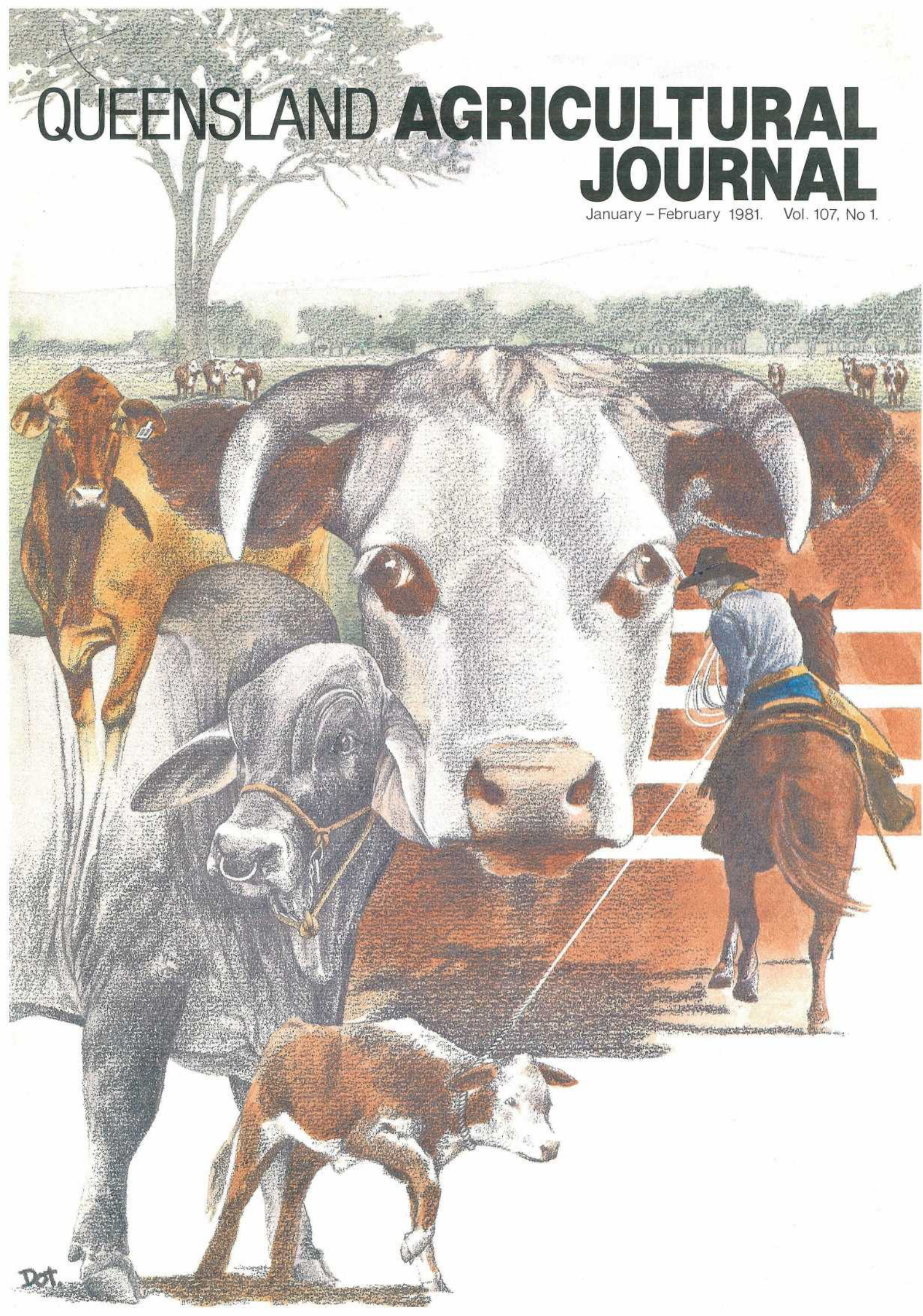


QUEENSLAND **AGRICULTURAL** **JOURNAL**

January – February 1981. Vol. 107, No 1.





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Cover: Queensland is Australia's biggest meat-producing State. The diversity of land types and climatic conditions and the different breeds adapted to them have helped stimulate the growth in this vitally important primary industry. See 'Beef cattle breeds' in this issue. Cover by D. W. Mulder.

Editor: P. R. Lee

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ISSN 0157-7786

QUEENSLAND AGRICULTURAL JOURNAL

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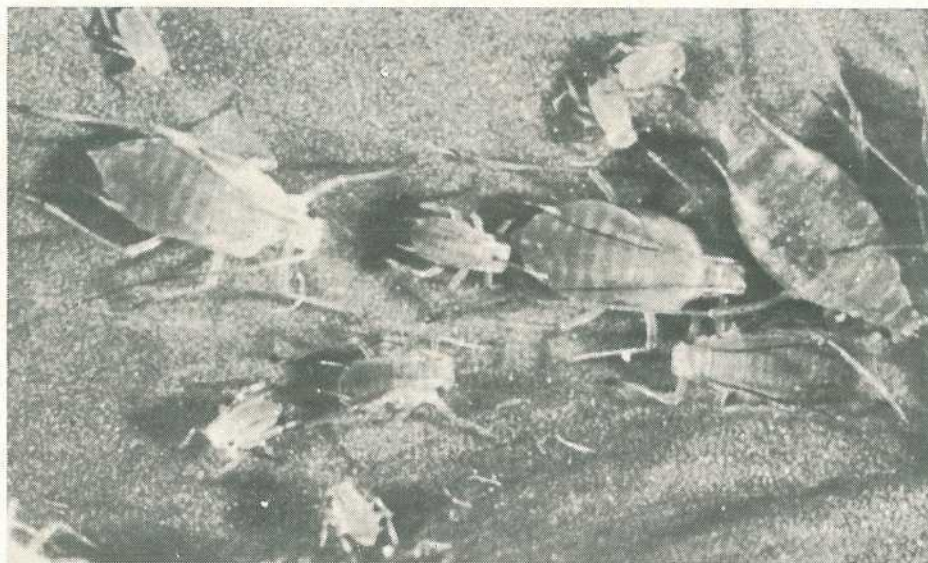
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The *Queensland Agricultural Journal* is published every second month by the Department of Primary Industries, Mineral House, George Street, Brisbane, Queensland, 4000. Telephone 224 0414.

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Lucerne insect pest management

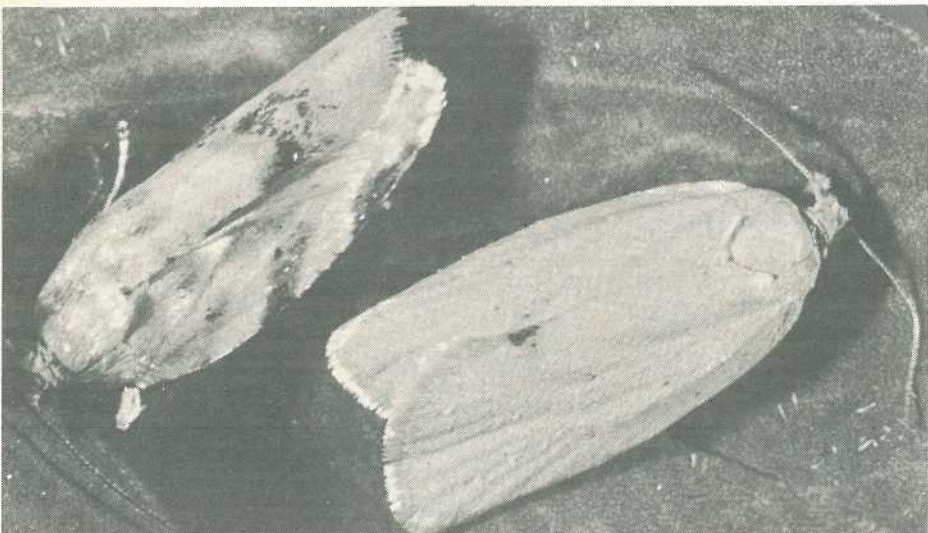
by J. W. Turner and B. A. Franzmann, Entomology Branch



Blue-green aphids.



A spotted alfalfa aphid 'mummy' and the adult parasitic wasp.



Moths of the lucerne leafroller (a male with dark bands on the wings and a female).

Lucerne is not only attacked by insect pests, but it also provides food and shelter for a number of beneficial insect parasites and predators of these and other pests.

Since it is a perennial crop these beneficial insects are able to persist from year to year and also to spread to neighbouring annual crops which are not available to support them continuously.

The crop is therefore important as a reservoir and a nursery for beneficial insects and should be managed accordingly.

The ability of lucerne to sustain some insect damage with very little loss of yield gives growers the opportunity of obtaining maximum benefit from natural controlling agents by allowing some pest species to remain in their fields. Often, spraying upsets the balance between pest and beneficial insect populations. This stimulates the resurgence of the pest and makes repeated treatments necessary. The development of insecticide resistance could be accelerated.

It is important to minimize the use of insecticides on lucerne and only to apply them when natural control is inadequate and economic losses are likely. The pest management procedures in this article approach this goal as closely as current knowledge will allow. They emphasize **CORRECT TIMING OF SELECTED TREATMENTS** as determined by the **PEST NUMBERS**.

The following are the important insect pests of lucerne in Queensland.

Spotted alfalfa aphid and blue-green aphid

Spotted alfalfa aphids are pale yellow with six or more rows of black spots along their backs. Blue-green aphids vary from pale green-grey to dark green-blue. When fully grown, they are about 2 to 3 mm long whereas spotted alfalfa aphids are 1 to 2 mm long.

In both species, all the adults are females and they can be either winged or wingless. Spotted alfalfa aphids are normally found on the stem and undersides of the lower leaves and have a tendency to jump when disturbed. Blue-green aphids typically inhabit the growing point and adjacent areas and do not jump as readily as spotted alfalfa aphids.

Both aphids can develop very rapidly. Living young are born as often as every 6 hours under ideal conditions. The life cycle can be as short as 1 week in summer.

The spotted alfalfa aphid is most common in the warmer months from spring to autumn. The blue-green aphid is mainly a pest during the cooler part of the year. Winged individuals colonize lucerne fields in the autumn and there are dramatic reductions in populations in the spring.

Both aphids suck juice from the leaves and stems and inject a toxin into the plants. Seedling lucerne can be killed rapidly. The first sign of spotted alfalfa aphid feeding in lucerne is yellowing or whitening of the leaf veins. As populations increase, the lower leaves yellow, curl, die and drop. Eventually, only the terminal leaves remain and these will also die if the infestation persists. Blue-green aphids cause shortened internodes, stunted plants, misshapen leaves and leaf yellowing.

Other effects of aphids include retardation of growth and reduction of root reserves and stand density with subsequent weed invasion. Not only is the lucerne yield reduced, but also honey dew and associated moulds reduce hay quality. Continuing damage shortens the productive life of a stand.

Hunter River is susceptible to both aphid species but a large number of lucernes which vary in aphid resistance and agronomic characteristics are now available. In making a choice, consideration has to be given to such things as soil, climate, disease susceptibility, availability of irrigation and use of the crop. The varietal recommendation for each locality can be obtained from the nearest Department of Primary Industries' office.

A tiny wasp which parasitizes the spotted alfalfa aphid has been imported and is established in all lucerne growing areas. A wide range of native predators feed on the aphids. Some of the more important are adults and larvae of ladybirds and brown lacewings, hoverfly larvae, damsel bugs, and some red mites and spiders. Native fungal diseases attack the aphids and can cause dramatic reductions in numbers, particularly when the populations are high and conditions are warm and humid.

These natural controlling agents may not destroy enough aphids to control a serious infestation before crop damage occurs. However, they are important in suppressing populations, holding down light

infestations and delaying reinfestation after applications of selective insecticides.

Lucerne seedlings can be protected from aphid damage for at least 4 to 6 weeks by using a granular insecticide drilled in with the seed. If this treatment is not used, seedlings should be inspected at least twice weekly and, if an average of two aphids per seedling is found (at any inspection site in the fields), control measures are necessary to prevent plant loss. During the period from when the lucerne is 100 mm high until the first harvest, five aphids per plant warrant control. If the variety is resistant to the particular aphid species present, these treatment levels can be increased.

When aphids infest established stands, the requirement for control measures will depend on the value lucerne has in the farming system. If each stem carries an average of more than 20 aphids, control measures are necessary to ensure continued lucerne growth. It is suggested that where control is considered necessary in hay production, an insecticide should be applied as soon as practicable after cutting. Where an infestation develops late in growth, the best procedure may be to cut (or graze) and apply an insecticide as soon as possible afterwards to ensure rapid growth for the next harvest.

While there are a number of insecticides which will effectively kill aphids, the chemicals listed (see table 1) have been selected because they have the least harmful effect on beneficial insects.

Pea aphid

A third lucerne aphid, the pea aphid, which is present in Southern Australia has not yet been found in Queensland. It is similar in appearance to the blue-green aphid but is shiny light yellow-green and grows to about 4 to 5 mm. In Queensland, it should be capable of surviving in lucerne during all seasons, reaching highest populations in spring and autumn.

Pea aphids suck juice from the tender parts of the plant and when abundant cause wilted, stunted and misshapen plants. The top leaves turn light green and the lower ones yellow and die.

The pea aphid can be important as a carrier of plant diseases.

If the pea aphid becomes established in Queensland, current controls for the other aphids should provide effective control.



Leaves that have been webbed together by lucerne leafrollers.



Native budworm larva killed by a virus disease.

Lucerne leaf roller

The parent moth of the lucerne leaf roller has a wing span of about 15 mm. The forewings when folded give the moth a bell-shaped appearance. These wings are light yellow with irregular dark markings, while the hind wings are pale brown. The moths deposit small eggs in clusters (like over-lapping scales) on the upper surfaces of leaves. The larvae which develop from them are greenish in colour with dark heads.

The larvae web and roll the terminal growth of the lucerne shoots, skeletonizing the leaves from within the roll. As the grubs grow, the size of the roll increases. After 4 or 5 weeks, the larva pupates within the leaf roll and the adult moth emerges 1 week later.

Lucerne leaf rollers are frequently present in high numbers during the warm spring, summer and autumn months. The pest is particularly common in well-grown lucerne shortly before and during flowering. Most severe infestations are associated with dry weather and the consequent reduction in the growth rate of plants.

Damage during severe infestations reduces plant vigour, while loss of leaf tissue reduces hay quality. Although the lucerne leaf roller is common in lucerne crops, the application of routine sprays is a waste of money as populations can be monitored reliably by the presence of leaf rolls.

It is suggested that for normal hay production, control measures be implemented when 30% or more of terminals are rolled. This level may have to be lowered for segments of the industry where more than usual emphasis is placed on appearance of the lucerne as a measure of quality.

If a crop is approaching maturity, early cutting or grazing should be considered as, although it is not as efficient in killing as sprays, this saves money, conserves beneficial insects and may reduce the necessity for future control measures.

