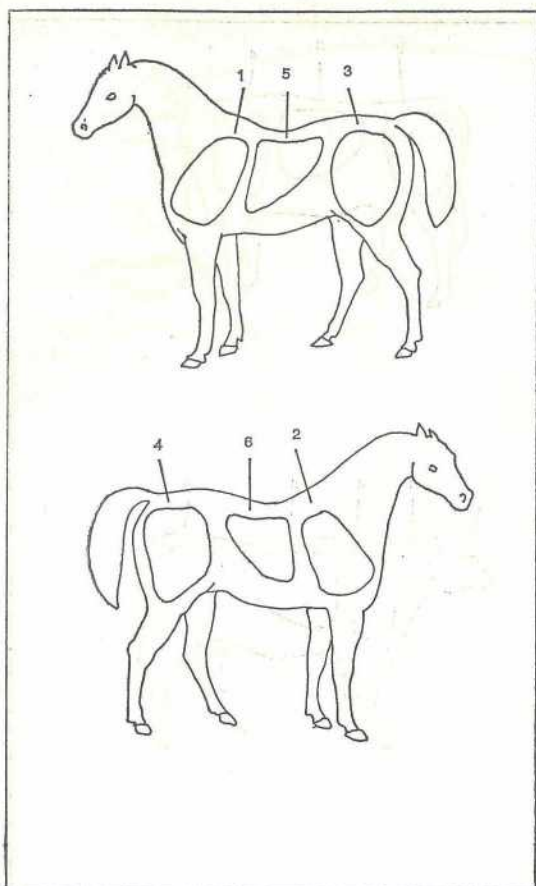
Supply of the actual branding irons or ear-marking pliers is the responsibility of the registered owner who should approach a private firm directly in this regard.

### Positions for branding

The 'off' refers to the right side and the 'near' to the left side of horses and cattle.

The first brander, having elected to brand on a particular position, may retain that position, or he may, if he finds this position inconvenient, change to any one of the other positions.





Position and order of brands on horses and camels (figure 2)

First position—'Near shoulder'

Second position—'Off shoulder'

Third position—'Near quarter' or 'near thigh'

Fourth position—'Off quarter' or 'off thigh'

Fifth position—'Near ribs'

Sixth position—'Off ribs'

It is not possible to register a specified position for use of a three-piece brand.

**HORSES.** The first brander may imprint his registered three-piece brand or symbol brand on his horses on any of the following positions—

First position, near shoulder; second position, off shoulder; third position, near quarter or thigh; fourth position, off quarter or thigh; fifth position, near ribs; sixth position, off ribs. (figure 2.)

**CATTLE.** The first brander may imprint his registered three-piece brand or symbol brand on his cattle on any of the following positions—

First position, neck; second position, rump or thigh; third position, ribs; fourth position, shoulder. (fig. 3.)

If he wishes, the first brander may imprint his registered symbol brand on the cheek instead of on one of the listed positions.

### Crossbranding

A crossbrand must be imprinted immediately beneath the last preceding brand at a distance of not less than 35 mm or more than 65 mm. If, in the opinion of the brander, there is not sufficient space beneath the preceding brand, the crossbrand is to be imprinted on the next position according to the table of positions. Positions follow consecutively.

For horses the first position follows the sixth and for cattle the first follows the fourth position. (See figure 4.)

Where horses and cattle are branded only on the cheek with a symbol brand, the second brander may brand on any of the listed positions.

### Reducing hide damage

Earlier in this article, the permissible sizes of brand characters were stated. These restrictions were imposed in an effort to minimize hide damage caused through the use of unnecessarily large brands.

Much of the damage to hides, however, is caused through crossbranding on both sides of an animal in such a manner that the hide is rendered practically useless for the leather trade. To further eliminate spoilage, branding is to be restricted as much as possible to one side of cattle.

If the last imprinted brand on a head of cattle is on the shoulder and there is insufficient space to crossbrand beneath that brand, the crossbrand must be placed (if there is sufficient space) on the neck on the same side.

The registered owner of a **symbol brand** may, upon application to the Registrar of Brands, be allotted a **specified position** upon which to

imprint his symbol brand when branding acquired stock previously branded before acquisition.

Once such a position has been registered, all crossbranding with the symbol brand must be carried out on this position. If space is not available on the 'Specific position', the brand must then be imprinted beneath the last imprinted brand.

**Distinctive brands**, usually consisting of a numeral or a letter, are registered for use on the cheek of horses and cattle and only in conjunction with a registered three-piece brand or symbol brand. They may be used to indicate age, class, inoculation or any other fact which the owner desires to denote.

Where a brand is registered in names of members of a family or partnership, distinctive brands may be registered and used to denote ownership of individual members of the family or partnership.

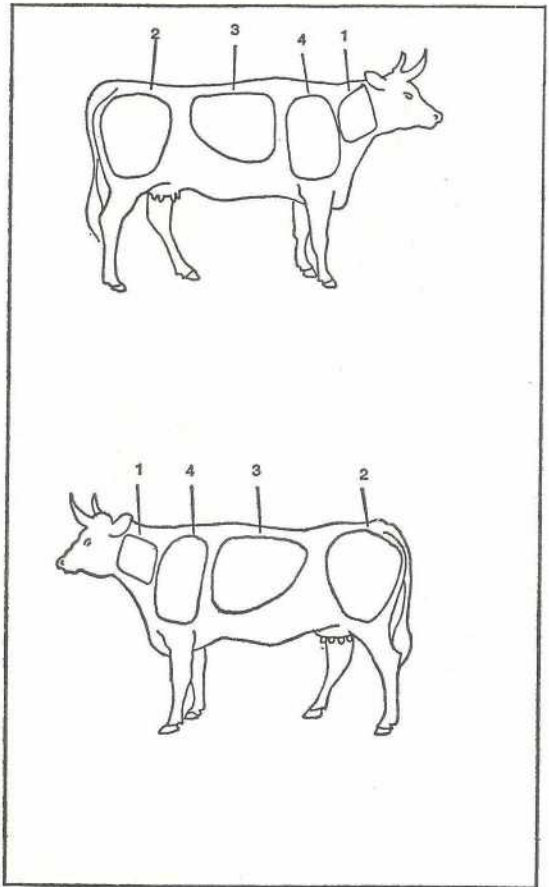
**Special brands** are allotted and registered to Breed Societies for use by their members and for use on specified portions. The size of these brands is laid down at the time of registration and members must ensure that they use only brands of the correct size. These brands must be used only on the authority of the Breed Society and for the purpose for which they are registered.

Special brands are also registered to public instrumentalities to indicate ownership and provision has also been made for registration by the Commissioner of Police of special brands for identifying suspected stolen stock.

**Pound brands** are registered for use by local authorities and on the sale of any impounded horses or cattle the animals must be branded with the registered pound brand in such a manner that the pound brand appears as the last imprinted brand.

**Distinguishing brands** have been approved for special purposes, for example, a broad arrow over the letter 'T' indicates cattle infected with tuberculosis and permanently isolated. These brands are to be applied by authorised persons only.

Age, Stud or Herd Book numerals may be imprinted by the first brander in addition to his registered brand. The face depth of these



Position and order of brands on cattle (figure 3).

First position—'Neck'

Second position—'Rump or thigh'

Third position—'Ribs'

Fourth position—'Shoulder'

numerals must be not less than 30 mm or more than 65 mm. Should a second line of numerals be necessary, they should be imprinted at the same distances.

It has been argued that, where speedy identification of individual animals from horseback or from the yard rails is desirable, it is an advantage to have these numerals high on the ribs. For this reason, provision was made allowing the first brander, who brands his cattle on the ribs, to number his cattle either above or below the registered brand.



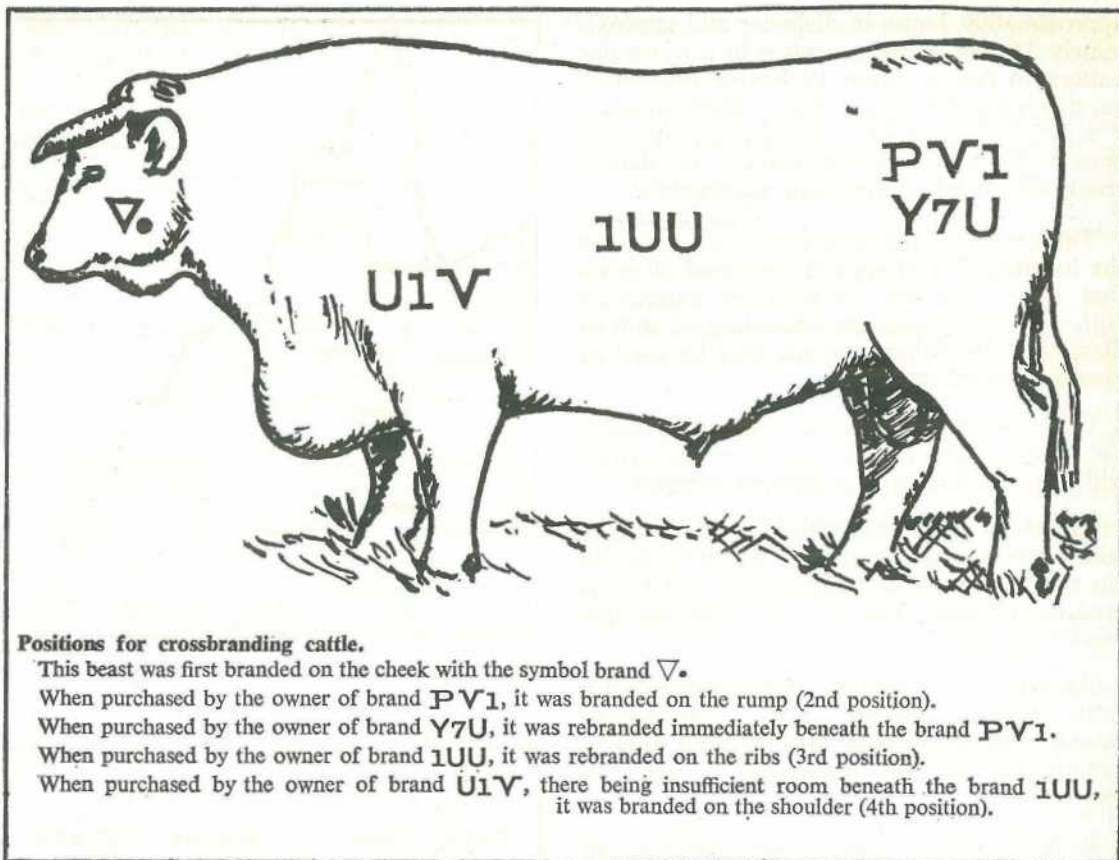


Figure 4.

Numerals may not be used except with a registered brand and on no account must these numerals be placed away from such brand.

### Cattle earmarks

All cattle earmarks registered since 1915 are for use only in a prescribed district. These districts are shown on the map. See figures 5 and 6.

To provide each applicant with an earmark which would be different from earmarks already registered and in use by neighbours and near neighbours, it has been found necessary to subdivide some of the more closely

settled districts. An earmark registered for use in a sub-district may, however, be used within the boundaries of the district proper.

An earmark is initially registered for use on a property specified by the applicant and may be used elsewhere in the district only if the earmark does not conflict with earmarks already in use at the new address.

In earmarking, the marks must be of the shape and on the portions of the ear or ears as indicated in the registration certificate.

Earmarks are no longer registered for use in the centres of the ears. The centre of the off ear has been reserved for official inoculation earmarks consisting of three holes

approximately 7 mm in diameter and approximately 15 mm between centres in a triangular pattern to denote strain 19 bovine brucellosis vaccination and three holes approximately 7 mm in diameter in a straight line approximately 15 mm between centres to denote strain 45/20 micro-organism vaccination.

The centre of the near ear is set aside for the identification of spayed cows and all cows that have been spayed must be earmarked with a circular mark not exceeding 40 mm in diameter. No other earmark may be used to identify spayed animals.

Care should be taken to ensure that pliers for cutting spay marks are of a size which will not interfere with registered earmarks.

Earmarks of all descriptions must be made with pliers and not more than one-third of the ear must be removed when making the registered cut or cuts. The use of a knife for earmarking is illegal.

As a brand is evidence of ownership and a cattle earmark only an aid to quick identification, a cattle earmark may be used only in conjunction with the brand with which it is registered.

It is an offence against the provisions of the Brands Act 1915-1974 to earmark without branding.

Purchased cattle with two full ears may be earmarked provided they are branded with the brand with which the earmark is registered.

Except to indicate spaying or bovine brucellosis vaccination, an animal earmarked with a registered mark may not be re-earmarked with another registered earmark.

It is possible to register more than one earmark for use with the one registered brand. But should more than one earmark be required to be registered in any one district, the applicant for registration must satisfy the Registrar of Brands that the registrations are warranted.

No more than three earmarks may be registered with the one brand in any district. It is not possible to register an earmark to identify



Districts for registered cattle earmarks (figure 5).

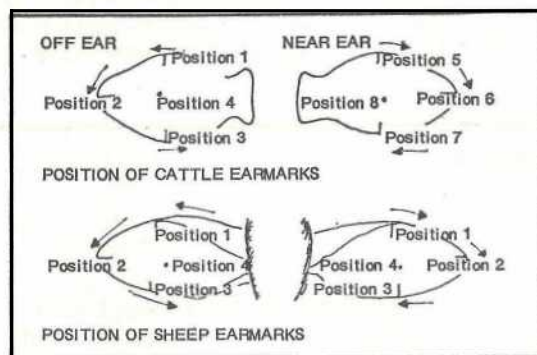


Figure 6.

cattle owned by individual members of a family or partnership who are the common holders of a registered brand.

### Sheep brands and earmarks

Sheep brands and earmarks are registered on a district basis and, except in the case of travelling sheep, may be used only within the boundaries of the district for which they are registered.



The boundaries of sheep brand and earmark districts are the same as the cattle earmark districts. With travelling sheep, a sheep brand and earmark may be used on sheep in another district provided the sheep are moved within 7 days to the district for which the brand and earmark are registered.

If, for some reasonable cause, the sheep cannot be moved within 7 days, they must be moved as soon as reasonably practicable.

The Stock Act 1915-1974 requires all travelling sheep to be branded with the letter T not less than 75 mm long. Exceptions are where sheep are legibly branded with the owners' registered sheep paint brand and are intended to be driven not more than 65 km, or conveyed by rail or motor vehicle to their destination or

1. are intended to be driven to a pound;
2. are stud sheep travelling to a sale or show;
3. are fat lambs travelling to a saleyard or licensed slaughter house.

Sheep earmarks may be used without a sheep paint brand or fire brand, and vice versa.

While a horse and cattle brand is permanent, the most extensively used sheep brands, that is, paint brands, are intended to last only from one shearing to the next. Even so, on the open, treeless plains of Queensland's north-western sheep areas, the branding fluid may not be persistent.

However, in the wool growers' interests, the use of tar brands is not permitted. Regulations under 'The Agricultural Standards Act' prohibit the sale in Queensland of non-scourable, fleece-marking preparations.

Brands may consist of single or double letters or numerals or a combination of a letter and numeral. Brands other than these are classed and registered as symbol brands.

A sheep paint brand is registered for use on a specified position and only the colour stated on the certificate of registration may be used. However, where a certificate specifies black, the colour blue may be used. Three colours are now available for registration—blue, red and green. The need for

the sheep owner to adhere to the registered position and colour cannot be stressed too much.

It must be realized that once a person brands on the wrong position or with a different colour, the brand so imprinted is no longer that person's registered brand. As a result of branding irregularities, difficulties in establishing ownership could easily arise.

Fire brands are registered for use on the face and horns. Firebranding of sheep is not practised extensively but, for identification of sheep which have been earmarked before purchase, firebranding offers an advantage to the sheep owner requiring greater proof of ownership. The size of sheep brands is not laid down, but generally paint brands up to 100 mm and fire brands up to 20 mm are used.

Sheep brands and earmarks may be registered and used for identification of goats.

### Sheep earmarks

All sheep earmarks registered to denote ownership must be made on the off or right ear of male sheep and on the near or left ear of female sheep. The positions are shown in the illustration. (See figure 6). Earmarks are read around each ear beginning at the front or top of the ear.

When sheep have been earmarked with a registered mark, they must not be again marked on the 'registered ear'.

### Distinctive marks

To denote the age or class of his sheep, the registered owner of a sheep brand or sheep earmark may use distinctive marks on the near or left ear of male sheep and on the off or right ear of female sheep. No distinctive marks may be used which are similar to or can be readily converted into any registered earmark used in the same locality.

The shape and number of distinctive marks is not limited, but it would facilitate recognition of age marks if the notch were used.



It is not recommended that owners use their 'registered' pliers for distinctive or age marking.

With a conglomeration of distinctive or age marks, much confusion arises when sheep of New South Wales origin mix with Queensland sheep. In New South Wales, sheep earmarks are made on the opposite ear to that marked in Queensland.

### **Transfer of brands and earmarks**

The right to a registered horse and cattle brand, sheep brand or sheep earmark may be transferred. Unless otherwise requested by the transferor, any cattle earmark or symbol brand registered in conjunction with a three-piece horse and cattle brand will be transferred simultaneously with that brand.

A transfer of a cattle earmark, sheep brand or sheep earmark is possible only where the transferee requires it for use in the district for which it was originally registered.

So far as the Brands Act is concerned, the transfer of any brand or earmark does not imply transfer of ownership of any stock bearing the brand or earmark at the time of transfer.

It is not sufficient to assume that, following on the change of ownership of a property, registration of the brand or earmark associated with the property is automatically transferred.

It is the responsibility of the purchaser, before making use of the brand or earmark, to make certain a transfer form has been completed, that registration has been transferred and that he receives a certificate issued by the Registrar of Brands accordingly.

In the event of the death of the owner of any brand or earmark, the person wishing to make further use of the brand or earmark should ensure that registration of the brand or earmark is transferred or that the Registrar of Brands is notified in the case where registration is required to the estate.

Provision was made in amendments to the Act for the vendor of a property to allow the new owner to carry on using the cattle earmark associated with the property. He must, however, sign a cancellation authority in

favour of the purchaser who would then make application for registration of the cattle earmark.

### **Brand returns**

Before 31 January each year, the owner of a registered brand and/or earmark at 1 January is required to advise the Registrar of all brands and/or earmarks in use by him. Forms for this purpose may be obtained from the local office of this Department and for the convenience of the stockowner these forms may be lodged with the annual Stock Return.

Once it has been determined which brands and/or earmarks are in use, the Registrar is able to take steps to cancel the registration of those no longer required.

### **Alteration of address**

To avoid the possibility of cancellation of registration, owners of brands earmarks should notify the Registrar of any change of address. Notification of alteration of address is then published. These monthly publications also contain details of all brands and earmarks registered, transferred or cancelled during the month.

### **Directory**

A Horse and Cattle Brands Directory is normally published every four years.

A Sheep Brands and Earmarks Directory is also published at intervals and copies of Directories may be inspected at the local Stock Inspector's Office, Police Station, Court House or Pound.

This article does not cover all aspects of the Brands Act but outlines the basic principles.

Failure to comply with the provisions of the Act renders the offender liable to the penalty of up to \$400. Inquiries about the use of brands or earmarks can be made through any local office of the Department of Primary Industries or direct to the Registrar of Brands, Department of Primary Industries, William Street, Brisbane, Q. 4000.





*A sample of the range of smallgoods that it may be necessary to store in the home.*

## Care of meat and meat products

by W. R. RAMSAY, Senior Meat Quality Officer; and B. DOBREN OV, Veterinary Food Technologist, J. C. Hutton Ltd.

MEAT, like all other natural foods, may spoil and be lost if it is not handled properly at all stages of preparation, distribution and storage.

Because of the need to ensure high standards of hygiene, meat is examined by Government Inspectors during production. Butchers' shops and trading practices are governed by regulations to make sure consumers get a fresh, wholesome product.