Jassids

Jassids or leaf hoppers are small green to yellow sap-sucking insects about 5 mm long and somewhat torpedo-shaped. The adults have the characteristic habit of jumping or moving sideways over the edges of the leaves when disturbed. Jassids insert eggs into the plant tissues. The nymphs are similar to the adults but have no wings. The cycle from egg

to egg requires 2 to 3 weeks in summer, thus allowing a rapid build-up in numbers.

Two species of jassids which are very different in their effects on the plant are found on lucerne. The vegetable jassid is bright green and larger than the yellowish-green lucerne jassid. The vegetable jassid has a wider range of hosts and is normally present in the fields far earlier in spring-summer than the lucerne jassid.

The vegetable jassid sucks from the cells in the leaves. Each feeding puncture kills some cells and the damage soon shows as a small white spot. Continued feeding results in the typical jassid stipple pattern on the leaves.

The lucerne jassid feeds from the sap-conducting system of the plant and does not produce obvious stippling. This causes yellowing of leaves and during severe infestations, burning of leaf tips. Lucerne jassids have a more severe effect on the plant than vegetable jassids at the same population level and can stunt crop growth.

Growers can usually ignore the presence of vegetable jassids as they cause little or no damage except when they are present in extremely high numbers. On the other hand, lucerne jassids should be controlled when high populations are found. Control measures should begin when more than 200 lucerne jassids are caught in 10 sweeps with a 350 mm diameter insect net (unfortunately there is no better on-farm assessment method). Early harvesting is again an option in pest management.

Minor pests

The native budworm, or *Heliothis*, is a pest of many crops. It generally attacks lucerne during spring and early autumn. Eggs are laid singly on the leaves and the larvae grow to maturity in 2 or 3 weeks. Larvae vary in colour from dark brown to pale green, with longitudinal stripes along their bodies.

Most larvae in lucerne never reach the pupal stage as developing populations are almost invariably wiped out by an insect virus disease. Infected larvae at death are soft and rupture readily, oozing dark liquid over the leaves.

When assessing infestations of native budworm in lucerne, check for disease in the population. Except in cases where very high populations are present and if many

larvae are showing disease symptoms, spraying will be unnecessary as the larvae will die in any case. Spraying is recommended when one healthy, medium to large size larva is seen per 10 stalks.

Cutworms are moth larvae which shelter in the soil and trash during the day and feed at night. Their presence may be indicated by thinning seedling stands and plants cut off at ground level and can be confirmed by digging in the soil at the base of plants for the large, soft-bodied, brown larvae. The larvae are readily controlled with insecticides.

Crown borers are normally pests of old lucerne stands. The larvae tunnel and feed in the crown, sometimes killing the plant. It is not practical to attempt chemical control with the insecticides now available and it is recommended that heavily infested stands be replaced. The same recommendation applies to stands heavily infested with white-fringed weevil larvae which feed on the roots of lucerne plants.

Pests mentioned in this article

Spotted alfalfa aphid	<i>Therioaphis trifolii</i> (Monell) f. <i>maculata</i>
Bluegreen aphid	<i>Acyrtosiphon kondoi</i> Shinji
Pea aphid	<i>Acyrtosiphon pisum</i> (Harris)
Lucerne leafroller	<i>Merophyas divulsana</i> (Walker)
Vegetable jassid	<i>Austroasca viridigrisea</i> (Paoli)
Lucerne jassid	<i>Austroasca alfalfae</i> (Evans)
Native budworm	<i>Heliothis punctiger</i> Wallengren
Cutworms	<i>Agrotis</i> spp.
Lucerne crownborers	<i>Zygrita diva</i> Thompson, <i>Corrhenes stigmatica</i> (Pascos)
Whitefringed weevil	<i>Graphognathus leucoloma</i> (Boheman)

Insecticidal control

A basic requirement for effective pest management is regular checking of fields for insects and their damage. Regular checking of the insect situation in each field results in more timely treatments.

The list of insecticides in table 1 is recommended for control of the particular lucerne pest when its population reaches the suggested treatment level. These materials must be applied carefully with a well-calibrated boom sprayer or from an aeroplane if safe, effective and economical insect control is to be obtained.

TABLE 1

Pest	Pesticide	Withholding period (days)	Application rate per hectare	
			Commercial preparation	Active constituent
Blue-green aphid and spotted alfalfa aphid	Demeton-S-methyl	3	300 mL of 25%	75 g
	Dimethoate	7	150 mL of 40%	60 g
	Disulfoton*		5 kg of 5% granule	250 g
	Pirimicarb	3	100-150 mL of 50%	50-75 g
	Thiometon	7	150 mL of 24.5%	40 g
Cutworms	Trichlorfon	2	900 mL of 60%	540 g
	Chlorpyrifos	0	700 mL of 50%	350 g
Jassids	Dimethoate	7	350 mL of 40%	140 g
Lucerne leaf roller	Carbaryl	1	1.1 kg of 80%	880 g
	Methidathion	7	850 mL of 40%	340 g
Native budworm	Carbaryl	1	1.1 kg of 80%	880 g
	Methomyl	3	1.5-2 L of 22.5%	340-450 g

* Soil treatment only at sowing.

The Hon. Mike Ahern, M.L.A. Minister for Primary Industries



Mr Mike Ahern was sworn in as Minister for Primary Industries on 29 July last. At the age of 25 he entered Parliament in 1968 as the National Party Member for Landsborough. It was a by-election following the retirement of the then Premier, Sir Francis Nicklin.

Mr Ahern was raised on his father's dairy farm and grazing property at Conondale near Maleny. He attended Downlands College in Toowoomba and then went on to the University of Queensland where he gained his Bachelor of Agricultural Science degree in 1963.

On graduating, he returned to the family farm and developed an interest in politics. He became Federal Chairman of the Young Australian Country Party or National Party as we know it today.

During his 12 years as a back bench he served on several Parliamentary Committees, the more recent of which was the Select Committee on Education which he chaired. In 1977, he attended a Parliamentary conference in Canada and also had a chance to see something of their grain handling facilities.

The first Bill which the new Minister introduced into Parliament was the Farmers' Assistance Act Amendment Bill, 1980. The Bill is designed to assist young people obtain a financial interest in the family farm.

When not attending to the duties of his Primary Industries portfolio, Mr Ahern lives at Caloundra with his wife and five young children—four daughters and a son.

Barley guide for 1981

compiled by J. F. Bourne, Agriculture Branch

Barley is grown in Queensland principally in the Darling Downs, Moreton, Burnett, and parts of the Capricornia and Near South-west regions. It is grown for grain and sometimes for grazing.

A total of 188 266 ha was registered with the Barley Marketing Board in 1979 for an intake of about 250 000 t. In favourable seasons, the total intake may be of the order of 500 000 t.

The Barley Marketing Board receives barley into three classifications—malt, manufacturing and feed.

Clipper is the only barley variety that will be accepted for classification as malt or manufacturing. Other varieties such as Corvette, Prior, Maris Baldric, Zephyr, and Lara will only be accepted as feed classification.

Quality

The Barley Marketing Board has set an upper limit of 11.9% protein (dry basis) for grain acceptable as malt quality.

A grain moisture level of 12% is applicable to all classifications.

Other grain quality restrictions apply to contamination by foreign matter such as weed seeds. The permissible level of foreign matter is subject to review but at present includes *Datura* spp., and Mexican poppy—one seed per 0.5 litre; smut—nil.

Disease

Barley is normally resistant to stem rust, but in hot weather this resistance may break down and some late crops could become infected. Detailed information is not available on the resistance of the barley varieties to current strains of leaf rust. Field observations indicate that Lara is more susceptible than other varieties.

Planting time

When sown for grain, barley is normally planted from May to July. May-early June planted crops will mature under cooler temperatures and produce a better malt quality grain. However, frost damage is a danger with grain crops sown very early.

When planted as a grazing or dual purpose crop, barley may be sown from April to August. July or

August-planted barley will give faster grazing than oats planted at that time. The most useful grazing variety is Corvette.

Planting rates

The planting rate for barley depends on the proposed use of the crop and ranges from 30 to 50 kg per ha for rain-grown conditions but should be increased to 50 to 70 kg per ha when grown under irrigation. The rate should also be adjusted to the district soil type, available soil moisture, planting time and variety.

Fertilizer

The type and rate of fertilizer is related to soil type, available soil moisture, cropping history and planting time. Under irrigation, higher rates of nitrogen may be applied without affecting the malt quality of the grain. Higher rates of nitrogen may also be used to advantage with feed varieties of barley.

Your local Agricultural Extension Officer should be consulted to determine the best planting rates and fertilizer requirements for your district and/or farm.

BARLEY VARIETAL CHARACTERISTICS, QUEENSLAND 1981

Variety	Agronomy						Disease	Grain Quality		
	Maturity	Yield potential % Clipper in D.P.I. trials	Head type	Height	Resistance to lodging	Suit- ability for grazing	Resistance to powdery mildew	Classi- fication	Test weight	Grain colour
Clipper	quick	100	2 row	medium	poor	fair	low	malt, manu- facturing or feed	high	white
Lara	medium-slow	115	2 row	medium	medium	fair	low	feed	medium	white
Corvette	quick	118	2 row	short	medium	good	medium	feed	low	very pale blue
Maris Baldric ...	medium	94	2 row	medium	poor	fair	not available	feed	medium	white
Prior	quick	93	2 row	medium	very poor	fair	low	feed	medium	white
Cape	slow	80	6 row	tall	good	good	low-medium	feed	low	white
Skinless	medium	75	6 row	tall	poor	good	not available	feed	very high	brown
Black	slow	70	6 row	medium	medium	good	not available	feed	medium	black

Radio on the property

By L. Dunlop, Sheep and Wool Branch, and A. Manuel, Postal and Telecommunications Department.

More graziers are discovering the advantages of radio for on-property management.

Radio has provided emergency and educational services in western Queensland through the Royal Flying Doctor Service (R.F.D.S.) and School-of-the-Air for many years. However, it has rarely been used for routine property control. Recently, with labour shortages and advances in technology, graziers are realizing its value in the day-to-day management of their properties.

On-property management

Radio for this purpose is used mainly to organize routine husbandry practices (for example, mustering). It involves equipping vehicles (cars, trucks, motor cycles, tractors) with transceivers to allow contact with a control base at the homestead and between each vehicle. There are several types of radio available in this category. An owner's choice will depend on:

- The distances involved.
- The reliability required in communication.
- Cost.

He should discuss his circumstances and requirements with officers of the Postal and Telecommunications Department before buying his radio equipment. The various types of equipment are:

CBRS (Citizens Band Radio Service)

Two frequency bands are available in CBRS—27 MHz and UHF. The 27 MHz band has 18 channels (frequencies), but reception, normally over 30 to 80 km, is subject to interference from Australian and overseas stations. In the UHF band, there are 40 frequencies but the coverage is only 10 to 20 km.

The main advantage of CBRS is that the annual licence fee is \$40 (non-private) and \$20 (private) for five stations. These stations may be fixed or mobile as the licensee wishes.

27 MHz handphone mobile service

This involves hand-held transceivers (power 4 w) operating on one selected frequency, 27.240 MHz (outside the Citizens Band). The range of this service is restricted to 1 to 5 km, depending on the terrain. The annual licence fee is \$25 (non-private) and \$20 (private).

27 MHz internal mobile radio telephone service

This operates in a similar fashion to the 27 MHz CBRS except that the individual licensee is given one specific frequency which may be shared by others, and the base site is to be approved in each case. The annual licence fee is \$50 for the base and \$50 for the mobile.

VHF land mobile service

This involves a base at an approved site with any number of mobile stations operating in the band 70–85 or 156–172 MHz. The coverage depends greatly on the base station antenna height, but reliable communication can be obtained up to 20 to 50 km. This is adequate for most sheep and cattle properties in western Queensland. The service is normally free of interference. The annual licence fee is \$50 (non-private) and \$25 (private) for the base and \$32 (non-private) and \$20 (private) for each mobile station.

HF SSB service

Where the property area is larger than can be covered by a VHF service (that is the distance may be 50 to 200 km or more) the Department may approve a High Frequency SSB Service. This involves more expensive equipment than VHF. Frequencies are subject to some fading and interference, but in practice this is acceptable to licensees. The frequency will be shared by other users in Australia. Licence fees are the same as for VHF Land Mobile Service.



The radio handset on a VHF system in operation at the homestead.



One mobile calling up another via the base station aerial.

Rural Fire Brigade operation

Almost all Rural Fire Brigade services in Queensland using radio operate on 74.06 or 168.82 MHz. The higher frequency is the one used in conjunction with the State Emergency Service. It is intended over the next few years to assign new Rural Fire Brigades to 78.685 MHz. This will permit services on 74.06 MHz to have the frequency changed, and ultimately all Rural Fire Brigades will be on a common frequency. Services now on 168.82 MHz will be asked to transfer to 78.685 MHz as new equipment is purchased.

Where stations are used solely for fire fighting, the licence fee is waived but applications for licences must still be made. Stations used also for property control will cost \$50 for the base and \$32 for mobile stations.

Provided the property owner is a member of the State Emergency Service or Rural Fire Brigade, he can apply for a licence to operate on the common emergency frequency of 78.685 MHz and is permitted to use the network for private purposes within property boundaries. Therefore, base to mobile operation is permitted but not base to base which can be used only for fires, emergencies or when telephone communications have failed.

One such system operates at Toompine in south-west Queensland. It has 13 users whose individual properties cover 231 000 ha and extend to 96 km. Intending applicants should write to the Director, Queensland State Emergency Service, P.O. Box 307, Fortitude Valley, Q. 4006.