High standards should apply to storage of meat in the home to make sure it retains

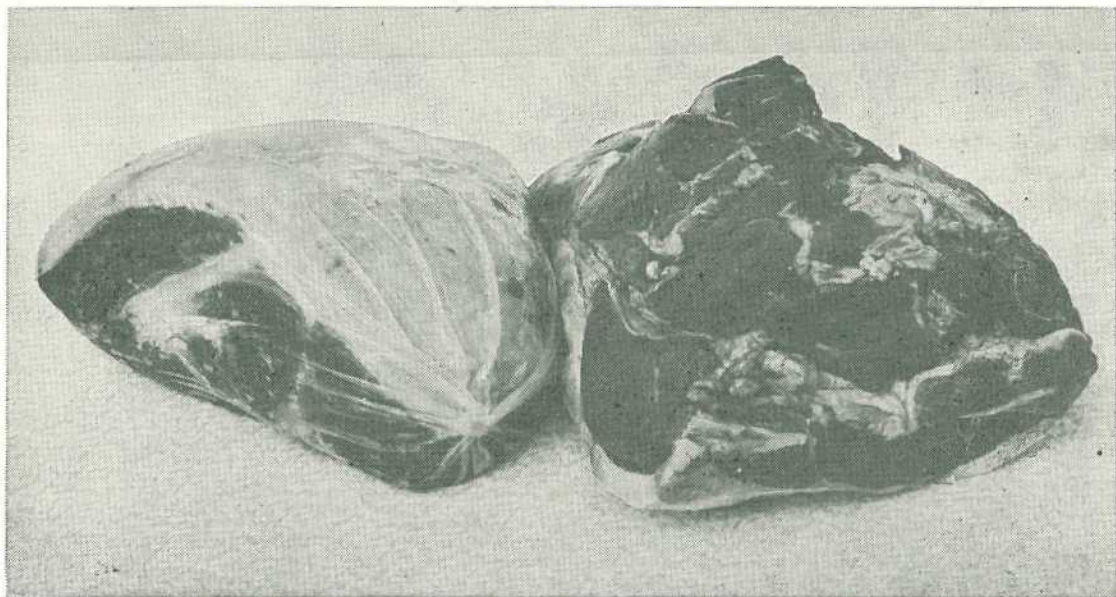
its safety, freshness and best possible condition up to the point of preparation for the family meal.

It is impossible to state safe storage times which will cover all conditions of storage in domestic refrigerators. Times quoted for various products can be taken only as guides.

### The refrigerator

The period that meat or meat products can be stored in a refrigerator varies with the efficiency of the refrigerator, the temperature at which it is set and the number of times the door is opened allowing warm air to enter. Meat which is very fresh when purchased has a longer safe storage period than meat which is bought less fresh.





A whole cut of beef vacuum-sealed in a plastic bag (left) and a similar cut turned out of the bag after storage (right).

Domestic refrigerators have three storage compartments—

1	The freezer ..	Temperatures well below 0° C (32°F)	Freezing
2	The meat tray	Temperatures about -2° C (28° F) (meat freezes about this temperature)	Chilling Freezing
3	Cool storage compartment	Temperature varies between 1° C (34° F) and -5° C (41° F)	Chilling

The freezing area is for long-term storage; the chilling for short term. The lower the temperature in the chilling area, the longer meat may be safely kept there.

At temperatures about freezing and below, meat tends to dry out in refrigerators and it needs the protection of impervious film.

Any meat that is being kept chilled needs to be inspected periodically since it is a perishable product. Surface changes can be expected and darkening (drying) will occur on surfaces exposed to air. Since refrigerators are disiccators, some drying will occur.

These changes have little significance but should greyish areas that are slimy to the touch be observed, it indicates that the meat is coming near the end of its shelf life. Thus it must be trimmed and then cooked or frozen immediately. The slimy area should be cut off by removing a small amount of sound meat with it. The affected meat should be discarded.

If meat which was affected with slime is frozen, it must be rapid freezing. When the time comes to use it, it must be thawed and cooked quickly or cooked frozen. Slime is sometimes associated with a sour smell. If the sour smell persists after trimming, the meat should be discarded and not used for human consumption. Similarly, should the meat smell bad or putrid it must not be used for human consumption.

### General rules

Some general rules for storing meat are—

Always keep meat and meat products as cool as possible between the butcher shop and the home refrigerator. Keep the time to get them home short too.



Shop for your meat last or keep it in a portable cooler if possible.

If the product is in a vacuum sealed plastic bag, store it unopened. If the bag is broken, take the product completely out of the bag for storing.

### Freezing

Some hints on freezing meat are given below—

Conserve freezer space.

Wrap closely to avoid drying out, expel as much air as possible.

Avoid projections and prevent tearing of the wrapping.

Label with the date and name.

Keep individual pieces separate with plastic or they will stick together.

Avoid ice build up in the freezer. This slows down freezing.

Keep packages as flat as possible for rapid freezing.

Avoid putting excessive amounts into the freezer at once. Masses of meat may freeze on the outside but remain unfrozen in the middle for a long time. Should this happen, the centre may become putrid or, due to slow freezing, produce large amounts of blood-stained fluid. Ensure that freezing is as rapid as possible.

Repeated thawing and refreezing of frozen raw cuts to obtain slices for cooking is particularly damaging to eating quality. Prepare the slices, wrap in such a way that they are ready to cook frozen and do not thaw.

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*Some more samples of smallgoods packed for home use.*





## Sausage meat

Sausage meat is meat that has been minced and mixed with cereal substances, with or without herbs, salt, sugar, spices, saltpetre and water. A sausage is sausage meat enclosed in a casing.

Various types of sausage need different treatment for preservation.

**FRESH RAW SAUSAGE.** These are usually pork and beef sausages. In the chiller part of the refrigerator, 2 days may be regarded as a safe storage period. In the freezer, they will keep up to 4 months.

**COOKED SAUSAGE PRODUCTS.** From the point of view of preservation, there are two types.

One type is the sausage from which the outer wrapping is normally removed before eating, for example, windsor, ham delight and luncheon sausage.

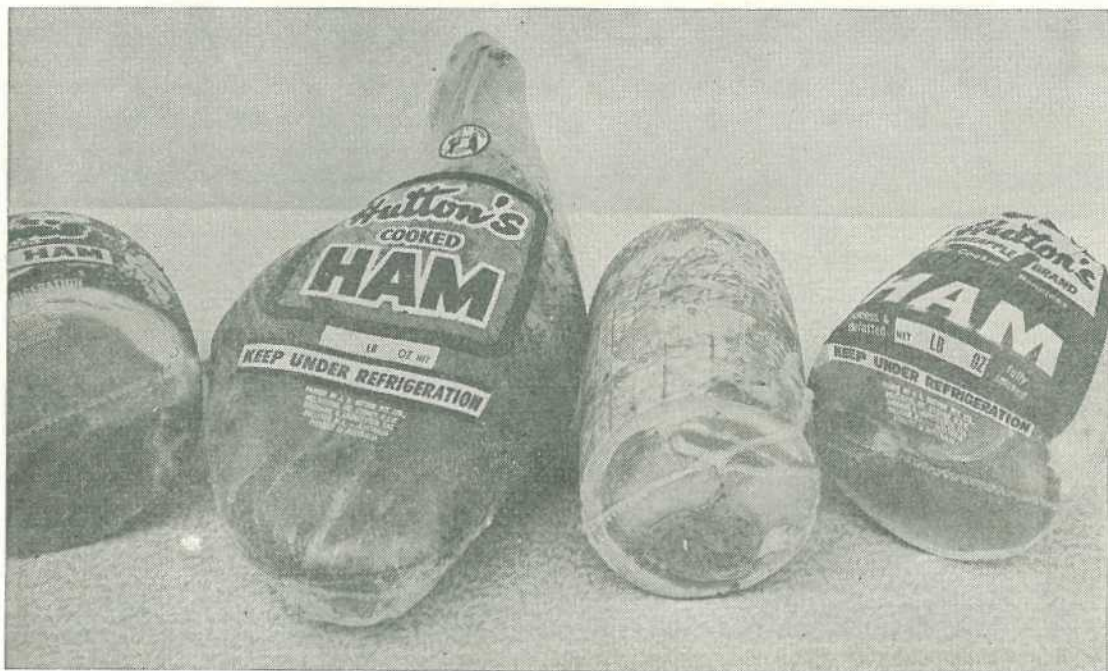
These may be chilled or frozen without further wrapping. They will keep chilled for about 5 days and frozen for about 4 months.

Should the outer casing be damaged, a plastic bag or film should be used.



▲ Two packers arrange a sample of smallgoods.

Cooked ham can be bought packed in vacuum packing film. ▼





The other type is the sausage that is eaten with the casing still on, for example, cheerios, saveloys and Australian cabana. These will keep for about 5 days in the chiller. They need wrapping for freezing, and will keep frozen for about 4 months.

**CONTINENTAL SAUSAGES.** These include salami and continental cabana.

These sausages are smoked, dry and spicy. They will keep chilled for 3 months. In fact, if there is a place which is dry, ventilated, insect-free and cool (70°F, 26°C), they will keep for up to 2 months without refrigeration.

Mould may develop on the outside during storage. If the casing is intact, this may be wiped off or washed in water. If the outer casing has been broken, the damaged portion should be cut off and discarded.

### **Bacon**

**BACON.** As with most meat products, bacon should not be kept out of refrigeration for any longer than is necessary.

Bacon brought sliced and already sealed in a plastic bag can be chilled (1 month) or frozen (2 to 4 months) in its original bag. If the bag is damaged, take the bacon out completely and store open in the chiller for up to a week.

When bacon is bought sliced and layer-packed in a plastic wrapping inside a cardboard box, loosen the plastic wrapping. It can then be kept safely chilled for a week.

Bacon bought as a slab can safely be kept in the chiller for 2 weeks.

Freezing is practical for bacon but some loss of quality occurs when it is defrosted, that is, thawed. If in its original, unbroken, vacuum-sealed plastic bag, it will last 2 to 4 months. If bought sliced and then wrapped in plastic in the home 4 to 6 weeks' safe storage can be expected.

**CANNED HAM.** There are two types of canned ham. One is pasteurized ham, which has 'Keep Refrigerated' on the label and which will keep for 6 months if the can is not opened. The other is sterile ham which does not have 'keep refrigerated' on the label. This will keep for 2 years without refrigeration. Both should be chilled before opening.

Neither type should be frozen in the can.

When the can is opened, the ham should be tipped out onto a plate and kept chilled.

**COOKED HAM.** Cooked ham may be bone-in or boneless. These can be bought packed in vacuum packing film or without it. In chilled conditions, without the vacuum packing film, ham will keep for 2 weeks. If packed in the bag 2 months storage in the chiller can be expected. Once the vacuum packing film is opened, the ham must be taken out and then has an expected life of 2 weeks.

If the ham is frozen, some loss of quality must be expected. It will be less tasty, softer, with more moisture and the texture will be more open. Thus freezing is not really recommended. If this has to be done, poly-wrap the ham, freeze and thaw it as quickly as possible.

Packed in vacuum packing films, sliced ham and sliced silverside should be treated in the same way as vacuum packed sliced bacon. Similarly products such as pickled pork and corned silverside are like ham with regard to preservation.

**MINCE, HAMBURGER AND SAUSAGE MEAT.** All of these should be kept in the chilled form for no longer than 24 hours.

Longer storage should be in the frozen form. When they are needed, they should be thawed quickly and used quickly after thawing.

**SEMI-PREPARED PRODUCTS.** These products (frozen raw hamburger patties, frozen partly cooked hamburger, specially prepared and frozen steaks and frozen partly cooked cuts) can be kept frozen at home for about a month. For best results they should be cooked from the frozen state and not thawed at all.

**OFFAL.** Offal meats can be kept chilled in the same way as raw meat. Some have a shorter life though.

The following can be taken as a guide on the times to keep these in the chiller part of the refrigerator: kidney, heart, tongue, and sweetbread 3 days; liver 2 days; brain 1 day.

All of these can be frozen wrapped in poly sheets or bags. But when thawed, they tend to look softer and lose liquids. This is particularly true of brains and liver.



# Brucellosis-Tested Swine Herds (As at 21 February, 1975)

## BERKSHIRE

Clarke, E. J. & Son, "Kaloos Stud", Boonah  
 Cochran, S., "Stanroy", Felton  
 Crawley, R. H., Rockthorpe, Linthorpe  
 H. M. State Farm, Numinbah  
 H. M. State Farm, Palen Creek  
 Handley, Est. J. L., "Meadow Vale", Lockyer  
 Handley, G. R., "Locklyn" Stud, Lockyer  
 Kimber, E. R., Tarella, M.S. 805, Mundubbera  
 Ludwig, A. L., "Beau View" Stud, Cryna, via Beaudesert  
 Neuendorf, W., M.S. 794, Kalbar  
 Queensland Agricultural College, Lawes  
 Research Station, Hermitage  
 Rosenblatt, G., Rosevilla, Biloela  
 Westbrook Training Centre, Westbrook

## LARGE WHITE—continued

Research Station, Biloela  
 Ruge, A. F. & V. M., "Alvir" Stud, Biggenden  
 Ruge, G. H. & I. E., "Al-Lester" Stud, Woowoonga, Biggenden  
 Sharp, D. W. & L. J., "Arola", Lavelle, Q., 4357  
 Smyth, R., Barambah Rd., Goomeri  
 Ward, R. J., "The Plateau", Mulgildie  
 Whiteman, J. H. & A. B., Long's Bridge, via Warwick  
 Willdo Farming Co., Southbrook  
 Willet, L. J., "Wongalea", Irvingdale  
 Williamson, K., Cattermul Ave., Kalkie  
 Withcott Stud Piggery, Rowbotham St., Toowoomba  
 Wolfenden, C. B. & J., Rossmoya

## TAMWORTH

Kanowski, S. E., Pinelands, via Crows Nest

## LARGE WHITE

Ballon, E. E. & E. MacLagan  
 Barrier Reef Islands Pty. Ltd., Hayman Island  
 Batterham, P. & N., Raby Park, Inglewood  
 Beutel, G. R. and Son, Brookdale Stud, M.S. 786, Boonah  
 Bool, A. R. and B. E., Rossvale, Crow's Nest  
 Briskey, R. G. and M. J., Wallingford, Pittsworth  
 Brosnan, D. J., "Betafield", Mt. Murchison, via Biloela  
 Cauley, J. R., M.S. 918, Toowoomba  
 Cauley, T. P., M.S. Jondaryan 444, Rosalie  
 Clegg, J. A. & M. A., "Karoma" Stud, Mundubbera  
 Coleman, C. J., Merriland Stud, Britannia Station, Charters Towers  
 Corney, F. D. and E. C. W., Pagel, Tara  
 Cotter, N. J., "Olaroy", Goomeri  
 Craig, K. F., "Echoes", Bancroft, via Monto  
 Crawford, B. P. & B. J., M.S. 757, Kingaroy  
 Department of Aboriginal and Island Affairs, Cherbourg  
 Diete, E., Ingoldsby, 4343  
 Duckett, R. and L. M., Fairview, Capella  
 Duncan, C. P., "Colley", Flagstone Creek, Helidon  
 Duncan, J. A. & B. L., Ma Ma Creek  
 Dunlop Meats Pty. Ltd., Coondulla, Robertson Pk., Murray Upper  
 Eagle, D. R. & J. A., "Walurga", 134 Hogg St., Toowoomba  
 Fisher, J. & L., Lyndhurst, Jimbour  
 Flegler, T. C., Wongabena, Dalby  
 Fletcher, L., "Par-en-eri" Stud, M.S. 806, Mundubbera  
 Forster, I. S. & D. E., 112 Drayton Rd., Toowoomba  
 Fowler, K. J. & B. D., "Kenstan", M.S. 195, Pittsworth  
 Fowler, K. P., Northlea Stud Farm, 156 Hogg St., Wilsonton, T'ba  
 Franke, K. H. and B., "Delvue" Stud, Cawdor  
 Freeman, W. A., "Trevlac", Rosewood  
 French, A., "Wilston Park", Pittsworth  
 Gosdon, T. C. & E. A., "Naumai", Dalby  
 Graham, T., Dunleigh, Highfields  
 Grayson, D. G., Wodalla, Killarney  
 Harwood, L. B., Cobar, Tara  
 H. M. State Farm, Numinbah  
 Head, G. A., M.S. 825, Ipswich  
 Hinchcliffe, D. F. & R. K., "Oakview", Milman, 4702  
 Hockings, J. & M., "Quambi", Kubarilla  
 Hudson, R. F. & V. D., "Rondel", Hogg St., Wilsonton, Toowoomba  
 Jones, K. B. & I. R., "Cefn" Stud, Clifton  
 Kajewski, C. & D. I., "Glenroy", Glencoe, via Toowoomba  
 Kanowski, A., "Exton", Pechey  
 Kimber, E. R., Tarella, M.S. 805, Mundubbera  
 Kruger, V. F. & B. L., "Greyhurst", Goombungee  
 Kuhl, V. and C. A., "The Mounts", M.S. 222, Oakley  
 Le Gros, W., "Elourea Stud", Marburg  
 Little, R. S., P. M. & G. W., "Glengarry", Jimbour  
 Maranoa Stud Piggery, Mitchell  
 Marsden, M., "Fernflat", Canaga  
 Mathieson, K. N., "Iderway", Gayndah  
 Philip, R. J. and M. M., Boolarong Stud, Elimbah  
 Postle, R. S., G. C. & Son, "Yarallaside" Stud, Pittsworth  
 Queensland Agricultural College, Lawes  
 Quilter, P. E., Paga Paga Piggeries, Postman's Ridge  
 Radel, V. V., "Braedella" Stud, Coalstoun Lakes  
 Robin, A. B., Blaxland Rd., Dalby  
 Rosenblatt, G., Rosevilla, Biloela

## WESSEX SADDLEBACK

Douglas, Mrs. W. S. & Son, "Greylight" Stud Goombungee  
 Smith, C. R. & Son, "Belton Park", Goombungee

## LANDRACE

Ballon, E. E. & E. MacLagan  
 Barrier Reef Islands Pty. Ltd., Hayman Island  
 Batterham, P. & N., Raby Park, Inglewood  
 Bertolotti, F. E. J. & N. I., "Mascotte", Wallumbilla  
 Bool, R. A. and B. E., Rossvale, Crow's Nest  
 Brosnan, D. J., "Betafield", Mt. Murchison, via Biloela  
 Cauley, J. R., M.S. 918, Toowoomba  
 Cauley, T. P., M.S. Jondaryan 444, Rosalie  
 Clegg, J. A. & M. A., "Karoma" Stud, Mundubbera  
 Coleman, C. J., Merriland Stud, Britannia Station, Charters Towers  
 Crawford, B. P. & B. J., M.S. 757, Kingaroy  
 Crowle, N. & D., Cooranga North, 4408  
 Diete, E., Ingoldsby, 4343  
 Duckett, R. and L. M., Fairview, Capella  
 Dunlop Meats Pty. Ltd., Coondulla, Robertson Pk., Murray Upper  
 Fisher, J. & L., Lyndhurst, Jimbour  
 Flegler, T. C., Wongabena, Dalby  
 Fletcher, L., "Par-en-eri" Stud, M.S. 806, Mundubbera  
 Forster, I. S. & D. E., 112 Drayton Rd., Toowoomba  
 Fowler, K. J. & B. D., "Kenstan", M.S. 195, Pittsworth  
 Fowler, K. P., "Northlea", 156 Hogg St., Wilsonton, Toowoomba  
 Fowler, N. E. P. & M. P., c/- Kewpie Enterprises, Kingaroy  
 Gosdon, T. C. & E. A., "Naumai", Dalby  
 Graham, T., Dunleigh, Highfields, 4352  
 Grayson, D. G., "Wodalla", Killarney  
 Harwood, L. B., Cobar, Tara  
 Hinchcliffe, D. F. & R. K., "Oakview", Milman, via Rockhampton  
 Hockings, J. & M., "Quambi", Kubarilla  
 Hudson, R. F. & V. D., "Rondel", Hogg St., Wilsonton, Toowoomba  
 Jones, K. B. & I. R., "Cefn" Stud, Clifton  
 Kajewski, C. & D. I., "Glenroy", Glencoe, via Toowoomba  
 Little, R. S., P. M. & G. W., "Glengarry", Jimbour  
 Maranoa Stud Piggery, Mitchell  
 Marsden, M., "Fernflat", Canaga  
 Marsh Pastoral Co., Brymaroo  
 Nielsen, L. R., "Sunny Hill", Ascot, via Greenmount  
 Peters, L. A., "Moonlight", Bongeong  
 Philip, R. J. and M. M., Boolarong Stud, Elimbah  
 Quilter, P. E., Paga Paga Piggeries, Postman's Ridge  
 Radel, R. M., Turua Stud, Biggenden  
 Robin, A. B., Blaxland Rd., Dalby  
 Rosenblatt, G., Rosevilla, Biloela  
 Ruge, A. F. & V. M., "Alvir", Biggenden  
 Sharp, D. W. & L. J., "Arola", Lavelle, Q., 4357  
 Trout, L. B. and L. J., "Caminda", Crawford, Kingaroy  
 Whiteman, J. H. & A. B., Long's Bridge, via Warwick  
 Willdo Farming Co., Southbrook  
 Willet, L. J., "Wongalea", Irvingdale  
 Williamson, K., Cattermul Ave., Kalkie



# Nematode control in tobacco

by R. A. BROADLEY, Nematologist.

THE root-knot nematodes *Meloidogyne javanica* (Treub) and *M. incognita* (Kofoid and White) are serious pests of tobacco in Queensland.

The root-lesion nematode *Pratylenchus brachyurus* (Godfrey) is of minor importance.