Aerial mustering

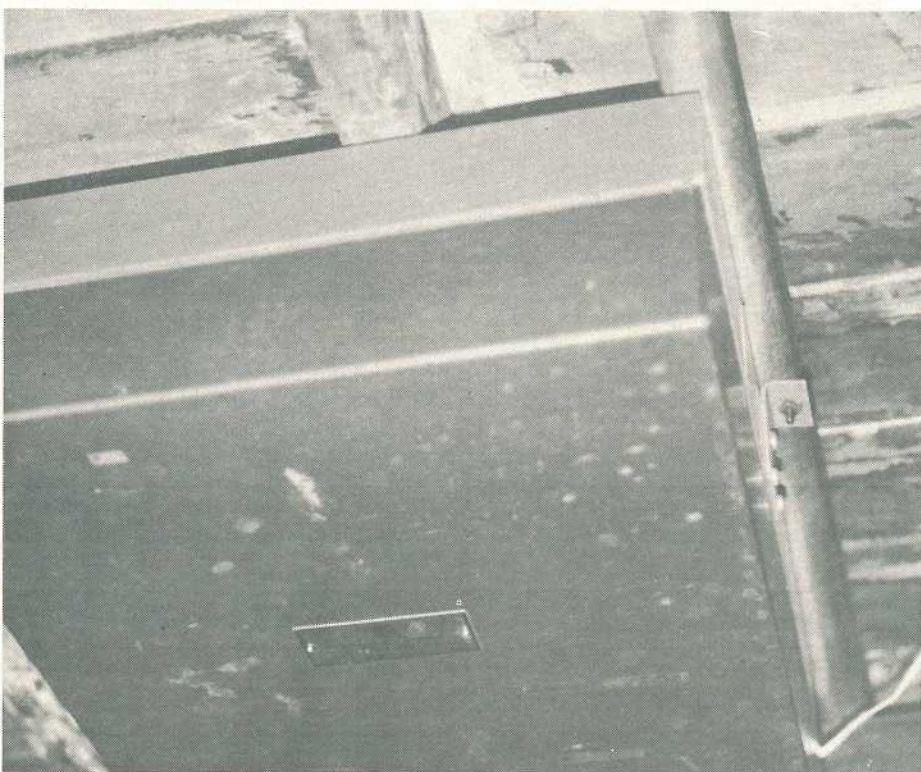
Any of the above VHF or 27 MHz services may be used for this purpose. For aircraft/helicopter to ground communication it is necessary to license the aircraft station and one or more aeronautical stations (either fixed or mobile). In this instance, quite often a frequency in the aeronautical band will be assigned by the Postal and Telecommunications Department. The licence fee for aircraft stations is \$30 (non-private) and \$20 (private) and for aeronautical stations \$50 (non-private) and \$25 (private).

Radio control of mechanical devices

Various bands are set aside for services used for this purpose. Such



This mobile station has a speaker mounted on the bonnet. The driver can be called up at a distance of 150 m from his vehicle.



A base station slung under the tank stand near a 46 m aerial.

services employ transmitting equipment with a power not exceeding 1 w. Where there is a requirement which cannot be met under these conditions, application should be made to the Postal and Telecommunications Department.

The use of radio for remote control of mechanical devices has not yet developed in the pastoral industry. Radio could be used to control and monitor the function of engines and pumps and the levels of water in tanks.

Emergency service

The emergency service provided by R.F.D.S. applies where property owners or other persons have no telephone and where mobile or camp sites are in isolated areas. The service works into the nearest R.F.D.S. outpost control station. In addition to emergency medical traffic, it permits messages in the form of telegrams to be sent anywhere in Australia. In Queensland there are control stations at Cairns, Mount Isa and Charleville.

Users of the emergency service can avail themselves of School-of-the-Air facilities upon first contacting the Education Department. If necessary, School-of-the-Air is available to people who do have telephone facilities.

Licence fees

These are subject to review from time to time. Intending users should keep in touch with the Postal and Telecommunications Department at the nearest office, or at P.O. Box 555, Fortitude Valley, Q. 4006.

Note: A private station is a station 'used solely for purposes other than business purposes'.

Seek advice

The Postal and Telecommunications Department (Brisbane Office) in making information available has emphasized the need to obtain advice

from the Department BEFORE purchasing equipment. Their experience over a number of years has revealed that many people purchase equipment advertised in magazines or papers, only to find that it does not satisfy their requirements. In many cases, the money is wasted. All equipment used in licensed services in Australia must be type-approved to conform to particular specifications. It is essential that the appropriate specifications be confirmed.

Information may be obtained from the Brisbane State Office of the Department or from the District Radio Inspector's Office at Bundaberg, Rockhampton, Mackay, Townsville, Cairns and Mount Isa.

Minimum prices fixed for apples and pears for processing

The Minister for Primary Industries, Mr Mike Ahern, announced that the recommended minimum prices during 1981 for juice apples will be \$82.50 a tonne and \$68.50 a tonne for juice pears. Canning grade A apples will be \$110.00 a tonne and B grade \$98.10 a tonne.

These recommended minimum prices are at factory gates within 48 km of Brisbane. Where apples and

pears are processed outside the specified area, the minimum price will be the capital city price less freight charges.

The Minister said the recommended minimum prices for each State were determined recently at a meeting in Melbourne of the Processed Apple and Pear Sub-Committee of the Standing Committee on Agriculture.

The Sub-Committee represents growers and processors of processing apples and pears in all producing States.

The 1981 prices are the same as for 1980. The decision not to increase prices reflects the industry's concern about the current level of apple juice stocks that could not be placed during 1980 and will have to be carried forward to 1981.

Delay in opening flower market

Wet weather has delayed the opening of the new wholesale flower market at the Brisbane Market, Rocklea.

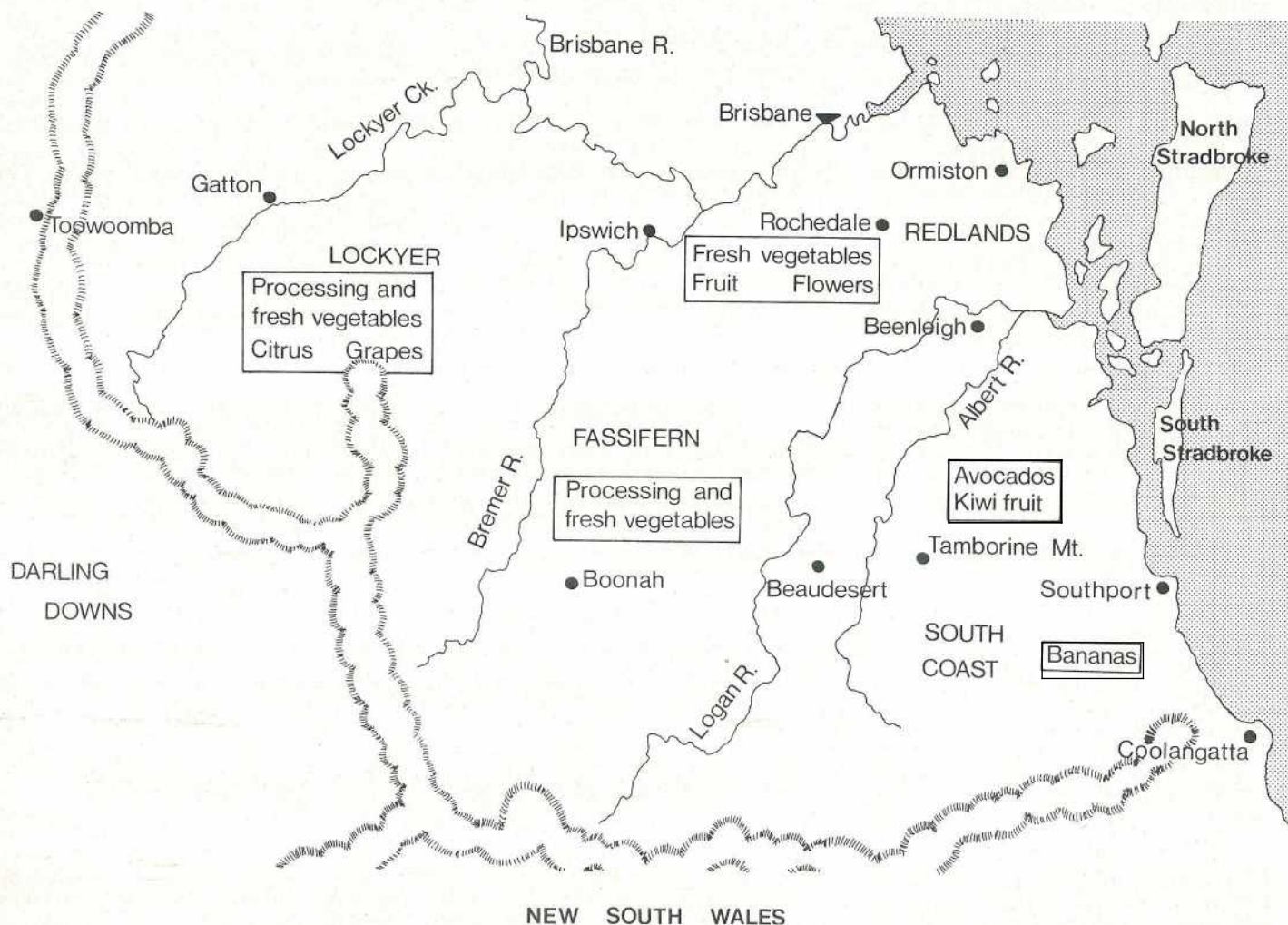
The Minister for Primary Industries, Mr Mike Ahern, said that the new flower market will now be officially opened on Monday, 13 April. The original opening date was 25 March.

Mr Ahern said that construction of the building had been delayed but given reasonable weather conditions, the new building should be available for wholesalers to occupy and equip in early to mid March. The Brisbane Market Trust advises that it may be possible for the new building to commence trading before 13 April.

Initially, four wholesalers have been allotted space in the flower market and the Market Trust will be

monitoring developments. The extent to which further facilities will be developed will depend upon the support which the new market receives.

The Minister said that he saw this facility as providing an additional market outlet for flower growers and for nurserymen. It was hoped that this would lead to an expanded market for the flower-growing industry.



Horticulture in the South Moreton region

By W. N. B. Macleod, Horticulture Branch

The South Moreton area is an important horticultural production region because of its proximity to the major population centres in Queensland.

It extends from the Brisbane River in the north to the Queensland-New South Wales border in the south, and from the coastline inland to the eastern Darling Downs. The area includes the Brisbane, Logan and Albert River systems.

There are six main horticultural-producing districts within the region and these can be broadly described as: the Redlands, south metropolitan, Lockyer Valley, Fassifern Valley, Beaudesert Valley and South Coast. (See map).

One of the more important fresh market fruit and vegetable producing

areas of Queensland is the Redlands district. It is a major producer of tomatoes, cabbages, passionfruit, strawberries and cut flowers.

The south metropolitan district includes the Rochedale, Richlands and Park Ridge districts; the latter two being important early table grape producing areas. Rochedale is an important lettuce- and strawberry-growing district. Prior to urbanization, Sunnybank also was a major horticultural production centre.

Other important vegetable-growing districts include the subcoastal valleys of the Lockyer, Fassifern and Beaudesert regions. The former two in particular are among the most important processing vegetable production areas in Australia, growing most of the country's beet-

root and a large percentage of its carrots, beans and peas. The near Darling Downs shows considerable promise for expansion of vegetable production and already grows the bulk of lettuce in summer for the Brisbane market.

Tamborine Mountain, which is within the Beaudesert Shire, is one of the major producing areas for avocados in Queensland. The district also shows considerable potential for the establishment of a kiwi-fruit (Chinese gooseberry) industry in Queensland.

Horticultural production in the South Coast district has declined in recent years. Banana production is the main enterprise in the Currumbin and Tallebudgera areas.

Climate

The coastal areas of the South Moreton region experience moderate summer and mild winter temperatures. Winter frosts are not common and are seldom severe.

In late summer and autumn, the prevailing winds are mainly south-east to easterly. During July and August, cold westerlies may cause plant injury, and windbreaks are therefore a distinct advantage in exposed situations.

Over half of the annual rainfall is recorded between December and March. Vegetable production in spring and early summer has virtually ended when the wet season begins. Unless very heavy rains occur in the late March–April period, land preparation for autumn-planted crops goes on without interruption.

The relatively dry winter period does not unduly upset horticultural production, as vegetables are grown under irrigation and most orchard and plantation crops are semi-dormant at that time of year.

Most of the coastal districts enjoy an insular climate. This is shown in table 1.

There are far greater variations in temperature in the sub-coastal districts. Higher temperatures occur during the relatively dry spring and early summer. The winter is cold and frosts are common.

Soils

The major soil types utilized for horticultural production are krasnozems in the Redlands, Mt. Tamborine and Toowoomba areas; red sandy loams and lateritic podsolics in the South Metropolitan areas and alluvial soils in the Lockyer, Fassifern and Beaudesert areas.

The Redlands krasnozems are generally deep, well-drained soils with a low to moderate range of available moisture, are well-structured, have underground water and good frost-resistance. They are low in available nitrogen, phosphorus, molybdenum and zinc. The regular incorporation of organic matter into these soils helps to maintain a good soil structure.

The red earths of Rochedale and Sunnybank generally have very low levels of available nutrients and require nitrogen, phosphorus, potassium, zinc and molybdenum. The soils are friable and well-drained and are elevated with good frost resistance. The other useful horticultural soils in the south metropolitan area are deep, coarse sands on the higher ridges through to sandy and red-yellow podsolics in the Park Ridge and Richlands districts. These higher ridge areas are utilized mainly for grapes with small crops grown on the lower slopes.

Black alluvial clay loams comprise the main useful horticultural soils in the sub-coastal valleys. They are generally neutral to alkaline in reaction and normally adequately supplied with plant nutrients, although a good response to nitrogen can be expected with most fruit and vegetable crops.

Irrigation

The area under horticultural crops in the South Moreton approximates 11 000 ha and almost 95 per cent of it is irrigated by overhead sprays. Trickle irrigation is now being widely used, particularly with new plantings, in many of the orchard and vine crops.

For satisfactory production of annual vegetable crops, irrigation is essential particularly during the comparatively dry autumn-winter-spring

growing season. Few fruit and vegetable farms have access to rivers and creeks in the Redlands and south metropolitan areas and as a result, irrigation is mainly dependent upon water from bores, wells and dams.

The underground water is tapped at 14 to 30 m, but the flow is variable. Where the flow is inadequate for pumping direct through the spray lines, a reservoir or dam may be built. The bore is then used to fill the reservoir which is in turn used for irrigation of the crop.

There are more creeks and rivers providing irrigation water in the sub-coastal valleys than the coastal areas. Some of the main streams are supplied by upper reach reservoirs. The Maroon dam supplies the river system in the Beaudesert Valley, Moogerah Dam in the Fassifern, and Atkinson Dam in part of the Lockyer.

However, there is still a large proportion of growers who pump from bores which tap underground supplies. This water is, on the whole, suitable for irrigation but in some areas tends to be saline, particularly during long periods of dry weather. Wells with salinity problems are usually near the upper reaches of some tributary streams in the Lockyer.

Production and markets

The area under crop, the average production, and value of the major fruit and vegetables for 1979–80 are listed in Table 3.

Production of processing crops, citrus, grapes and cucurbits has been static in recent years. However, production of other horticultural crops is steadily increasing.

The main vegetable production seasons in the South Moreton region are in the spring and autumn periods.

TABLE 1

Climatic Data for Redlands Horticultural Research Station, Ormiston

—	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year
Mean max. temp. (°C)	28.4	28.2	27.5	25.7	22.8	20.9	20.0	21.3	23.2	25.0	26.9	27.6	24.8
Mean min. temp. (°C)	20.1	20.0	18.2	15.2	12.1	9.8	7.8	8.9	11.0	14.7	16.8	19.0	14.5
Mean rainfall (mm)	194	181	182	79	93	86	88	59	41	104	94	145	1 346

TABLE 2

Climatic Data for Gatton Research Station, Gatton

—	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year
Mean max. temp. (°C)	31.3	29.9	29.3	27.4	23.9	21.6	20.6	22.4	24.6	27.8	29.8	31.2	26.7
Mean min. temp. (°C)	19.4	18.9	16.8	13.2	10.1	6.8	5.5	7.3	9.3	13.0	15.3	18.2	12.8
Mean rainfall (mm)	207	103	73	17	47	17	66	43	26	116	75	122	912

TABLE 3

Major Crop Production Data 1979-80 South Moreton Region

Crop	Area (ha)	Production	Estimated Gross Value (\$m)
FRESH MARKET VEGETABLES			
Tomatoes	400	1 m cartons	5
Capsicums	50	50 000 cartons	0.25
Crucifers	1 000	35 000 t	4
Lettuce	250	1 m cartons	3.25
Cucurbits	800	6 000 t	0.75
Potatoes, English (winter crop)	200	6 000 t	0.75
Carrots	150	2 250 t	0.5
PROCESSING VEGETABLES			
Beans	2 200	11 000 t	1.8
Peas	3 150	11 500 t	1.2
Beetroot	675	25 000 t	1.5
Carrots	515	13 000 t	1.2
Sweet corn	160	1 600 t	..
FRUIT CROPS			
Strawberries	60	1 000 t	2.0
Bananas	360	345 000 cartons	1.7
Passionfruit	90	2 000 t	0.9
Citrus	200	200 000 cartons	0.8
Grapes	160	80 000 cartons	0.5
Avocados	140	35 000 cartons	0.5
Custard apple	25	10 000 cases	0.05
FLORICULTURE			
Cut flowers	100	1 000 000 doz. bunches	2.0
NURSERIES			
Ornamental, turf, fruit	..	..	10.0
Total	10 725	..	\$38.65

However, the relatively large geographical differences within the region allow some vegetable production to be carried out throughout the year. For example, the higher, cooler near Darling Downs district allows summer production of lettuce, celery and other vegetables. Tomatoes can be grown through the winter in the frost-free coastal areas.

Most of the fruit and vegetable production is consigned to the fresh market. Brisbane is the major fresh market outlet, but significant quantities of fruit and vegetables are consigned to southern markets, during the late autumn-winter-early spring periods. The main southern consignments consist of avocados, strawberries and lettuce.

Produce not marketed on the fresh market is processed. Citrus, passionfruit, and strawberries are in this category. The Lockyer, Fassifern and, to a minor extent, Beaudesert Valleys produce approximately 6 500 ha of processing vegetable crops. These include beans, beetroot, peas, carrots and sweet corn.

Higher costs of production in the fruit and vegetable industries are making it less profitable and only growers with a high level of expertise are gaining stable returns.

The availability of improved vegetable varieties with increased

yields and disease resistance, accompanied by a greater rationalization in the packaging, marketing and distribution side of production, have helped increase the efficiency of horticultural production

Crop culture

Vegetable crops

TOMATOES—Tomatoes are the major horticultural crop in the South Moreton region. Over 400 ha are grown annually for a production in

excess of 1 million cartons valued at some \$5 million.

The major areas of production are the Redlands, south metropolitan and Lockyer districts.

Tomatoes are intensively grown in small areas and are thus trellised as opposed to the more extensive broad-acre ground crops grown in North Queensland. The crop is grown during the greater part of the year and fruit is harvested between April and December. There are two main crops per year—autumn and spring.



Trellised tomatoes.

Floradade is the major variety grown, due mainly to its superior keeping quality and tolerance to verticillium wilt. Bacterial wilt is still the major disease problem in the summer and early autumn. An experimental resistant line has been developed and has been grown successfully in small areas. It has recently been released to the industry under the name of Scorpio.

CRUCIFERS—Cabbages are the major crop in this group. Annual production of crucifers is valued at some \$4 million from about 1 000 ha producing some 35 000 t. Main centres of production are Redlands-south metropolitan (60%) and Lockyer (40%).

Crops are grown mostly from seedlings transplanted into the field, although significant areas are still direct-seeded in the Lockyer. A current trend is the use of container-grown seedlings.

The bulk of the crucifer crop is marketed on the local Brisbane market.

By using the right varieties, cabbages can be grown throughout the year. The markets prefer the semi-drumhead types. Green Coronet and Hybrid 33 are the main autumn-winter-spring varieties, while Olympic is the main summer variety, although it is likely to be replaced by the better quality Rambo and 1488 varieties.

The cauliflower season is limited, the crop being harvested from April to September on the coast. The cooler summer in the Toowoomba district enables earlier production of cauliflowers in the late summer period.

The main cauliflower varieties grown in the region are Selection 174, Snow King, Snow Gem, and Snowball Y.

Broccoli production has increased rapidly in the last 5 years. Premium quality is very important with this perishable commodity, and this has resulted in many growers constructing and utilizing coolrooms to pre-cool the crop before marketing.

The recent introduction of pyrethroid insecticides has enabled satisfactory control of most pests. Centre grub is sometimes a problem but is controlled with organophosphate insecticides.

Disease problems are minimal as most varieties grown have tolerance to black rot and 'fusarium yellow'.

LETTUCE—Lettuce is the third most important fresh vegetable crop grown in the region. Some one million cartons are produced annually from about 250 ha. The value of the crop is approximately \$3.25 million. The main centres of production are the Redlands-south metropolitan and Toowoomba districts.

The use of container-grown seedlings has been one of the biggest changes in this industry in the last 2 years, with a large percentage of growers now employing this method. This system offers many advantages including greater uniformity of head size and maturity, and lower costs of production due to the reduced time the crop is in the field.

Yatesdale is the main variety for crops planted from March to August; Pennlake is the preferred type for spring-summer production.

The Toowoomba area is the major region for summer lettuce production because it has a cooler climate than the coastal areas.

CUCURBITS—Cucumbers, rockmelons, watermelons, pumpkins and zucchinis are all grown extensively in the region. Early spring cucumbers are a speciality crop grown on warm frost-free slopes in the Redlands district. Marketer is the main variety produced. Autumn crops are also grown throughout the region and Green Gem is the major variety.

The Blackjack variety of zucchini is grown in small areas mainly in the south metropolitan and Redlands districts through the spring and autumn. The autumn crop is often severely affected by watermelon mosaic virus.

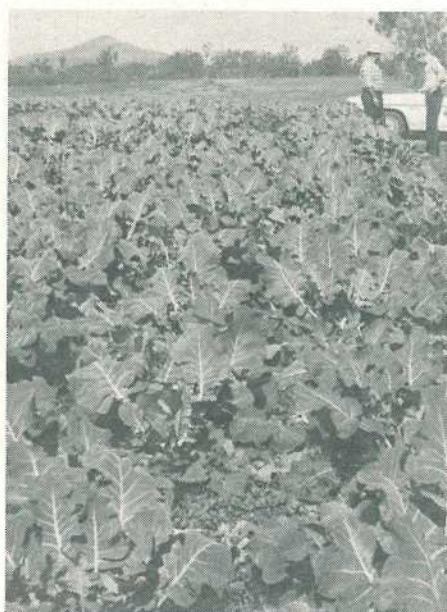
The subcoastal districts are the main producers of watermelon, pumpkins and rockmelons. Warpaint, Candy Red and Sunnyboy are the main watermelon cultivars, and Queensland Blue is the preferred pumpkin variety. Gulf Coast and Gulf stream are the main coastal rockmelons with Hales Best and Saticoy being the most popular subcoastal varieties.

Some 800 ha are planted to cucurbits in the region for an estimated production of about 6 000 t valued at approximately \$750,000.

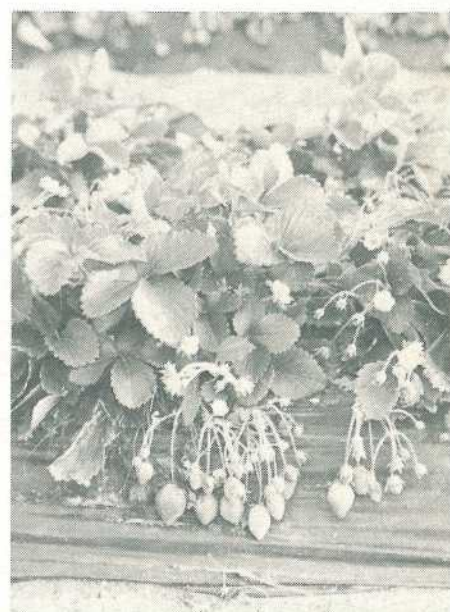
PROCESSING CROPS—The subcoastal districts of the Lockyer, Fassifern and to a lesser extent, Beaudesert Valleys are among the most important processing vegetable producing areas in Australia. They



Cucumbers are an important crop in the region.



Broccoli in the Lockyer Valley.



Erlisweet strawberries.



The high cost of labour and its unreliability have urged some growers to market their crops on a 'pick your own' basis.

grow most of the country's beetroot and a large percentage of its carrots, beans and peas.

A little over 2 000 ha of beans are produced annually. The major areas are the Lockyer (75%) and Fassifern Valleys (25%). Most are grown in the spring, but autumn cropping is also carried out to a lesser extent. The main variety is Gallatin Valley 50. Smaller areas of Apollo are also grown.

Some 3 200 ha of peas for processing are grown in the region. The Lockyer and Fassifern Valleys are the main areas of production with minor quantities produced in the Beaudesert Valley. The steady demand for the processed product has produced a fairly stable situation in this industry. There is a trend towards the greater use of precision planting to give greater crop uniformity, maturity, and thus overall improved quality.

Approximately 700 ha of beetroot are grown annually for processing. The Lockyer Valley produces 90 per cent and the Fassifern Valley the remainder. Production is in the order of 25 000 t.

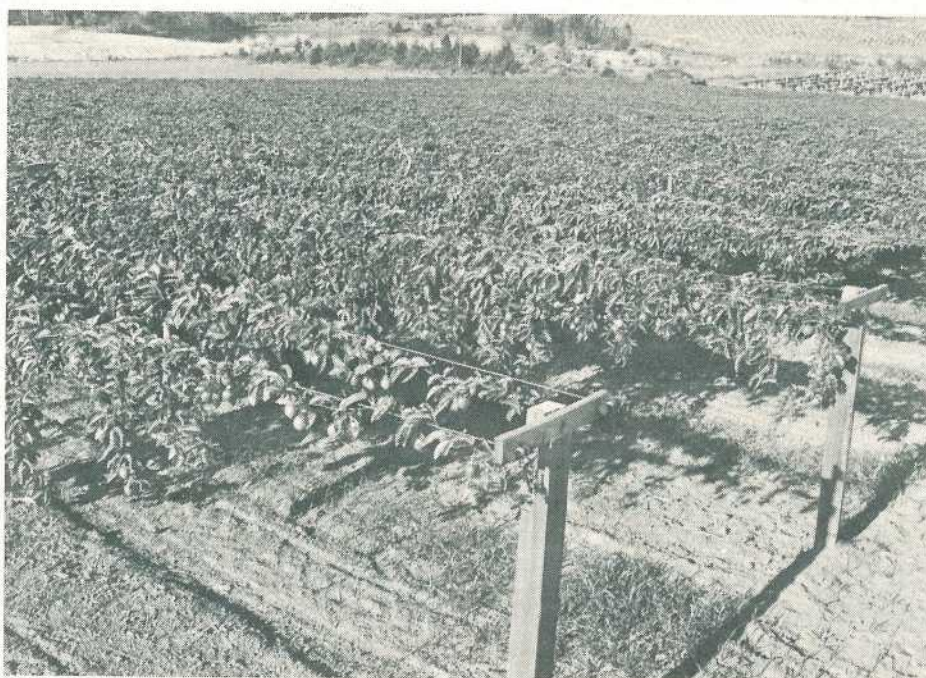
Few problems are experienced in dry seasons, but cool wet winter periods cause difficult establishment conditions.

Carrots for processing are grown mainly in the Lockyer (365 ha) and Fassifern Valleys (150 ha) for the baby carrot trade with a small percentage used for dicing, some 150 ha are grown for the fresh market.

MISCELLANEOUS VEGETABLES —Capsicums are a minor crop with approximately 50 ha grown in the spring and autumn periods. Bacterial spot and potato virus Y are the major problems limiting production.

Fresh market sweet corn production is limited to the pre-Christmas period because of fungus and virus disease problems which affect most commercial varieties after Christmas.

Celery is grown mainly by specialist growers. The main producing areas are Toowoomba and the south metropolitan districts. Approximately 50 ha are produced in the region. No expansion is likely because of high costs of production.



A passionfruit crop in the Redlands district.

Fruit crops

STRAWBERRIES — Approximately 40% of the strawberry production in the State occurs in this region. The Redlands and south metropolitan districts are the major production areas.

Planting takes place in March, and the mild winter in these areas ensures a long picking period which extends from May to December. During the early part of the cropping season, the fruit sells well on the local fresh fruit market and many growers also consign fruit to southern markets. Later in the season, during peak production in the spring, much of the fruit is sent to the processing factories for canning and jam making.

Redlands Crimson and Earlisweet are the two commercial varieties grown with approximately 60 ha producing 1 000 t annually.

The Approved Strawberry Runner Scheme provides up to 2 million 'special runners' annually to the industry. These runners produce higher yields of larger, better quality fruit and are also free of most pests and diseases. Before the introduction of the Scheme, viruses such as yellow edge, crinkle and mottle as well as root-knot and root lesion nematodes caused marked yield reductions.

The high cost of labour and its unreliability in this industry is initiating a trend toward 'pick-your-own' operations and smaller family units in an endeavour to reduce production costs.

BANANAS—Banana growing has declined in recent years due to the rising costs of production and lower returns. Approximately 350 ha are under production with the South Coast being the major production area. The Currumbin and Tallebudgera Valleys produce three-quarters of the crop with the Beenleigh-Pimpama district being the other main production district.

The essential features of good plantation management are soil conservation, fertilizer applications adequate to the needs of the crop, and rigorous control of the virus disease 'bunchy top'. The importance of this disease is recognized by the special legislation in force to deal with it.

Bananas do well on a variety of soil types. The most widely grown variety is Mons Mari. The Lady Finger is grown extensively on the better-drained alluvial and heavy black clay loams near the coast in the Beenleigh-Pimpama district. Owing to the incidence of Panama disease in this variety, growers show a tendency to make new plantings on slopes which would normally be assigned to Mons Mari.

PASSIONFRUIT—Production of this crop is centred mainly in the Redlands and south metropolitan areas. The industry is at present fairly stable and some 90 ha are under production.