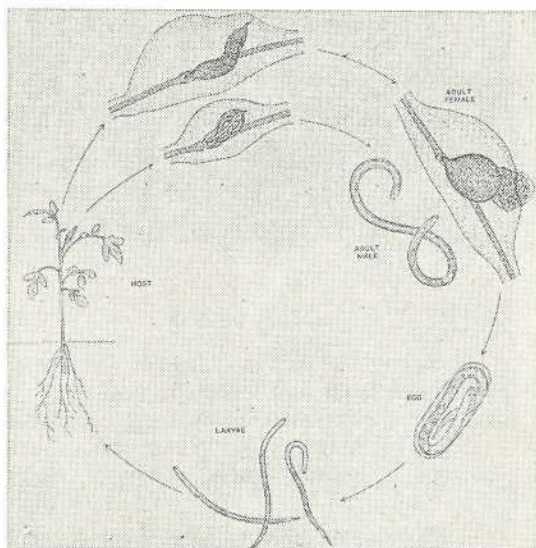
Root-knot is easily recognized because diseased plants have galls or swellings on the roots. Light infestations have little effect on vigour and, in some situations, may even be beneficial by slowing growth late in the season and improving leaf quality.

Heavy infestations early in the season lead to the formation of large galls encompassing most of the main roots. This causes stunting, yellowing, temporary wilting, and premature senescence.

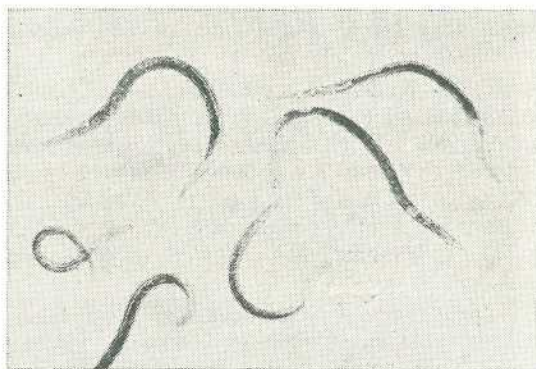
Leaves from affected plants vary from light bodied to trashy and, in severe cases, can be reduced to unsalable dead tissue known as 'nondescript trash'.

When tobacco seedlings are planted into infested soil, larvae 0.4 to 0.5 mm long and too small to be seen with the naked eye, invade the root tips. A secretion injected by a larva stimulates the root to form a gall. In 4 or 5 weeks a larva develops into a thread-like male about 1 mm long or a pear-shaped female visible to the naked eye as a small white body about half the size of a pin's head.

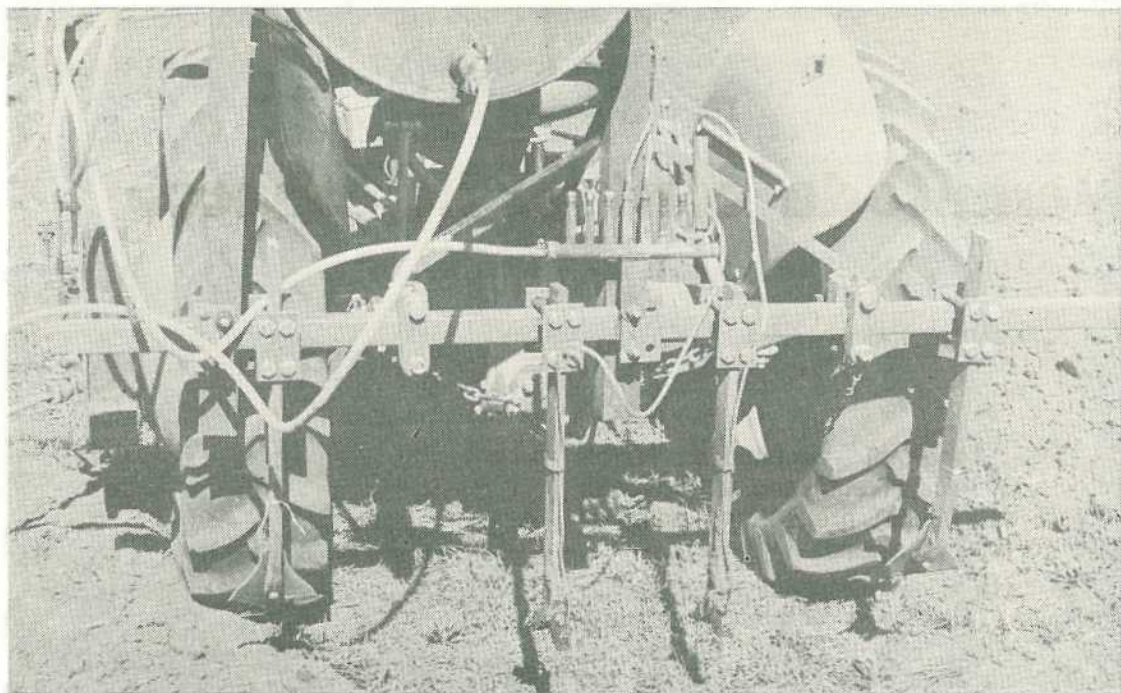
Each female secretes a globule of jelly-like material into which it lays up to 1 000 or more eggs. Under normal growing conditions, larvae begin to hatch from eggs in 10 to 14 days and these move further into the gall or leave in search of younger roots.



A. Life cycle of root-knot nematodes.



B. Root-lesion nematodes.



C. Equipment for double row fumigation.

Larvae may live in the soil for up to 2 years but may die from starvation or are killed by parasites and predators. Root-knot nematodes reproduce in many crop plants and weeds including crowsfoot grass, summer grass, Rhodes grass, red Natal grass and nut grass.

Poor growth of tobacco plants as a result of damage from the root-lesion nematode *Pratylenchus brachyurus* has been recorded a few times in the Mareeba-Dimbulah area. The life cycle of this species consists of an egg stage, four larval stages and an adult stage. Males are extremely rare.

Unlike root-knot nematodes, the female root-lesion nematode is worm-like in shape, not visible to the naked eye, and moves through the root laying eggs along its path. Larvae and females feed on the cortical cells causing the death of the fine feeder roots. The condition is sometimes referred to as brown root rot.

*P. brachyurus* has a wide host range which includes maize, pineapple, cowpea, tomato, lablab bean, sorghum-Sudan grass hybrids and nut grass.

## Control

1. IN THE SEEDBED. Prepare the seedbed so that the soil is moist and of fine tilth. Apply methyl bromide under plastic sheeting which is lifted after 24 hours. Seed should not be sown until the bed has been exposed to the air for at least 3 days.

Methyl bromide is now marketed in 1 kg cans, each of which is sufficient to control nematodes in a seedbed of 14 m<sup>2</sup>. To control weeds and fungi, the rate of 1 kg to 10 m<sup>2</sup> is commonly used.

To reduce the risk of harm from methyl bromide, the soil should not contain large quantities of undecomposed organic matter and the liquid should not be allowed to spill from the end of the applicator tube on to the soil.

2. IN THE FIELD. Fumigate the soil with EDB (ethylene dibromide). Several formulations of EDB are registered for use in tobacco, and the application rate depends on the formulation used. The four kerosene-based formulations contain 12.5%, 15%, 25% and 50% by volume of EDB.



The 15% formulation, which is most commonly used, is applied as an overall treatment at 220 litres per hectare. A 25% formulation offers the grower reduced handling costs without loss of efficiency, and is applied at 140 litres per ha. The 50% formulation is applied at 70 litres per ha and, as specialized equipment is needed to deliver such a low volume, this formulation is used only by contract operators.

A water-miscible formulation of EDB which contains 193% EDB on a weight to volume basis is also available. When using this product, mix 1 part of concentrate with 5 parts of water, and apply the diluted material at 220 litres per hectare.

The chemical is injected at a depth of 20 cm through tines 25 to 30 cm apart.

To ensure maximum benefit from fumigation, the soil should be free from clods and undecayed organic matter. Land preparation should start early. As soon as possible after the wet season, the land is ploughed and disced, and then disced again 4 to 6 weeks later. EDB can be applied one month after the second discing. A third discing may be necessary immediately before fumigation.

The soil should be moist when fumigated, and should be rolled with a wide diameter roller immediately after treatment to improve control in the surface. Tobacco should not be planted for at least 3 weeks after fumigation.

On areas where root-knot is not a major problem, the cost of fumigation is reduced by applying the EDB in two rows each 15 cm to the side of the proposed planting row. The marks left by the tractor wheels or by tines set behind them enable the treated strips to be accurately relocated when the time comes for fertilizing and planting. Any cultivation in the interim should be in the direction of the rows.

In areas where leaf halides may reach levels which reduce leaf quality, the increase caused by fumigation can be lessened by extending the period between fumigation and planting. If there is no risk of soil erosion, overall fumiga-

tion can be carried out in autumn, followed by occasional cultivations to reduce the reproduction of nematodes in weeds.

In recent years, the non-volatile nematocides Nematicur\* (ethyl 4-(methylthio)-m-tolyl isopropyl phosphoramidate) and Mocap (O-ethyl S, S-dipropylphosphorodithioate) have been registered for use in Queensland.

These materials are more expensive than EDB and, while the price differential exists, are not likely to be used to any extent unless soil conditions are unsuitable for effective fumigation.

Mocap and Nematicur can be applied to the growing crop and may have some value when crops are replanted early in the season after hail damage.

### Crop rotation

There is no short-term crop known to reduce nematodes to a level which will remove the need for fumigation. Gatton panic and green panic are effective when grown for 2 years or longer, and can be planted in rotation with tobacco.

Avoid susceptible crops such as tomato, cowpea, maize and French bean.

### Destroy diseased plants

As soon as harvesting has been completed, slash the tobacco stalks and plough to expose the roots to the drying action of wind and sun. This kills nematodes in the roots and reduces the infestation for the following season.

In areas where overall cultivation at this time is undesirable because of the risk of soil erosion, use two discs of a three-disc plough or a wide duckfoot tine to lift the roots in the row without unduly disturbing the inter-row spaces.

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\* Registered trade name.

# Wheat and barley varieties, 1975

compiled by S. R. WALSH, Agriculture Branch.

WHEAT and barley varieties recommended for sowing in Queensland in the coming season are listed below.

## Wheat

Timgalen, Gatcher, Oxley, Gamut, Mendos, Tarsa, Spica and Hopps are recommended wheat varieties for 1975 plantings. All except Hopps are acceptable by the State Wheat Board for Prime Hard classification. Hopps is restricted to No. 1 Hard classification.

The recommendations are based on trial results, field experience and the susceptibility to disease. In the tables below the main season varieties are listed in order of preference for each region. Varieties marked with an asterisk are susceptible to stem rust. Traces of stem rust were detected on Gamut in 1973.