The industry is based on the hybrid E23 with Lacey's being the other main commercial variety. Recent years have seen an increase in the severity of passionfruit woodiness virus which restricts the production and life of vines. As a result, there has been a minor trend to plant Purple Gold (a 3-1 type, also known as Days' Special) which is apparently more tolerant of the severe strain of woodiness.

Cropping of passionfruit is seasonal with a main summer crop and small winter and intermediate crops. The fruit is supplied to both fresh and processing outlets. About two-thirds of the crop is processed. The edible pulp and seeds of the passionfruit are important constituents of both fresh and canned fruit salads and are used for flavouring. The juice is used in the soft drink trade.

CITRUS—There are very few citrus orchards of any size outside the Lockyer Valley in this region. The area in the Lockyer Valley is steadily decreasing and at present there are 180 ha under production. Oranges are the main crop in the Lockyer Valley and a large percentage is marketed through roadside stalls in the district.



Grapes at Park Ridge.



Avocados being grown at Daisy Hill.

GRAPES—The total area under this crop is some 160 ha. The Lockyer Valley accounts for about 95 ha with the remainder grown in the Richlands, Park Ridge and Browns Plains districts.

Muscat Hamburg and Black Hamburg are the most popular varieties on the coast with lesser areas of Chaouch. On the light, deep, sandy soils where grapes are principally grown, it is customary to graft on to *Phylloxera* resistant stocks (such as *Rupestris du lot*) which also gives added vigour to the scion vine. Harvesting usually begins in late December and is completed by early February.

In the Lockyer Valley, Muscat Hamburg, Black Hamburg, Royal Ascot and White Muscat are the most popular varieties. Vines in this area are normally grown on their own roots. Vineyards are established in the warm areas of the Coominya and Helidon districts on well-drained light soils. Harvesting is later than in coastal areas and is usually completed by the end of February.

AVOCADOS—Tamborine Mountain is one of the major avocado-producing areas in the State with approximately 120 ha under trees. Smaller plantings have been established in the Redlands, south metropolitan, Lockyer and Toowoomba districts.

There is a large amount of interest shown in this crop due mainly to the good returns which have resulted in significant increases in plantings in recent years. Exceptionally well-drained soil is essential for the avocado tree, and irrigation is an advantage in an orchard, particularly in spring to improve fruit set and filling after blossoming.

Fuerte remains the major variety, although there is a slight swing to others due to its irregular bearing and susceptibility to fruit fly and Anthracnose disease. Other important varieties grown include Hass, Sharwil, Rincon, Hazzard and Wurtz. With the range of varieties and different district production times in which they are grown, fruit can be seen on the markets from late March through to early January.

The major problem and limitation to avocado production, root rot (*Phytophthora cinnamomi*) has been controlled by soil fungicide applications. However, the effects of a wet season on treated trees have yet to be observed.

CUSTARD APPLES—The Redlands and near south metropolitan areas are still noted for their custard apples orchards. About 25 ha are under production but sometimes large annual variations in yields occur because of the often rather shy bearing habits of the trees.

Pinks Mammoth is the most widely grown large fruit variety. African Pride is a fairly consistent bearer and is the other major variety with medium-sized fruit.

The main crop is developed from flowers produced during October to February. The majority of the crop is harvested from April to June and is sold on the local, southern and sometimes export markets.

MISCELLANEOUS FRUITS—The papaw, once a major crop, is now of little importance in the region. 'Dieback' still continues to be a major problem.

Grower interest in kiwifruit is considerable since it has been recently demonstrated that vines can produce prolifically in elevated areas (600 m). At this elevation, sufficient chilling is experienced and good crops are being produced. The Tamborine Mountain area could be suitable for this crop. New plantings are being established, and at present some 10 ha are trellised.

Alternative crops, such as tamarillo, litchi, persimmon, macadamia and pecan nut have been planted on a small scale. Significant expansion in any of these crops is not expected in this region.

FLORICULTURE — Cut flowers (gladioli, chrysanthemums, carnations and to a lesser extent, asters and roses) are important field crops, mainly in the Redlands district. Some 100 ha are grown with an estimated value in excess of \$4 million.

The main period of gladioli production is during winter when Queensland growers supply the entire Australian market and export to New Zealand. Many factors limit commercial production. Diseases cause serious economic losses, particularly on replant land. Shortages of water reduce stem lengths and the number of florets per spike. Plants can be damaged by frosts and some varieties are sensitive to low temperatures resulting in 'blindness' or failure to flower.

In recent years, winter production of chrysanthemums has developed. Until then, they were grown as a natural season crop—flowering for Mother's Day. Chrysanthemums are a versatile crop which can be produced as large single flowers, a spray of smaller flowers or as a potted flowering plant. In addition, with the use of artificial lighting, they can be produced year-round or timed precisely to flower for specific market dates. There are many varieties of chrysanthemums available with a wide range of colours, size and form.

Carnations, although considered a marginal crop for production in Queensland, are still grown widely. The varieties planted have been bred for a temperate climate and in Queensland's hot, humid summers they do not perform to their full potential. Flower quality is adversely affected and flowers are small. In addition, the climatic conditions aggravate leaf and soil-borne disease problems, and most growers suffer severe losses through diseases.

NURSERIES—There are now a large number of nurseries in the region which are catering for the increased demand for tropical foliage and ornamental plants.

There is a large demand from southern States as well as the local markets.

Future prospects

The horticultural future of any district depends on market outlets for the produce and the availability of land for expansion. The South Moreton region is fortunate in the first aspect due to its close proximity to the Brisbane market and the efficient transport system to southern markets. Fertile productive land, however, is at a premium. Recent years have seen the loss of Sunnybank as a production area through urbanization. The fertile Redlands district now faces a similar threat.

In the long term, this trend is likely to continue and may severely reduce the area of fertile production land. As a result, it would appear that the extension of major horticultural developments into soil types other than the red soils will be limited by various factors and that much of the production will tend to shift to other parts of Queensland outside the South Moreton region. The areas outside the South Moreton region which are likely to take over the production of the red soil areas of the Redlands and

Rosedale districts are the Bundaberg, Bowen and Gympie districts. However, some areas such as the Park Ridge district and the subcoastal valleys should become more important horticulturally than at present, and extension into the grey podsols in the Redlands will no doubt increase considerably. Unfortunately, much of the poorer class of land can only be developed for vegetable production by heavy capital expenditure on irrigation facilities and drainage works.

Production of fresh and processing horticultural crops in the Lockyer Valley is likely to remain static in the future. This is mainly due to the full commitment of creeks and underground aquifers to the current areas of production.

The Fassifern and Beaudesert Valleys are suited to the production of processing vegetable crops. However, they have limited potential in replacing fresh market production from the red soil coastal areas because the districts are generally susceptible to frost and thus have limited production periods.

Major production of passionfruit and strawberries will most probably continue in the Moreton district, with areas of production tending to shift from South Moreton to North Moreton as urbanization takes place. Because of the high cost of labour in growing strawberries, there will be an increase in family unit and 'pick-your-own' operations.

Tamborine Mountain will continue to be a major avocado-producing district. Observations at this stage indicate that it is also an ideal area for kiwifruit. As a result, there is potential for a sizeable industry to be developed in the future.

There is a trend towards a reduction in the total number of commercial holdings, increased farm size, mechanization and crop specialization. This trend will lead to a greater efficiency in crop production through wide usage of mechanical planting, mechanical grading, harvesting aids to assist bulk harvesting, on-farm and market transport precooling and palletization. Urban expansion, high labour costs and unprofitability of smaller holdings are the chief reasons for this trend.

The South Moreton will always remain an important horticultural production region due to its proximity to the major population centre of Queensland. However, in the long term, there will be a shift in fresh market vegetable production from the coastal areas of the region to other areas in Queensland.

Red deer in Queensland

by A. K. Searle, Queensland National Parks and Wildlife Service

Red deer (*cervus elaphus* (L.)) occur naturally in Europe, and have long been regarded as a major game animal.

Introductions to Queensland have all been of British origin. Releases were made in the Brisbane Valley and Conondale Range areas late last century. Individuals were also released on Hinchinbrook Island in northern Queensland at the turn of the century by Captain Clark and, in later years, an additional pair were also released there.

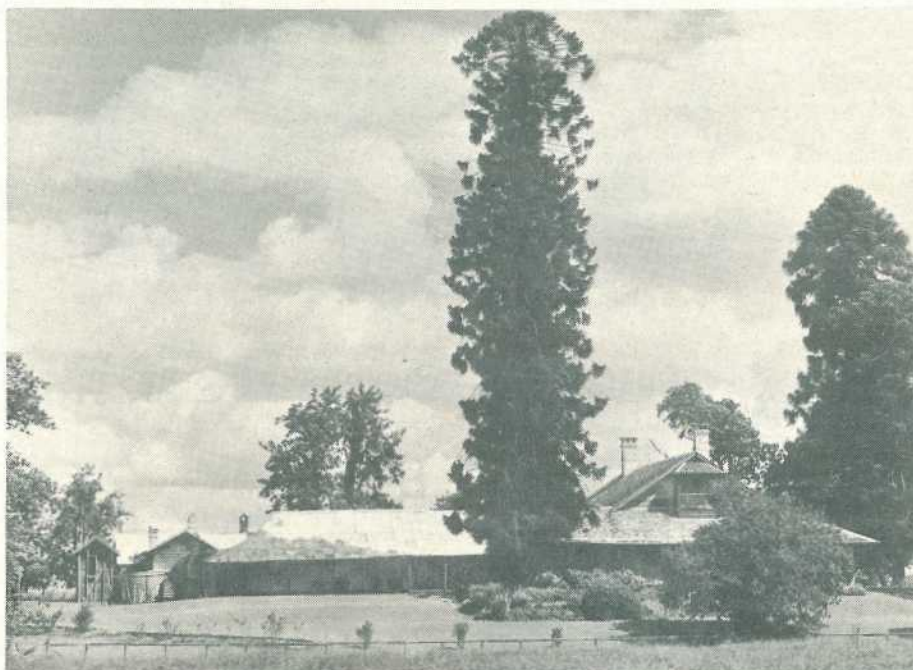
A further liberation took place on 'Maryvale' near Cunningham's Gap in southern Queensland in 1903. From here, animals are reported to have spread southwards to the head of the Condamine River and northwards to the Mt. Castle/Liverpool Range area. Cast antlers have been collected on the coastal foothills of this range only a few kilometres from Aratula.

Today, red deer are distributed throughout the watersheds of the Brisbane, Stanley and Mary Rivers, with no recent sightings from any of the other release areas. Within the known range, deer occur in grassland, open forest and rain-forest and any combination of these habitat types. From recent observations, it would appear that an increase in deer numbers and expansion in range have occurred in the north or north-eastern section (that is, Kilkivan and Widgee Shires) and further expansion in that direction is possible.

Within the distribution area, deer numbers tend to fluctuate locally from year to year in accordance with logging operations, and pastoral and forestry management. Any sudden increase or spread into the marginal area, however, is likely to be a temporary consequence of a succession of good seasons. After a bad season, of course, the situation may be expected to revert to the usual.

Description

The red deer is the largest of the deer species in Queensland. An adult male (or stag) may stand 130 cm at the shoulder and weigh up to 180 kg,



In September 1873, the first release of red deer into the wild in Queensland occurred on Cressbrook Station in the Brisbane River Valley. Comprising two stags and four hinds this, together with similar later releases, constituted the foundation stock of the present-day populations found in the area.

Photograph by Richard Stringer.



The red deer is the largest of the deer species in Queensland, with a mature stag capable of attaining a live bodyweight of up to 180 kg and a maximum height at the shoulder of 130 cm. Antler size appears to be influenced by nutrition and/or seasonal conditions.

Photograph by Ivan Cause.



ABOVE. The hind or female red deer, while differing slightly from the stag in body size, displays a number of similar body markings.



LEFT. A stag's antlers commence regrowing in September or October, and the process is usually complete by January or February of the following year.

BELOW. With the breaking of the rut, stags display a variety of behavioural changes. Most visible of these are the herding of hinds (as shown here) and the roaring displays.

Photograph by Ivan Cause.



while the female (or hind) is somewhat smaller. The general body colour is reddish-brown with less red on the underneck and legs. The eyes are surrounded by a light yellowish ring and the insides of the ears are a paler brown. A dark stripe runs from the back of the head to the tail and may include the tail, which is surrounded by a paler, usually yellowish rump patch.

The full range of coat colours includes creamy, sandy and dark brown. The summer coat is usually pale brown or reddish compared with the winter coat, which is shed in September–October.

In relation to coat colour, it is important to note that red deer frequently wallow in mud, particularly in the warmer months of the year, and the red coat colour may be obscured by the colour of the local soil type. One common consequence is that 'black stags' are often reported during the rut.

As with most deer species, only the stags have antlers. Usually a male calf begins to grow its first set of antlers from a pair of pedicles in front of the ears in the eighth month of life (August). These continue to grow, until February, into two single 'spikes' up to 40 cm long, which during growth are covered by a fur (velvet). In February, the velvet is shed, this being assisted by rubbing on small bushes or saplings (rub trees).

Each year, stags cast their antlers in September–October, the time depending on age (the oldest stags shed their antlers first). Antlers then commence to regrow, the growth being complete by January–February. The second and later sets of antlers are branched—the branches being called tines or points. The second set of antlers may have two, three or (rarely) four points on each. The third and later sets usually have more with as many as 12 recorded on each antler.

There is no reliable relationship between antler points and age, however, after the second set. The influencing factors on antler size appear to be nutrition and/or seasonal conditions. Antlers sought after as trophies are those of good thickness (timbre), length of antler, and spread with 10 or more points; these are produced by mature stags in good condition.

Under good seasonal conditions, red deer are sexually mature in the second year of life.

Seasonal activity

The most spectacular seasonal behaviour is in the mating season (or rut) which normally takes place from the end of March until late April.

During February, the older stags begin to separate from the bachelor groups in which spring and summer have been spent. By mid March, they can be located in areas where the rut will take place, usually the country in which hind groups spend the autumn. The presence of freshly-rubbed trees or saplings within the hind territory indicates the presence of stags.

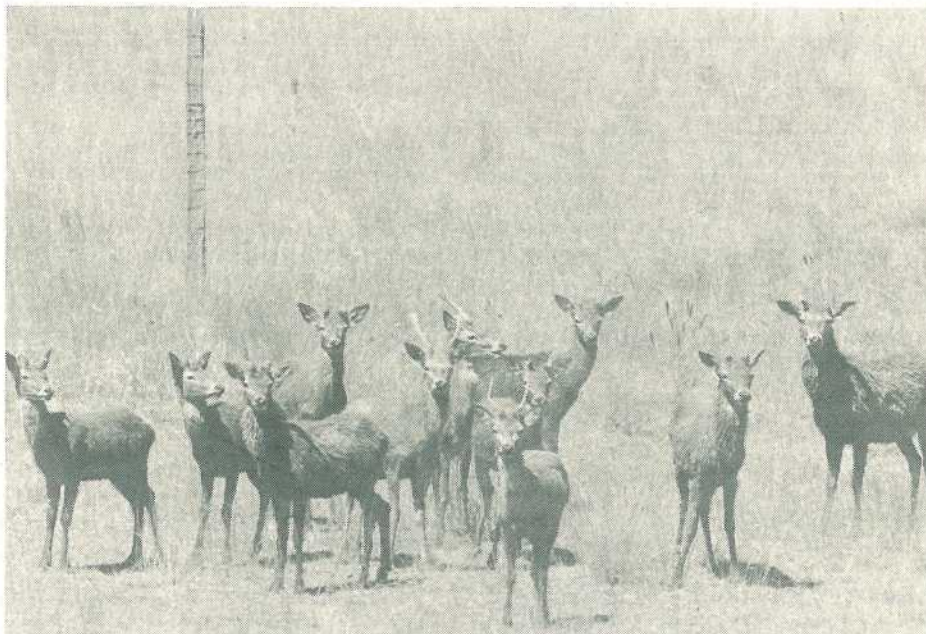
Both stags and hinds influence the initiation of the rut. Mature males, as a result of an accumulation of the hormone testosterone are sexually ready for the rutting in the latter part of March. At this time, it seems that a small number of hinds come into oestrus and this results in the rut 'breaking'—that is, stags begin to exhibit rutting behaviour, roaring and beginning to herd the hinds.

This early activity of a few hinds and older stags appears to stimulate other hinds into oestrus, and the rut spreads rapidly across the deer range in early April. Weather conditions influence the timing and speed of the rut. Cold changes in the weather result in immediate and considerable increases in activity.

The first sound of the rut—the 'roar' of the stag—is usually heard by 20 March, and over the next week or so roaring develops in frequency, duration and intensity. The roar is a series of deep guttural growls, each of varying duration up to more than 10 seconds. It is sometimes interspersed with one or more short, deep coughs.

The main rut occurs in the first 2 weeks of April when mature stags are in control of hind groups. During the first 10 days of this period, much of the roaring can be attributed to younger stags (3 to 4 years old) that have no hinds but spend their time travelling and roaring. Hunters who 'roar up' stags (that is, call them up by emulating their roar) mainly call up the younger stags.

Generally, a mature stag (5 years or older) herds a group of several hinds and remains with them until sexually exhausted. During this period, the stag expends considerable effort attempting to keep his harem together. Hinds tend to wander off and much time is spent moving among his hinds sniffing and checking areas where they have rested, apparently to detect any females in oestrus. A receptive hind is pursued and either mated within the harem area or apart from the harem after a small chase.



Deer farming is new to Queensland, and establishment stock are being taken from the wild using a variety of capture techniques. Once established, such farms will produce both velvet and venison in marketable quantities.

The stags spend little or no time feeding, and lose condition fairly quickly. Stags of large body size rather than stags of large antler size seem to dominate. During one roar observed by the author, a large-bodied hummel (antlerless stag) was in control of at least 20 hinds, and on another occasion a large 'rig' stag (one testicle not developed) of small antler size was in control of 15 hinds.

During the rut, stags challenge one another in roaring duels but these are usually conducted at a distance. Once an intruder stag approaches a stag with a hind group, roaring may cease and a fight or a pushing contest develops in which the antlers are locked together and each stag endeavours to throw the other over and thrust his antlers into the opponent's side. Control of the harem is then taken by the stronger stag.

Hinds are seasonally poly-oestrus, with 18-day cycles which may continue well after the rut—observations indicate that the majority conceive during early April. In good seasonal conditions, a 16-month-old hind may conceive during the rut, although the normal age at first conception is 28 months. Older hinds are able to conceive each year, and hinds up to 12 years old have been found pregnant.

After the rut, the stags retreat to secluded areas and reappear in winter, feeding in small groups on whatever green feed is available. The hinds also form small groups and usually feed separately from the stags.

The gestation period in red deer is approximately 230 days and the calf (or fawn) is born between late November and early January. The hind about to give birth separates from the herd and the calf is born in seclusion. The new-born calf is marked with bright white spots, and is well hidden by the mother for the first week or so. During this period, the mother acts with a characteristic nervous concern for the fawn, usually grazing in its vicinity. If disturbed, the mother will trot away only to stop after a short distance to watch the disturbers, with quick glances back towards the hidden fawn.

At 1-week-old, a calf is quite capable of following its mother, and early in December small groups of mother hinds and calves may be seen. The calves grow rapidly and, although they may be weaned by August, they remain with their mothers until 12 to 15 months of age. Groups seen frequently include mother and calf, and mother, calf and yearling (especially mother, calf and yearling female).

Conservation

All deer are protected under the *Fauna Conservation Act 1974-1979*. In addition to this legal protection, red deer are protected to a large extent by their habitat preferences, and there is a large degree of landholder protection. Red deer may, however, cause problems to farmers and graziers particularly during severe winters when animals invade

crops and pastures. Numbers are destroyed occasionally under pest destruction permits.

Sport shooters and, more recently, deer farmers are interested in exploiting red deer. Sport hunters include those interested in trophies—the red stag is probably the most attractive game animal in Queensland—while others are interested in the meat (venison). These interests have been pursued for many years, mostly illegally except for a 6-week open

season in 1977. The current ratio of adult males to females in the population (one male to two females)—might well be a reflection of the intensity of this take.

Deer farming is new to Queensland, and interested people have formed the Queensland Deer Suppliers Association. Their objective is to take red deer from the wild to establish nucleus herds, from which deer for farming may be bred. The products of such farms are velvet

(initially) and venison. The velvet in this context is the entire partly-grown antler, removed from the stag at a specified stage of growth and which is bought by those who regard it highly for its medicinal value.

Research by the National Parks and Wildlife Service on red deer biology and ecology is in progress, the objective being to provide the data needed to establish proper management plans for this attractive animal.

Restrictions to be removed on interstate movement of bees

Restrictions on the movement of bee hives and used beekeeping equipment from New South Wales into Queensland are to be lifted.

The Minister for Primary Industries, Mr Mike Ahern, said that the presence of European Brood Disease in apiaries on the Darling Downs and in the coastal areas of southern Queensland has now made it pointless in retaining current restrictions on movements of bee hives from interstate.

He said that amendments were being made to regulations dealing with the introduction of hives, bees and used beekeeping equipment. These amendments would give beekeeping officers in the Department of Primary Industries greater control over introduced apiaries.

European Brood Disease was first identified in Queensland at Yelarbon last December. Since then, it has been found in several apiaries in South-east Queensland. The disease does not affect the quality of honey.

Mr Ahern said there are about 2 000 beekeepers in South-east Queensland. It is very important that each beekeeper, whether he owns one hive or hundreds of hives, should become familiar with the symptoms and treatment of European Brood Disease.

For the disease to be kept down to a low level in Queensland, it will be necessary for all beekeepers to quickly identify that they have a problem and treat their hives. By doing this, they will reduce the

source of infection to neighbouring hives.

Mr Ahern stressed that the positive diagnosis of European Brood Disease was difficult, and could only be done by a laboratory examination. He advised that to help beekeepers identify the disease, colour slides and specimens of diseased combs would be displayed at meetings to be held at Warwick, Toowoomba, Brisbane and Maryborough in the near future.

Mr Ahern reminded all beekeepers to regularly inspect their hives and to send specimens of brood showing unusual symptoms to the Beekeeping Office, Department of Primary Industries, Meiers Road, Indooroopilly, 4068.

Assistance to attend International Horticultural Congress

Financial awards totalling around \$3 000 will be made available to support the attendance of Australian horticulturists at the XXth. International Horticultural Congress to be held in Hamburg, Federal Republic of Germany in August 1982.

This was announced following the inaugural meeting of the Horticultural Congress Trust by its Chairman, Mr Graham Gregory of the N.S.W. Department of Agriculture.

Other trust members are Mr Don Kidd, Chairman of the Queensland COD, and Mr Alan Newport, immediate past President of the Australian Nurserymen's Association, both of whom represent the Australian Horticultural Grower's Council, and Dr Barry McGlasson of CSIRO Division of Food Research.

The grants will be financed from investments made with surplus monies following the conduct of the XXth. International Horticultural Congress in Australia in 1978. The funds have been contributed by Australian horticultural industries and it was the Congress Organising Committee's wish that they be invested and the proceeds utilized to the benefit of Australian horticulturists.

The awards, which will each be valued at between \$1 000 and \$1 500, will be granted to those applicants who in the opinion of the trustees will gain the greatest value to both themselves and their particular horticultural industry by attending the XXth. Congress

Applicants under the age of 40 years who would find it difficult to otherwise raise the full amount of finance required for attendance will be favoured.

Successful applicants will be required to prepare a 2 000-word report to their particular industry on the benefits achieved from the award. Mr Gregory said that applications for awards will be called in July 1981.

Although the amount is relatively small, the trustees hope that further contributions to the trust fund would increase the amount which could be made available. Mr Gregory said he would welcome any inquiries in this regard which may be directed to him at P.O. Box K220, Haymarket, N.S.W., 2000.

Graham stylo . . . more than a replacement for Schofield

by H. G. Bishop, J. M. Hopkinson and C. D. Webb, Agriculture Branch

In July, 1979, a new stylo was released for use in Queensland under the cultivar name 'Graham'.

It was named in honour of Mr T. G. Graham, now retired and living in Rockhampton, who spent most of his working life in tropical pasture research and development in Queensland.

Graham belongs to the group of stylos classified as *Stylosanthes guianensis* var. *guianensis*. It closely resembles the other cultivars in this group, Cook, Schofield and Endeavour, but differs greatly from Oxley (*S. guianensis* var. *intermedia*), Verano (*S. hamata*), Seca and Fitzroy (*S. scabra*) and Townsville stylo (*S. humilis*) in both use and appearance, and they are best regarded as only distant relatives.

Origins

Graham is one of a number of similar stylos collected in the same general part of South America, either in eastern Bolivia or adjacent regions of western Mato Grosso in Brazil. A characteristic of the region is its prolonged and severe dry season. It is probable that these stylos developed a very early flowering habit in order to survive such conditions.

Graham originated from seed collected in 1965 by Mr Ron Williams of C.S.I.R.O., and introduced into Australia as Commonwealth Plant Introduction (C.P.I.) 40255. The place of collection is about 50 km east of Santa Cruz de la Sierra in Bolivia, at latitude 17°S and at an elevation of 440 m. The region contains quite sharp rainfall gradients (600 to 1 000 mm mean annual rainfall (M.A.R.)) and has a 7-month dry season. The range of climates is very similar to that of the dry tropics of north-eastern Queensland.

Description

Graham most closely resembles Endeavour in appearance. It is unlikely to be mistaken for Schofield, which has very much broader leaflets, or Cook, which is much hairier on the stems and leaf sheaths.

Like Endeavour, it tends to be finer-stemmed than Cook or Schofield, and produces smaller flower clusters. Its flowers are deep yellow like those of Cook and Endeavour, and unlike those of Schofield which are pale. Its very early flowering habit (early April) immediately distinguishes Graham from the other three cultivars.

Graham is a robust perennial which may, when ungrazed and supported by adjacent plants, exceed 1 m in height. It may behave as an annual under harsh conditions.

RIGHT. A specimen plant of Graham stylo showing the erect growth habit.



Heifers grazing native pasture containing Graham stylo in uncleared woodland at 'Meadowbank' near Mt. Garnet. The stylo was sown 5 years previously with a spinner-broadcaster after a burn.



Harvesting a first-year seed crop of Graham stylo near Mareeba.



Close-up of a ripe seed crop of Graham stylo.

Seeds are small, there being about 400 000 per kg. They are borne within a flimsy hull which is commonly lost during processing. The hull is brown, papery in texture, with no hook. A seed sample normally contains a mixture of seeds with and without the hulls.

History of release

Schofield served for many years as a pioneer legume in newly established pastures on infertile soils receiving high rainfall in Queensland's tropical coastal lowland belt. However, Schofield had certain faults. One of these was the very late flowering habit, which gave it little chance of regeneration from seed in districts with either a frost risk or a prolonged dry season.

Continuing plant introductions and selections resulted in the release of Cook and Endeavour, which out-produced Schofield in trials conducted at South Johnstone Research Station. These varieties were also earlier flowering. It was hoped that early flowering would extend the range of usefulness of stylos beyond the rather restricted limits of Schofield.

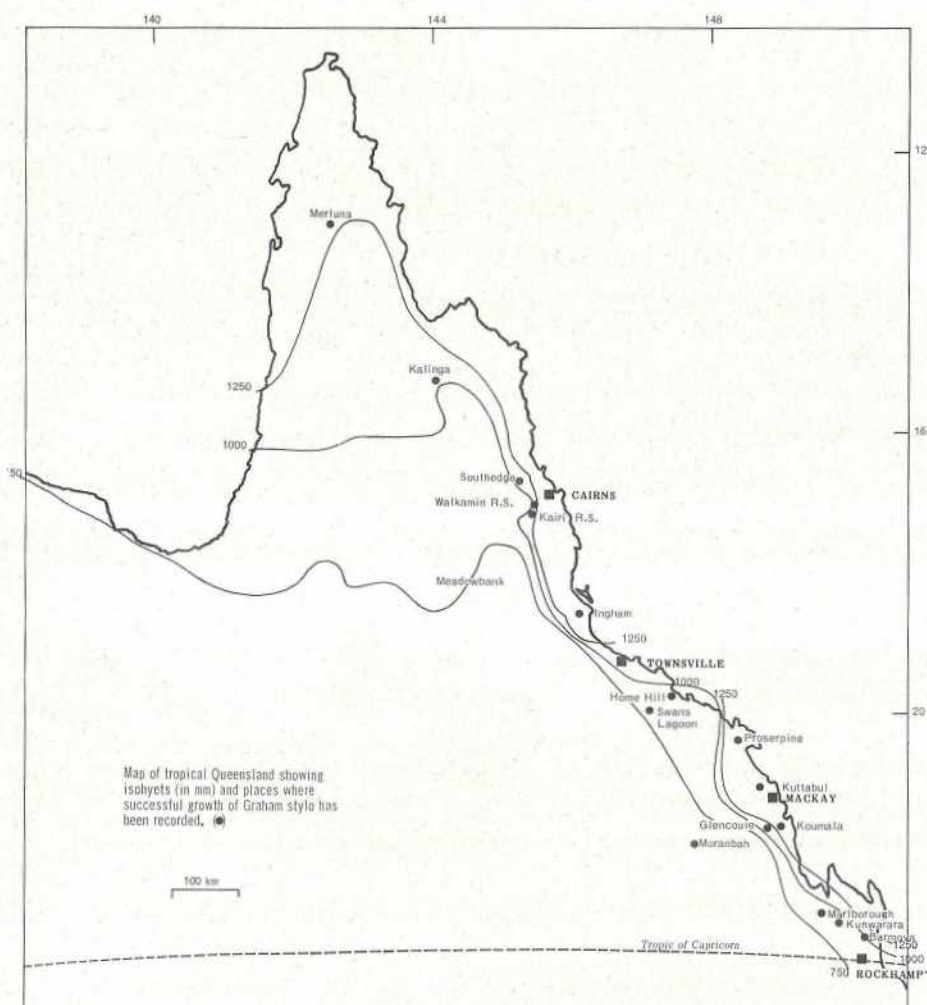
However, this did not happen, and Cook and Endeavour never really became more than alternatives to Schofield. At the southern limit of usefulness around Mackay, they failed to displace Schofield at all. Although early flowering seemed to be an advantage in theory, they had not been early enough for this to be a real advantage.