Accordingly, Timgalen, Gatcher and Oxley are the only varieties resistant to known Queensland strains of stem rust for the 1975 season.

Gatcher appears less tolerant of stress and nutrient disorders on the plains country of the Darling Downs.

Diversification of varieties planted on a farm reduces the risk of stem rust damage. In regions where Mendos and Spica are preferred, it should be remembered that both varieties are attacked by the same strain of stem rust. It is therefore of little use to diversify by planting part of an area to each of these varieties.

Where a stem rust susceptible variety is grown, diversification is achieved by growing resistant varieties as well. Mendos and Spica are listed in the recommendations as alternatives. No rust resistant varieties are commercially available for 1975 to replace these varieties in the western areas of the wheat belt. Seed supplies of the variety, Kite may not be available in commercial quantities.

Mendos is still recommended for certain areas because it may produce Prime Hard quality grain under difficult conditions. In addition, it is an awnless variety and, in the event of a crop failure, it may be grazed without risk of injury to stock.

Spica is retained because its standability and quality are good under difficult conditions in certain areas.

Oxley is a replacement for Tarsa and Festiguay. It is a mid season, high yielding variety and is resistant to Queensland strains of stem rust.

Oxley was released by the University of Queensland in conjunction with the Department of Primary Industries. The recommended planting time for Oxley is mid May to early June in the southern wheat areas but it may be sown in early May in the more northern and inland areas.

Festiguay may be severely damaged by stem rust and growers are strongly advised against large plantings of this variety. Tarsa is also susceptible to stem rust and could also be severely damaged.



Hopps is recommended as a dual purpose variety which, towards maturity, shows reasonable resistance to stem rust.

Kite is a semi-dwarf, tip awned variety. It was named in New South Wales and approved for release in Queensland for the No. 1 Hard classification.

It is highly rust resistant and has a maturity similar to Timgalen. Research results indicate that Kite has a high yield potential and that it is similar to Mendos in threshing behaviour. Only limited supplies of seed are

commercially available for the 1975 planting season. Kite may also be used to replace Mendos in the more western areas where an awnless rust resistant variety is required.

It is recommended that trial areas of Kite be sown in all regions.

Fertilizer requirements should be governed by soil type, previous cropping history of the paddock and soil moisture.

This information is a basic guide only, and District Extension Officers will give specific recommendations.

Region (Shires or Districts)	Planting Time	Variety	Rate (kg/ha)
<b>East Moreton</b> (Caboolture, Pine Rivers, Albert, Beaudesert)	April May-June	Hopps (dual purpose) Timgalen, Gatcher	55-65 45-55
<b>West Moreton</b> (Moreton, Esk, Gatton, Kilcoy, Laidley, Boonah)	April May-June	Hopps (dual purpose) Timgalen, Gatcher	55-65 45-55
<b>Near North Coast</b> (Landsborough, Noosa, Tiaro, Maroochy, Widgee, part Kilkivan)	April-May May-June	Hopps (dual purpose) Timgalen, Gatcher	55-65 45-65
<b>South Burnett</b> (Part Kilkivan, Kingaroy, Murgon, Nanango, Wondai, Rosalie (Cooyar only))	mid May-mid June mid May-mid June mid June-July	Oxley Timgalen, Gatcher (Frost free areas only) Timgalen, Gatcher	30-40 30-40 34-45
<b>Burnett</b> (Biggenden, Gayndah, Mundubera, Perry, Eidsvold, Monto, Isis, Kolan, Gooburrum, Miriam Vale, Woongarra, Burrum, Woocoo)	April-May May-June	Oxley Gatcher, Timgalen, Gamut, Mendos*	30-60 30-60
<b>Capricornia</b> Rockhampton, Wowan, Alton Downs, Biloela, Theodore, Moura, Wowan, Baralaba, Duaringa, Banana	May-June IRRIGATED mid April-May May-mid June RAIN-GROWN mid April-mid May mid May-mid June	Timgalen, Gatcher, Gamut, Spica* Oxley Timgalen, Gatcher, Gamut (also for hay) FOR TRIAL: Oxley Gatcher, Timgalen, Gamut, Mendos*/Spica*	45-50 (heavy clays) 40-45 (light soils) 55-70 55-70 30-40 (light soils) 35-50 (heavy soils) 30-40 (light soils) 35-50 (heavy soils)
<b>Emerald, Peak Downs, Springsure</b>	RAIN-GROWN May-June IRRIGATED May	Gatcher, Timgalen, Gamut, Mendos*/Spica* Gatcher, Timgalen, Gamut, Mendos*/Spica* Oxley, Timgalen	30-40 (60 cm wet soil) 25-30 (less than 30 cm wet soil) 60-70

\* Susceptible to stem rust.

Region (Shires or Districts)	Planting Time	Variety	Rate (kg/ha)
<b>Near South West</b> Murilla, Tara, Taroom	late April-mid May mid May-June	Tarsa*, Oxley, Festiguay* Gatcher, Timgalen, Gamut, Mendos*/Spica*	20-30 20-30 30-35 (late planting)
Bendemere, Booringa, Bungil, Warroo	late April-mid May mid May-June	Tarsa*, Oxley Mendos*/Spica*, Gatcher, Timgalen	20-30 20-30 30-35 (late planting)
Waggamba	mid May mid May-June	Oxley, Tarsa* Gatcher, Timgalen, Gamut, Mendos*	20-30 20-30 30-35 (late planting)
Balonne	RAIN-GROWN May-July	Timgalen, Gatcher, Mendos*	20-30 30-35 (late planting)
	IRRIGATED late May-early July mid May	Timgalen, Gatcher FOR TRIAL: Oxley	70 70
<b>Darling Downs</b> NORTHERN DOWNS (Chinchilla, Wambo)	May-June May-July	Oxley Timgalen, Gatcher, Gamut, Mendos*/Spica*	27-32 27-30
CENTRAL DOWNS (Jondaryan, Rosalie (part) Pittsworth, Crow's Nest, Cambooya, Millmerran)	mid May-mid June June-July	Oxley Timgalen, Gatcher, Gamut	30-45 30-45 (60-70 irrigated)
SOUTHERN DOWNS (Clifton, Allora, Glengallan, Rosenthal)	mid May-mid June June-July	Oxley Gatcher, Timgalen, Gamut	30-45 30-45
INGLEWOOD	May June-July	Oxley Timgalen, Gatcher, Gamut, Mendos*	30-40 30-40 (60-70 irrigated)

\* Susceptible to stem rust.

## Barley

Barley is grown in Queensland principally in the Darling Downs, Moreton, Burnett and parts of the Capricornia region for malting, milling, feed grain and for grazing.

About 138 853 hectares were grown in 1973-74 for a total yield of 221 051 tonnes. The average yield of 1 592 kg per ha was 566 kg per ha higher than in the 1972-73 season.

Clipper is the only barley variety that the Barley Marketing Board will accept for classification as malting or milling grade. Other varieties will be accepted only as feed grain.

When planted for grain, the crop is sown in the period May-July in the major production areas and during March-August when planted for grazing. Seeding rates vary with proposed use of the crop, moisture availability, planting time and variety but are in the vicinity of 30 to 50 kg per ha for grazing crops and 20 to 40 kg per ha for grain crops.





# Getting the right urea-molasses mix

by J. WEDMAIER, formerly Beef Cattle Husbandry Branch

INSTRUCTIONS that give only quantities per head, or ratio of ingredients, are not enough for bulk mixing molasses-urea supplements.

It is important to know, not only the actual daily intake of molasses and urea per head, but also what quantity of total mix will supply the correct amounts of the two ingredients.

Any one combination of urea, molasses and water will not suit all situations for the entire feeding period. However, a starting point is necessary and the table shown here provides starting points from which adjustments can be made to regulate intake according to class of country and seasonal conditions.

## Using the Table

1. **SELECTING AN INITIAL MIX.** One of the major advantages of molasses-urea is that intake can be regulated by altering the ratio of molasses to urea. It is well known that cattle react differently to a supplement according to the type of country and the amount of pasture available. For this reason three mixtures have been considered.

The No. 1 Mix will generally be adequate in coastal and second-rate forest country in association with adequate dry standing pasture.

On the other hand, the No. 3 Mix will be required on better class country to obtain adequate intake, or when the availability of dry standing feed is somewhat limited.

The No. 2 Mix is an intermediate mix which can be used between these two extremes.

All include a phosphorus supplement in the form of M.A.P.

2. **READING THE TABLE.** The table is based on the total quantity of mix required for a given number of cattle to provide them with a daily intake of—

56 g of urea (2 oz.)

6 g of phosphorus

either 0.23, 0.45 or 0.68 kg of molasses ( $\frac{1}{2}$ , 1 or  $1\frac{1}{2}$  lb.) depending upon the mixture selected.

Perhaps an example will show the way to use the table. Suppose that there are 50 cattle in a paddock and one wishes to calculate 3 days' requirements. Then, 50 cattle for 3 days is equal to 150 cattle for 1 day.

By adding the amounts for 50 cattle and the 100 cattle of No. 1 Mix, we get 8.6 kg (18.8 lb.) of urea, 22½ litres (5.0 gal.) of molasses, 16 litres (3.5 gal.) of M.A.P. solution, and 52 litres (11.5 gal.) of water to give a total mixture of 91 litres (20 gal.).

Any combination of numbers to the nearest five head can be obtained, and for practical purposes is sufficiently accurate.

Naturally the same approach can be taken with the No. 2 and No. 3 Mixes.

3. **ADJUSTMENTS TO THE TABLE.** It is realized that these mixtures will not satisfy all situations. Two major adjustments are likely to be necessary. First, phosphorus supplementation is not essential on all country.

## DAILY MOLASSES-UREA-M.A.P. REQUIREMENTS AND VOLUME OF TOTAL MIX

No. Beasts per day	No. 1 Mix—56 grams (2 oz.) Urea + $\frac{1}{4}$ kg ( $\frac{1}{4}$ lb.) Molasses per Head Daily					No. 2 Mix—56 grams (2 oz.) Urea + 0.45 kg (1 lb.) Molasses per Head Daily					No. 3 Mix—56 grams (2 oz.) Urea + 0.70 kg (1½ lb.) Molasses per Head Daily				
	Urea kg (lb.)	Molasses litres (gal.)	M.A.P. soln. litres (gal.)	Water litres (gal.)	Total in Mix litres (gal.)	Urea kg (lb.)	Molasses litres (gal.)	M.A.P. soln. litres (gal.)	Water litres (gal.)	Total in Mix litres (gal.)	Urea kg (lb.)	Molasses litres (gal.)	M.A.P. soln. litres (gal.)	Water litres (gal.)	Total in Mix litres (gal.)
5	0.3 (0.6)	0.9 (0.2)	0.5 (0.1)	1.8 (0.4)	3.2 (0.7)	0.3 (0.6)	1.4 (0.3)	0.5 (0.1)	0.9 (0.2)	2.7 (0.6)	0.3 (0.6)	2.3 (0.5)	0.5 (0.1)	1.8 (0.4)	4.5 (1.0)
10	0.6 (1.3)	1.4 (0.3)	0.9 (0.2)	3.6 (0.8)	5.9 (1.3)	0.6 (1.3)	3.2 (0.7)	0.9 (0.2)	1.8 (0.4)	5.9 (1.3)	0.6 (1.3)	4.5 (1.0)	0.9 (0.2)	4.1 (0.9)	9.5 (2.1)
50	2.9 (6.3)	7.7 (1.7)	5.5 (1.2)	17.2 (3.8)	30.4 (6.7)	2.9 (6.3)	15.0 (3.3)	5.5 (1.2)	9.0 (2.0)	29.5 (6.5)	2.9 (6.3)	22.7 (5.0)	5.5 (1.2)	20.4 (4.5)	48.6 (10.7)
100	5.7 (12.5)	15.0 (3.3)	10.5 (2.3)	35.0 (7.7)	60.5 (13.3)	5.7 (12.5)	30.5 (6.7)	10.5 (2.3)	18.2 (4.0)	59.1 (13.0)	5.7 (12.5)	45.6 (10.0)	10.5 (2.3)	40.5 (8.9)	96.4 (21.2)
500	28 (62)	75 (16)	53 (12)	175 (38)	303 (67)	28 (62)	151 (33)	53 (11)	91 (20)	295 (65)	28 (62)	227 (50)	53 (11)	202 (44)	483 (106)
1 000	56 (125)	151 (33)	106 (23)	348 (76)	606 (133)	56 (125)	303 (66)	106 (23)	177 (39)	586 (129)	56 (125)	456 (100)	106 (23)	405 (89)	965 (212)

NOTE.—To make M.A.P. solution mix 50 kg of Mono ammonium phosphate in 160 litres (35 gal.) of water. Let the mixture stand for 10 to 12 hours. Imperial measures are in italic type.



If phosphorus is not required, simply add the water and M.A.P. column together to give total water in the mix.

Second, with any mixture, alterations have to be made depending on fluctuations in pasture availability. These alterations have to be made fairly constantly through the dry season.

Generally, if consumption is too slow for the desired daily intake of urea and molasses, a decrease in the water content should raise consumption. On the other hand, if intake is too high (that is, the amount of mixture is

being eaten in less than the calculated time), increasing the water content will reduce rate of intake. It is important to hold the amount of urea and phosphorus (if fed) constant. If consumption is too rapid even when extra water is added, it may be necessary to reduce the amount of molasses though this should be avoided if there is a shortage of dry standing feed.

Further information on feeding urea-molasses mixtures may be obtained from Beef Cattle Husbandry Branch officers in your district.

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## State trade mission overseas

THE Minister for Primary Industries (Hon. V. B. Sullivan, M.L.A.), accompanied by two Government members, is leading an eight-member Queensland trade mission to Middle and Far Eastern countries from 15 February to 24 March.

Announcing Cabinet approval of the tour, Mr. Sullivan said that the mission's objective was to promote sales of the State's primary produce in at least 10 countries.

The mission would visit Bahrain, Kuwait, Lebanon, Iraq, Saudi Arabia, Egypt, Iran, Japan, South Korea and Singapore, market outlets which were considered to have the most potential.

Mr. Sullivan said that the mission would seek to—

- Create a favourable environment for new market establishments.
- Develop contacts and lines of communication for Queensland primary produce exporters.
- Provide information to prospective buyers and accept firm orders.

'I expect the main value of the mission initially will be in fostering good public relations and contacts between exporters and buyers; groundwork which can be built upon subsequently by the parties involved,' he said.

Mr. Sullivan said that members of the mission would be: Messrs. S. H. Hunter (Manager, Barley Marketing Board), C. L. Harris (Chairman, Sugar Board, who would

join the party in Iran), A. G. English (General Manager, Committee of Direction of Fruit Marketing), D. C. Mactaggart (Managing Director, Mactaggart's Primary Producers' Co-op. Assn.), G. McCamley (President, Australian Brahman Breeders' Assn.), W. Trout (Manager, Queensland Grain Sorghum Marketing Board), D. Eather (Vice-President, Queensland Graingrowers' Association), and a representative from Provincial Traders Pty. Limited.

The Deputy Director of Marketing in his Department, Mr. E. O. Burns, would accompany the mission in an advisory capacity and the Minister's private secretary (Mr. E. R. G. White) would be the mission secretary.

Mr. Sullivan said that the Australian Meat Board, which had representatives stationed in Iran and Japan, had offered every possible assistance and promised to arrange contacts.

Valuable aid also was being provided to the mission, planning of which had begun last September following a request from the Premier (Hon. J. Bjelke-Petersen) by the Commonwealth Department of Trade, which had trade posts throughout the areas to be visited.

Trade officers were compiling up-to-the-minute reports on the potential for trade in such primary products as frozen and chilled beef, live cattle and sheep, prawns, grain sorghum, maize, barley, apples, mandarins and fresh lettuce.



# Anne COOK'S farm home

## Wool for child safety

*CHILDREN are safer if they are dressed in wool. This is the finding reached by the Victorian Consumer Affairs Council following an investigation into textile flammability.*

The Council has reported that, in the period under study, the Burns Research Unit of the Royal Children's Hospital, Melbourne, did not experience any burn cases where children had been wearing wool clothing.

The most useful guide to fabrics likely to be dangerous comes from the Burns Unit which retained the clothing from burn victims. The Unit's headquarters at the Royal Children's Hospital are in contact with hospitals or individual doctors in other Australian centres, so the Unit's surveys of accidents cover most of the country. Each burn case reported to the Unit is investigated from a medical, sociological and textile aspect.

Nearly all burned clothing was made of lightweight (up to 4½ oz. per square yard) cellulosic material (cotton and rayon) or heavy cellulosic material with a pile surface, for example, cotton Moleton or cotton Chenille.

There has been an example of burned acrylic but no example of burning wool.

The Council also gives some advice on how to prevent burns in your home—

- Guard all fires with firmly fixed fine mesh fireguards, which cover the fireplace completely. Keep mantle shelves clear of toys and mirrors.
- Wide shirts and sleeves can easily catch fire on stoves and heaters. Dress little girls in pyjamas, not nighties and select garments made of flame resistant material.
- Teach young children how to use matches and help them to understand dangers associated with playing with matches or cigarette lighters.
- Store kerosene, petrol and other flammable liquids in a locked cupboard away from fire and heat. Never allow children to play with motor mower fuel or other flammable liquids.
- Be always conscious of the fire hazard and treat it with the same serious attitude as the road-toll, poisons and electricity, especially when there are young children around the house.
- Remember: a fire accident is 30 seconds of acute terror followed by a lifetime of deep regret.



## Home hints

USE a drinking straw for lighting a gas oven. The waxed paper lights easily and the length of the straw prevents burnt fingers.

Turn the corner of a beach towel over, stitch along one side then insert a zip in the other. This makes a handy pocket for keys and money.



To make cut glass and crystal really gleam, wipe over with a cloth moistened with methylated spirits.

To pack shoes for a journey: put each pair together into the centre of a discarded stocking. Then tie up the toe and top. The shoes can then be packed among clothes in the suitcase.

Print your name, address and phone number on a strip of adhesive tape and wrap it around your umbrella shaft for easy identification.

We planted a small type of fir tree in an attractive pot. Kept outside during the year, it is brought in and decorated as our Christmas Tree each December. Now is a good time to start yours.

Place crab and prawn shells in plastic bags in the freezer of your refrigerator while waiting for garbage collection. They do not taint the other foodstuffs and it saves any offensive smells coming from your garbage can.

When using grated cheese as a topping, mix it first with dried bread crumbs. It sprinkles better, goes further and makes a better crust.



## Lifting

WRONG lifting methods cause many back injuries and strained muscles, daily in home and industry, or as the result of many years of incorrect lifting.

Permanent injury to the spine is the most serious consequence of incorrect lifting, although muscular injuries are also common. The trunk part of the body usually suffers the most damaging and painful strains, as people tend to bend the back and cramp the

abdomen when picking up a weight from the floor. This puts the person off balance and, when he tries to lift, all the weight is thrown on to the lower back muscles which are not really meant for heavy work. Even more important is the risk of damage to the intervertebral discs of the lower spine.

It has been estimated that with such lifting, the amount of work-load on the spinal discs and lower back muscles is five times the amount of the load being lifted. If such incorrect lifting becomes a habit, it is likely to result in eventual muscle fatigue or strain.

If you have planned to shift the furniture at the week-end, and are now having second thoughts, do not despair. Correct lifting is not necessarily difficult or dangerous, provided you follow a few simple rules, and do not over-estimate your capabilities. Remember to—

- Place the feet correctly for balance, in the direction of movement, with the legs bent and your back almost upright. Never attempt lifting with your feet together.
- Bend your legs, not your back, to reach loads on the floor; the back should be kept straight or, preferably, the hollow above the buttocks should be preserved.
- Avoid twisting the trunk or over-reaching.
- Avoid accidents by giving your full attention to the lifting task. If the load is too heavy, obtain assistance.

With correct posture (one foot pointing in the direction of movement), the weight of the body helps the stronger leg muscles do the work. Practise this method and you should find your back muscles relaxed and free from strain.

Apply the same principle to other work, such as pushing or pulling objects, pulling on a rope, taking loads from a high shelf, and even in sporting activities, and you will have much less chance of doing yourself an injury.

—Queensland Health Education Council.

## Eyes

HOW many times a day do you risk your eyesight? None? Think again. You may unconsciously be exposing your eyes to many dangers by being unaware of the risks in certain situations.

For instance, it is advisable to wear safety-approved eye protection when—

- Chopping wood
- Mowing the lawn
- Using a hammer, cold chisel or punch, or power tools such as drills, grinders, sanders or saws
- Using corrosive liquids
- Welding

Some of the most important protective measures concern children. Teach youngsters to carry pencils, scissors and similar objects, with points down, and never to run while holding such items. Keep children out of workshops and kitchens, where splinters of wood, metal, and stone chips, boiling water or hot fat or oil could spray out and damage eyes. Prohibit play near windows and discourage the throwing of stones, dirt, or sand.