Continued testing eventually showed the theory to be correct, and the much earlier flowering Graham proved remarkably persistent at sites formerly considered too harsh climatically for the *guianensis* stylos. Moreover, it was a very free seeder, and ample seed was always available whenever required.

As well as this accumulated information on the versatility of Graham, the collapse of Schofield in 1978 to a new race of the fungus disease anthracnose (*Colletotrichum gloeosporioides*) gave further impetus for its release. In July, 1970, the Queensland Herbage Plant Liaison Committee released CPI 40255 as cultivar Graham.

Areas suitable

Graham is adapted to a wide range of climatic conditions. Its performance has been extremely versatile, showing promise in many different situations in eastern Queensland from upper Cape York Peninsula



south to Rockhampton. The accompanying map shows the experimental and observational sites at which Graham has been successful.

Graham has succeeded on a wide range of soil types including sandy loams, earths and texture-contrast soils. Although a couple of failures have occurred on clay soils (Moura and Moranbah), it has performed well at clay sites north of Rockhampton (Barmoya and Kunwarara).

Superior persistence

Better persistence is the main advantage of Graham over Schofield stylo. It is a heavy seed producer, and some seed is ripe as early as mid-April, with the main crop ripening in May or June. Core samples have shown that seed accumulates in the soil, ensuring a reserve for future seedling establishment.

Graham will act as a perennial or an annual depending on rainfall, grazing pressure, frost and fire. Because of this, it will persist under heavy grazing, although continuous heavy grazing will result in poorer animal performance.

At 'Meadowbank' Station, 100 km inland from Cardwell and receiving 750 mm M.A.R., it has persisted under grazing since 1974 when it was established in uncleared woodland. It has survived droughts and fires, regenerating from seed or perennating according to circumstances.

At a site in the Mackay district with a M.A.R. of 1 700 mm, Graham showed good persistence over a 6-year period when continuously stocked at 2.5 beasts per ha. Figure 1 compares the persistence of five stylo cultivars at this site.

Better growth

Graham has outyielded other *S. guianensis* cultivars at test sites in the Ingham (M.A.R. 2 000 mm) and Mackay regions as well as in rainfall zones below 1 500 mm. In the higher rainfall regions, yields have been similar but tend to be maintained for longer. At several sites, yields are comparable with those of Verano and Seca. However, Graham produces more leaf than Seca and shows better compatibility with grasses than Verano.

The dry matter yields of five stylo cultivars at Mackay and three cultivars at Ingham are compared in figures 2 and 3, respectively.

Establishment

Sowing method, seeding rates and fertilizer application are the same as for other *S. guianensis* cultivars. As a guide, 2 to 3 kg per ha of seed should be sown on to a well-prepared seedbed and 200 to 400 kg per ha of molybdenized single superphosphate applied depending on soil type and rainfall.

Graham is well suited for establishment with minimum tillage or following a burn in country not accessible to machinery. In these situations, seeding rate should be doubled. As with most tropical pastures, the better the seedbed preparation, the better the establishment obtained.

Spread

Considerable spread of Graham from original plots, after several seasons, has been recorded at many sites. Planting in strips would therefore be a suitable method of establishment in partially cleared country.

Compatibility with grasses.

Any of the grasses suitable for sowing with Cook can be sown with Graham. However, it is important not to let the more vigorous grasses such as *Kazungula setaria* (*Setaria sphacelata* var. *sericea*) or signal grass (*Brachiaria decumbens*) become too mature and rank. Best grazing will result if the pasture is kept around knee to waist high.

Animal performance

Graham is readily eaten by cattle and good liveweight gains have been measured on a large area under grazing over 7 years in north Queensland with 750 mm M.A.R. At 'Meadowbank' 18-month-old steers at 1.3 steers per ha gained 44 kg per steer between April and October, 1977, and 95 kg per ha in a full year (1978) stocked at 0.5 steers per ha.

The big advantage on the wet coast is that Graham is contributing to animal performance over many more years than was the case for the previous cultivars, owing to its superior persistence under grazing.

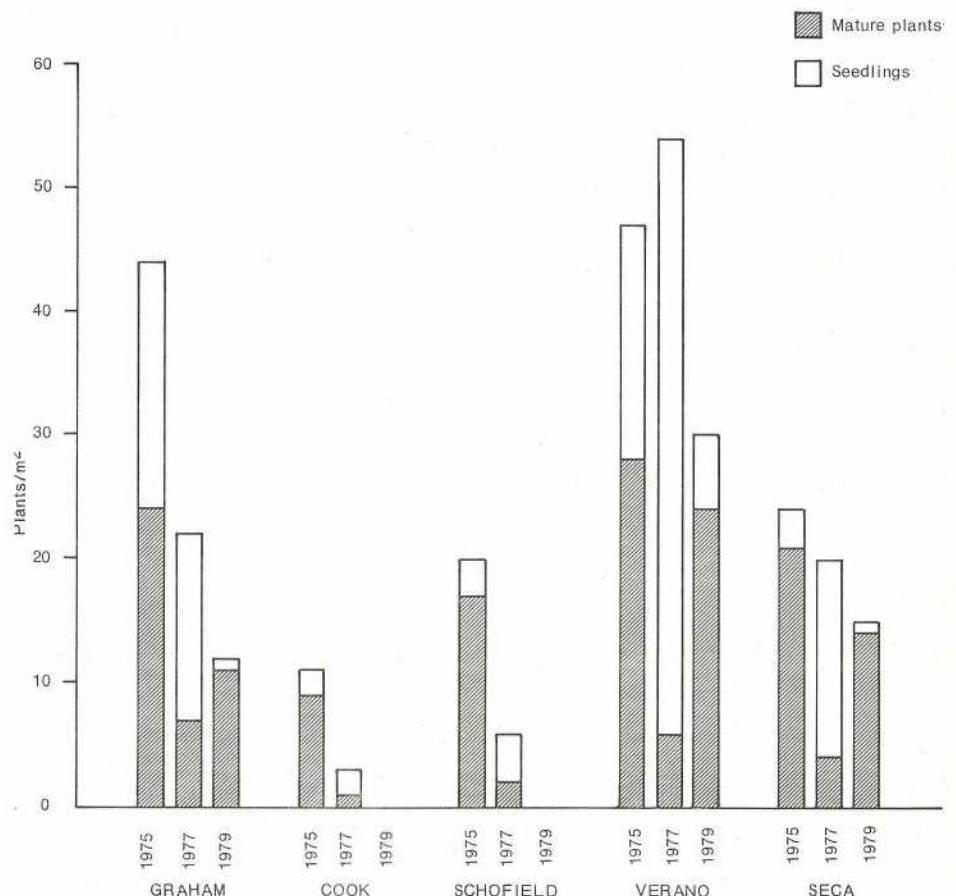


Figure 1. Persistence of five stylos in grazed plots at Mackay as shown by plant numbers for the second, fourth and sixth years of growth.

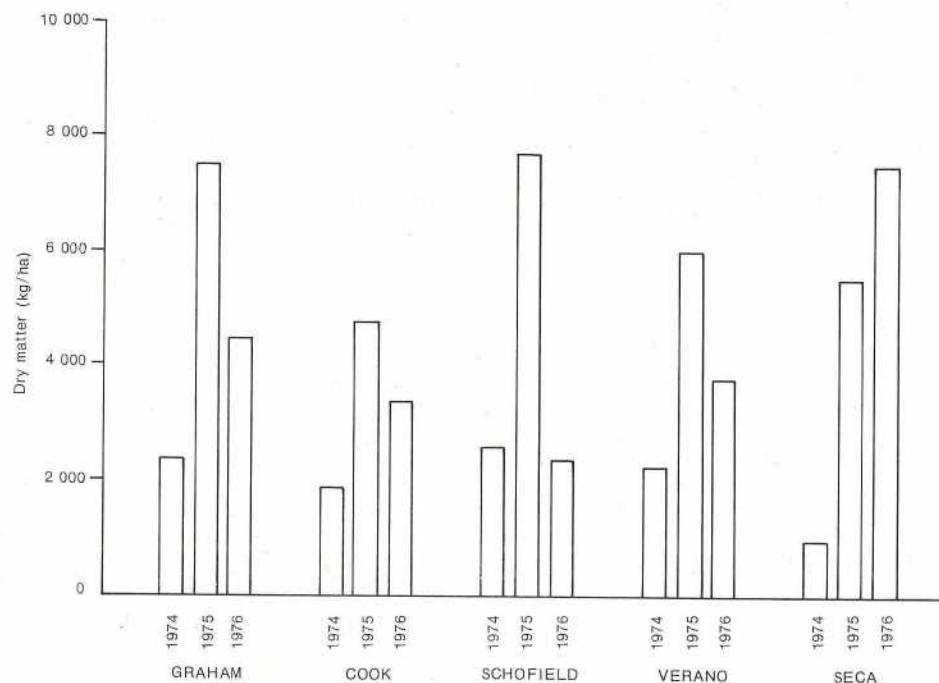


Figure 2. Dry matter yields of five stylos in plots at Mackay for the first 3 years of growth.

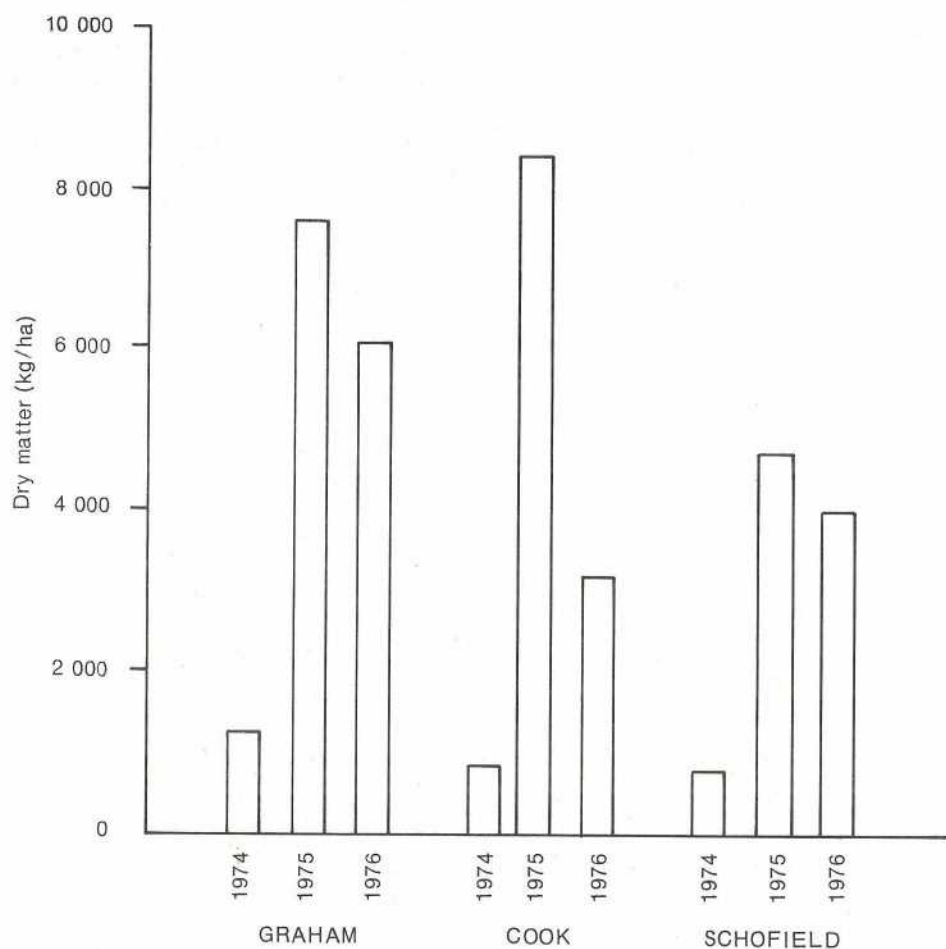


Figure 3 Dry matter yields of three stylos in plots at Ingham for the first 3 years of growth.

Seed production

Management for seed production of Graham differs little from that of Cook, Schofield or Endeavour, which has been covered in an earlier article (see reading list). The few differences stem from the earlier flowering habit of Graham.

Flowering begins in early April in north Queensland, and ripe seed may be found after mid April. Harvest ripeness has been reached as early as May, and as late as July. The normal expectation would be for a June harvest. This places Graham about 3 months earlier than Schofield.

It is generally recommended that strongly-growing stylo crops should be slashed during the wet season in order to reduce surplus growth and produce an even, level crop surface. This allows more rapid and efficient harvesting. Slashing must be done in time to permit the complete recovery of the framework of the crop before the first flowers form—otherwise, yield is reduced. The last safe date for slashing Cook in north Queensland is late February.

Slashing of Graham therefore is not recommended after the end of January. Only in an exceptional season is Graham likely to have made surplus growth by this time, and slashing may only have a very limited place in the management of the seed crop.

The early flowering habit of Graham appears to extend the useful geographical range of the seed crop into somewhat drier districts than would be safe for the other cultivars. It has also enabled Graham not only to avoid frost damage, but also the worst of the cool season 'drizzle' which is so much a feature of the Tableland winter. If drizzle occurs at peak flowering, the risk of *Botrytis* head blight damage is very great with any stylo.

Graham produces far heavier seed yields than the three other cultivars. At Kairi and Walkamin, header harvest yields have averaged 600 kg per ha. In similar circumstances, none of the other cultivars would have averaged 300 kg per ha. The management and harvesting of small areas always produces higher yields than can be obtained on a commercial scale, and growers must not expect yields of this order. They can, however, reasonably expect yields to be at least one and a-half times those of Cook or Schofield growing under the same conditions.

First year yields are normally lower, the only exceptions being when crops get off to a very early start. Because of its early flowering,

the seed crop of Graham is likely to be more vulnerable to late planting than that of the other cultivars.

Trial and error will indicate the best seed-growing districts. At present, most districts in north Queensland below about 700 m elevation and with between 850 and 2 000 mm M.A.R. can be recommended with confidence. The majority of seed crops are currently planted in the lower Atherton Tableland and Cooktown areas.