Toys such as air guns, bows and arrows, and shanghais are not suitable as playthings but, if older children have them, ensure they are used properly. Fireworks and chemical sets are also potential dangers, and use of these should be carefully supervised. Check that play equipment and play areas are safe—no protruding bolts and edges on swings and playframes, and no exposed nails or trailing wire on fences.

While you are using paint stripper, caustic, or other corrosive liquids, household cleaners or sprays, ensure that children are safely out of range of spills or splashes.

Further information on this topic is contained in the Queensland Health Education Council pamphlet, 'Eye Protection', available by writing to P.O. Box 155, Fortitude Valley, Q. 4006.

## Rubella

RUBELLA, or German measles, is normally a mild disease, but like some other virus diseases, it can be dangerous to unborn babies.

It is important, therefore, to ensure that women and girls are immune to the disease before becoming pregnant.

If an expectant mother contracts the disease during the early months of pregnancy, her child may be born with defective hearing or vision, heart problems, or other abnormalities. Exposure to the disease is recommended for girls over 3 years of age, or vaccination may be given from the age of 12 months.

For girls aged between 12 and 14 years, free immunization is available from local authorities. (Women and girls in other age groups should arrange for immunization by their private doctors.)

Tests are available to determine whether or not a woman is immune to rubella, but unless the woman is pregnant or suffers from certain diseases, it is cheaper and easier to have the immunization.

It takes an average of 18 days after exposure for rubella to develop. A mild headache, often accompanied by a slight fever, may appear about 2 days before the rash. First appearing on the face and neck, the rash soon spreads to other parts of the body. An attack lasts for 2 to 5 days, and may be accompanied by mild catarrh as well as fleeting pains in the hands and feet.

The disease is spread by droplet infection (uncovered coughs and sneezes), by direct contact (kissing, etc.), and by contaminated articles such as handkerchiefs and towels. It is infectious for about a week before the rash appears and for 4 days after. Usually, one attack of the disease gives lifetime immunity.

Rubella sufferers should be careful to avoid contact with expectant mothers. However, if a mother-to-be contracts rubella, or is exposed to it, she should inform her doctor immediately so that all possible steps can be taken to minimize the risk to the developing baby. The best protection is immunity before pregnancy.

—Queensland Health Education Council



# Dishes for cheese lovers

*STARTING here is a selection of dinner dishes including batter-dipped, tiny veal escalopes, pan-fried in butter; simmered beef roulades; oregano and garlic sauced chicken and foil wrapped baked carrot and beef burgers.*

Frankly these recipes are designed for cheese lovers with the Australian varieties at their versatile best—as stuffings mixed with breadcrumbs; simply grated and seasoned or cut into sticks; in batters or as melting golden brown toppings.

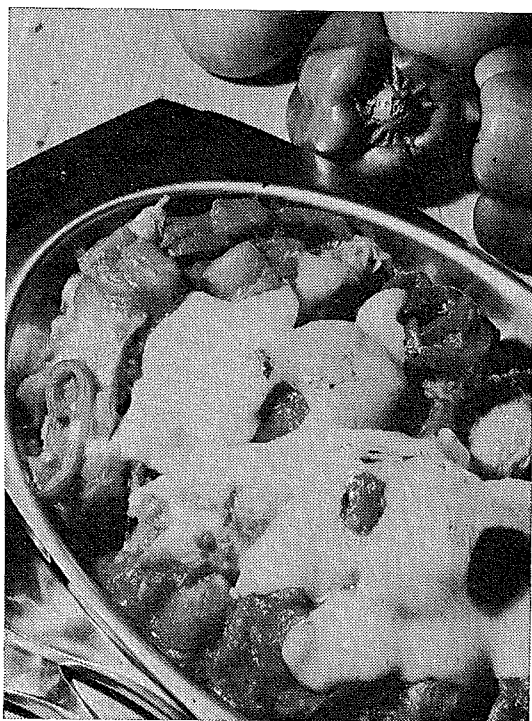
For those less enchanted with cheese here is a challenge, sample these then find out where you stand.

In the following recipes, a standard 8-oz measuring cup is used. All spoon measurements are level.

## Veal picatta

- 6, 3 oz. veal escalopes
- 1 tablespoon lemon juice
- 2 tablespoons flour
- 2 eggs
- 2 tablespoons milk
- $\frac{1}{2}$  cup finely grated Australian Swiss cheese
- 3 oz. butter

Trim and pound veal to  $\frac{1}{4}$  in. thickness. Sprinkle with lemon juice. Toss each escalope in flour. Beat eggs and milk together. Add cheese. Season with salt and pepper. Melt butter in frying pan. Dip escalopes into batter. Pan fry slowly for 3 to 5 minutes on each side till lightly browned. Garnish each with a lemon slice topped with 1 teaspoon capers or a sliced stuffed olive. Serves six.



*Swiss peppered chicken*

## Surprise pineapple burgers

- 4, 2 oz. slices fresh pineapple

### THE STUFFING

Combine together:

- 4 oz. (1 cup) grated Australian matured Cheddar cheese
- 1 teaspoon each mustard and paprika
- $\frac{1}{4}$  teaspoon cayenne pepper
- 1 tablespoon each tomato juice and soy sauce

Shape into four balls. Place in centre of each pineapple ring.

## THE BURGERS

Combine together:

- 12 oz. lean buttock steak, minced
- 1 clove crushed garlic
- 1 small onion, finely diced
- 2 teaspoons salt
- Freshly ground pepper
- 1 small carrot, peeled and grated

Divide mixture into four, flatten to size of pineapple rings. Place on top of pineapple rings, pressing edges firmly together. Wrap securely in foil. Bake in moderate oven (350°F) for 30 to 40 minutes. Serve with two medium, halved, seasoned, and grilled tomatoes. Serves four.



## Swiss peppered chicken

- 1, 3 lb. cooked chicken, cut into 4 serving portions
- 2 oz. butter
- 2 medium onions, diced
- 2 cloves garlic, crushed
- 2 small green peppers, cut into strips
- 1 teaspoon oregano
- $\frac{3}{4}$  teaspoon sugar
- 1 chicken cube
- 2 tablespoons flour
- $\frac{3}{4}$  cup tomato puree
- 8 oz. ripe, tomatoes, peeled and chopped roughly
- 4, 1 oz. Australian Swiss cheese slices

Arrange chicken in shallow ovenproof casserole. Melt butter in frying pan. Saute onions, garlic, peppers and oregano for 5 minutes. Blend in flour, and the chicken cube. Cook 1 minute. Add sugar, tomato puree and chopped tomatoes. Stir till boiling then simmer 5 minutes. Pour sauce over chicken. Lay Swiss cheese slices over each portion.

Place under a hot griller or in hot oven (400°F) till cheese melts and browns lightly. Accompany with buttered savoury rice. Serves four.



## Beef roulades Parmesan

- 12 thin slices round or topside steak approx. 2 lb. in weight
- 4 oz. clarified butter
- 3 tablespoons flour
- 2 cups beef stock
- 1, 30 oz. can whole peeled tomatoes
- 2 green peppers, diced
- hot buttered noodles

## THE STUFFING

Combine together:

- $\frac{1}{2}$  cup dry breadcrumbs
- 4 oz. (1 cup) grated Australian Parmesan cheese
- 4 cloves crushed garlic
- 2 teaspoons salt
- 1 teaspoon of mixed herbs
- $\frac{1}{2}$  teaspoon majoram
- 1 egg
- 2 tablespoons water

Trim and flatten steak to approximately 4 in. x 3 in. square. Spread stuffing between each, roll up and secure with toothpicks. Melt clarified butter in large pan. Brown roulades on all sides. Remove onto absorbent paper. Blend flour in pan. Cook 1 minute. Stir in stock till boiling. Add tomatoes and the roulades. Season with salt and pepper. Cover, simmer 1 hour. Uncover, reduce sauce for further 20 minutes. Add peppers. Cook further 10 minutes. Remove toothpicks from roulades. Arrange down centre of buttered noodles and spoon over sauce. Serves six.



# Top and root rot of pineapples

## Control

TOP and root rot can be prevented by avoiding conditions suitable for the development and spread of the causal fungi. These are now outlined.

**1. Selection of Site for Pineapple Crop.** Only well-drained soils should be used for pineapple growing.

**2. Plantation Drainage.** Plant on beds raised as high as possible. Beds when settled should be at least 230 mm high.

It may be necessary to have wider rows and reduce plant density so there is sufficient soil to build up high beds.

Drains to intercept outside run-off before it reaches the plantation should be constructed. Within the plantation, water should be diverted into a network of inter-row drains so that it is removed as rapidly as possible without erosion.

If subsurface soil compaction is evident, deep ripping before hilling is recommended to improve drainage. It is essential for ripping to be done down the slope to prevent ponding.

**3. Polythene Mulching.** On high beds, mulching with polythene is an effective means of controlling top and root rot. Polythene mulch sheds excess water into the inter-row drains and prevents erosion of the formed beds.

It also encourages surface rooting, thereby keeping roots out of the wet zone where they are more vulnerable to the fungi.

An additional benefit of the polythene mulch is the warmer soil temperatures obtained in winter.

It is stressed, however, that polythene mulch should be used only on beds raised to at least 230 mm. High beds assist in keeping the roots above the water-table, whereas, in low beds and flat ground, the roots are often in waterlogged soil following periods of wet weather. Here polythene mulch prevents soil drying by evaporation and prolongs the conditions suitable for development of the fungi.

**4. Chemical Treatments.** Young tops are extremely susceptible to top and root rot and some form of protection is necessary. Where possible, planting material should be given a pre-plant fungicide dip. This treatment has the added benefit of controlling base rot caused by the fungus *Ceratocystis paradoxa*.

Further treatment with fungicide drenches is also recommended to avoid losses from top and root rot. These should be applied immediately after planting and then at intervals of 4 to 6 weeks if wet weather occurs. Fungicides currently available are only protectants and must be applied before invasion by the fungi.

*Compiled by N.T. Vock, Plant Pathology Branch. (Further information including recommended fungicides can be obtained from your nearest Plant Pathology office or by writing to the Director, Plant Pathology Branch, Meiers Road, Indooroopilly, Q. 4068.)*



# Diseases of pineapples - 2



**TOP AND ROOT ROT CONTROL WITH FUNGICIDES.** Left row: treated. Right row: untreated.



**CONTROL BY PLANTATION DRAINAGE.**  
Note the high beds and inter-row drains.



**CONTROL WITH POLYTHENE MULCH.**