The high rainfall coastal belt between Mossman and Ingham can also be expected to produce seed satisfactorily. Lowland coastal districts further south, even beyond Mackay, warrant attempts to produce seed, as do warmer farming areas marginally below 850 mm M.A.R.

Diseases

The most serious disease of stylos is anthracnose, caused by the fungus *Colletotrichum gloeosporioides*. The symptoms of anthracnose are black leaf spots or cankers on the stem. When it is severe, whole leaves, sheaths and stems may blacken and die, cankers may girdle and thus ring-bark stems, seedlings may be killed outright, and adult plants may be weakened to the point of death.

Although minor symptoms can be found on Graham at most places where it has been grown, severe damage has not been observed in Queensland. Certainly Graham is much more resistant to anthracnose than is Schofield, and appears to be about as resistant as Cook.

During particularly wet years in the high rainfall belt, such as the Innisfail-Tully area where the

M.A.R. exceeds 3 000 mm, Cook suffers moderately severely from anthracnose. It is reasonable to expect similar damage in Graham.

Elsewhere in Queensland, Graham is unlikely to be seriously affected unless new races of anthracnose occur. Reports from Brazil and Colombia indicate that it is much more susceptible to strains of anthracnose present in South America.

The only other disease likely to be of commercial significance to Graham, and then only to seed producers, is *Botrytis* head blight. This disease becomes serious when damp, heavily overcast weather occurs at full flowering. Only the seed-heads are killed and, although it can destroy a seed crop, the rest of the plant is not affected.

Seed growers accept *Botrytis* as a tolerable hazard of other cultivars and the risk to Graham will, if anything, be lower as *Botrytis* is more severe during the light rain of the cool season.

Seed supplies

The Seed Increase Committee established for Graham stylo began with 220 kg of seed supplied by the Walkamin Research Station. In the 1980 season, almost 100 ha of seed crops were sown in an area extending from Melvor River in the north, through the lower Tableland, Tully, Ingham, Bloomsbury and Mackay to as far south as St. Lawrence. The majority of planted paddocks have been registered for certification.

Most crops have established well and will be in full production in 1981. A late start to the season

resulted in light yields from these first year stands, but 4 t of seed were harvested. At least half is basic seed suitable for planting for future certified seed production. A minimum harvest of 20 t is expected in 1981.

Important role

Graham is a very persistent and adaptable stylo now added to our range of legumes for pasture improvement on the wet coast of central and northern Queensland. As well, it has extended the area which can be sown with perennial legume-grass pastures down to the 1 000 mm M.A.R. zone. In certain situations, Graham can be sown into native pastures in lower rainfall areas of 800 mm M.A.R.

Further reading

Seed production of stylo in north Queensland—by J. M. Hopkinson and D. S. Loch; *Queensland Agricultural Journal*, Mar.-Apr. 1977, pages 2-11.

The performance of *Stylosanthes guianensis* accessions at two sites in coastal north and central Queensland—by J. G. Melvor, H. G. Bishop, B. Walker and M. T. Rutherford; *Tropical Grasslands*, Vol. 13, pages 38-44, 1979.

Yield and persistence of perennial *Stylosanthes* species on the Mackay Wet Coast—by H. G. Bishop, J. G. Melvor and M. T. Rutherford; *Tropical Grasslands* Vol. 14, pages 57-62, 1980.

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Winter grazing crop varietal guide—1981

Compiled by J. F. Bourne, Agriculture Branch

In Queensland, oats are the main winter grazing crop. Other grazing crops include barley, wheat, triticale, canary and rye grass.

Oats are usually classified according to their rate of growth to the first grazing, and the accompanying table details the characteristics of a number of oat varieties.

Minhafer is an example of a quick-growing variety which has an erect plant habit and high early growth rate. Algerian, on the other hand, has a slower growth rate and is prostrate in habit. The slow-maturing varieties are usually easier to manage in a forage programme.

Stout, a new oat variety introduced from America, is an erect-growing variety, resistant to most common strains of crown rust. It has a medium to high grain yield. Stout was released by the Queensland Department of Primary Industries in 1977.

In recent years, seed supplies of recommended varieties have not met the local demand, and varieties from

southern States have been substituted.

Where seed of a recommended variety is unavailable, farmers should contact their local Agricultural Extension Officer or consult the table of oat varietal characteristics to determine a useful alternative.

Corvette barley is a useful grazing crop suitable for sowing from April to August and is recommended for most districts.

If late planting in July and August is necessary, barley will give faster grazing and higher grazing yields than oats.

The recently introduced taller-growing triticale lines (for example, Gro-quick) have gained favour in some localities as grazing crops. These lines generally produce a bulk of early feed, but recover poorly. The suggested sowing time is April to August.

Canary is recommended for sowing from February to April as an alternate grazing crop.

Where irrigation is available, the use of nitrogen-fertilized ryegrass is recommended for certain districts.

Planting rates

Oats—rain-grown: 30 to 50 kg per ha
irrigated: 40 to 70 kg per ha
irrigated/sod seeded: 50 to 90 kg per ha

Barley—30 to 60 kg per ha

Triticale—30 to 50 kg per ha

Ryegrass—up to 30 kg per ha

The rates should be adjusted to the variety, type of crop, soil moisture, soil type, district, irrigated or rain-grown and planting time.

Fertilizer

The type and rate of fertilizer is related to soil type, soil moisture, availability of irrigation, cropping history and planting time. Consult your Agricultural Extension Officer for local information on planting rates and fertilizer requirements.

RECOMMENDATIONS

Region (Shires)	Varieties
Northern region	
(Ayr, Bowen, Proserpine, Hinchinbrook, Dalrymple and Thuringowa Shires)	IRRIGATED—GRAZING: Algerian, Camellia, Saia, Stout. —HAY: Stout, Saia RAIN-GROWN—Not recommended
Capricornia	
(Livingstone, Fitzroy, Broadsound, Nebo, Calliope, Emerald, Peak Downs, Belyando, Bauhinia, Banana and Duaringa Shires)	GRAZING OATS—Algerian, Camellia, Minhafer, Stout HAY OATS—Minhafer, Stout GRAZING BARLEY—Corvette
Burnett	
(Miriam Vale, Kolan, Gooburrum, Woongarra, Isis, Perry, Biggenden, part Tiaro, Woocoo, Hervey Bay, Monto, Eidsvold, Gayndah and Mundubbera)	GRAZING OATS—Algerian, Camellia, Minhafer, Garry, Saia, Bentland, Stout GRAZING BARLEY—Corvette
South Burnett	
(Kingaroy, Nanango, Wondai, Murgon, part Kilkivan and part Rosalie Shires)	GRAZING OATS—Algerian, Cooba, Camellia, Minhafer, Stout, Garry GRAZING BARLEY—Corvette
Near North Coast	
(Widgee, Noosa, part Tiaro, part Kilkivan, Maroochy and Landsborough Shires)	GRAZING OATS—Algerian, Camellia, Minhafer, Saia, Stout

RECOMMENDATIONS—continued

Region (Shires)	Varieties
Moreton (Caboolture, Pine Rivers, Redlands, Albert, Beaudesert, Moreton, Esk, Kilcoy, Boonah, Gatton and Laidley Shires)	GRAZING OATS—Algerian, Camellia, Minhafer, Saia, Bentland, Stout GRAZING BARLEY—Corvette
Darling Downs (Chinchilla, Wambo, Pittsworth, Millmerran, Jondaryan, Crows Nest, part Rosalie, Cambooya, Clifton, Allora, Glengallan, Rosenthal, Stranthorpe and Inglewood Shires)	GRAZING OATS—Algerian, Cooba, Camellia, Minhafer, Garry, Stout GRAZING BARLEY—Corvette GRAZING TRITICALE—Gro-quick and similar lines
Near South-west (Waggamba, Balonne, Murilla, Tara, Taroom, Bungil, Booringa, Bendemere and Warroo Shires)	GRAZING OATS—Algerian, Camellia, Minhafer, Garry, Bentland, Stout, Benton HAY OATS—Minhafer, Bentland, Stout GRAZING BARLEY—Corvette GRAZING TRITICALE—Gro-quick and similar lines

CHARACTERISTICS OF OAT VARIETIES

Variety	Growth to flowering	Early plant habit	Growth to first grazing	Frost tolerance	Rust resistance	
					Crown	Stem
Recommended varieties—						
Algerian	sl.	prostrate	sl.	good	s.	s.
Bentland	med.—sl.	erect	v.q.	fair	s.	s.
Camellia	med.—sl.	semi-prostrate	med.—sl.	v. good	s.	v.s.
Cooba	sl.	prostrate	sl.	v. good	v.s.	s.
Garry	sl.	semi-erect	q.	fair	mod. r.	mod. r.
Minhafer	med.—sl.	erect	q.	fair	mod. r.	mod. r.
Saia	med.—sl.	semi-erect	med.	poor	s.	v.s.
Stout	med.	erect	q.	fair	r.	r.

Others may be sown when seed of above is not available.

Avon	med.	erect	med.	poor	s.	v.s.
Belar	med.	semi-erect	med.	fair	s.	s.
Benton	med.-sl.	erect	q.	fair	s.	s.
Blackbutt	sl.	semi-prostrate	med.	good	s.	v.s.
Coolabah	med.	semi-erect	med.	good	v.s.	s.
Fulghum	q-med.	semi-erect	med.	good	v.s.	s.
Klein	sl.	prostrate	sl.	v. good	s.	s.
Lampton	sl.	semi-erect	med.	poor	s.	s.
Landhafer	v.sl.	semi-prostrate	med.	good	s.	s.
Rodney	v.sl.	erect	q.	fair	s.	s.

Variety	Seed Colour	Awns	Tillering Ability	Grain Yield
Recommended varieties—				
Algerian	brown	fine X	good	fair
Bentland	yellow	few fine	fair	fair
Camellia	yellow	few fine	good	fair
Cooba	light brown	nil	v. good	v. good
Garry	yellow	few strong*	fair	fair
Minhafer	cream	few strong	fair	fair
Saia	black	medium	fair	poor
Stout	cream	nil	fair	v. good

Others may be sown when seed of above is not available.

Avon	cream	nil	poor	poor
Belar	light brown	strong*	good	good
Benton	yellow	fine	fair	fair
Blackbutt	light brown	strong	good	fair
Fulghum	light brown	nil	good	good
Coolabah	cream	strong*	good	fair
Klein	light brown	fine X	v. good	fair
Lampton	light brown	strong	fair	fair
Landhafer	brown	fine X	good	fair
Rodney	cream	few strong*	fair	fair

KEY: sl.=slow; mod.r.=moderately resistant; med.-sl.=medium slow; r.=resistant; q.=quick; X=awns on both grains; v.s.=very susceptible; s.=susceptible; v.sl.=very slow; *strong awns indicated by twisted black base.

Beef cattle breeds

By J. J. Daly, Beef Cattle Husbandry Branch



The author, Dan Daly, is a Senior Extension Officer with Beef Cattle Husbandry Branch in Brisbane. Dan has been a beef cattle specialist for most of his 26 years with the Department.

Pulling ploughs, providing food and acting as religious symbols... these are only a few of the many, diverse functions served by the world's 1 000 million head of cattle.

Cattle were probably first domesticated in Europe and Asia during the New Stone Age. According to most authorities, today's cattle bear the blood of either or both of two ancient ancestors—*Bos taurus* and *Bos indicus*. Other species or subspecies were frequently listed in early writings but these are seldom referred to today.

BOS TAURUS

This type includes those domestic cattle common to the more temperate zones. They appear to have been derived from a mixture of the descendants of the Aurochs (*Bos primigenius*) and Celtic Shorthorn (*Bos longifrons*). The Aurochs were massive animals standing 2 to 2.5 m high at the withers and were hunted by early man. These animals roamed the forests of Central Europe until they became extinct around 1627.

The Celtic Shorthorn was the only breed in the British Isles until 500

A.D. when the Anglo-Saxons introduced animals derived from the aurochs of Europe. The Celtic Shorthorn was smaller than the Aurochs and possessed a dish face.

BOS INDICUS

This type includes the humped cattle of tropical countries that belong to the Zebu group. Cattle of this type were first domesticated anywhere from 2 100 to 4 000 B.C. A hump of fleshy tissue over the withers which can weigh up to 23 kg is typical of these animals. They have a large dewlap, large, drooping ears and a voice that is more of a grunt than a low. They have more resistance to heat and parasites than the *Bos taurus* breeds.

Domesticated cattle belong to the family Bovidae, which includes ruminants with hollow horns. Members of this family possess one or more enlargements for food storage along the oesophagus and they chew their cud. In addition to what is commonly called cattle, family Bovidae (and the sub-family Bovinae) include the true buffalo, the bison, musk-ox, banggai, gaur, gayal, yak and Zebu.

The following outline shows the basic position of the domesticated cow in the zoological scheme:

KINGDOM ANIMALIA. Animals collectively, the animal kingdom;

PHYLUM CHORDATA. One of approximately 21 phyla of the animal kingdom in which there is either a backbone (in the vertebrates) or the rudiment of a backbone, the chorda;

CLASS MAMMALIA. Warm-blooded, hairy animals that produce their young alive and suckle them for a variable period on a secretion from the mammary glands;

ORDER ARTIODACTYLA. Even-toed, hoofed mammals;

FAMILY BOVIDAE. Ruminants having polycotyledonary placenta, hollow non-deciduous up-branched horns, and nearly universal presence of a gall bladder;

GENUS BOS. Ruminant quadrupeds, including wild and domestic cattle, distinguished by a stout body and hollow, curved horns standing out laterally from the skull;

SPECIES BOS TAURUS AND BOS INDICUS. *Bos taurus* includes the ancestors of the European cattle and represents the majority of the cattle found in Australia. *Bos indicus* is represented by the humped cattle (Zebu) of India and Africa. (The Brahman breed was developed in the U.S.A. from the Indian Zebu).

Over time, differing breeds of cattle evolved through both accidental crossing caused by migrations of cattle and man's deliberate interference. Both species and breeds crossed to evolve new breeds and man assisted in the process through selecting animals for specific purposes such as milk production, beef, draught, or dual purpose types according to his needs.

This process was assisted once agrarian conditions improved with the end of the feudal commons and the beginnings of the enclosure system about the middle of the sixteenth century. Previously, individuals could do little selection when cattle were grazed on the commons.

Enclosing began in England about the sixteenth century, but progress was slow. It was not until the eighteenth century that a combination of improved agriculture and the influence of men like Bakewell (a noted English agriculturist and the first great improver of English breeds) made significant improvements in stock breeding.

Early history in Australia

Cattle were first brought to Australia by European settlers. In an attempt to provide a diet and living conditions similar to that of the settlers' country of origin, livestock of varying types were imported to provide milk, meat and draught.

The first importations were made to develop a government herd that could be used as a source of food in time of need. Over time, private settlers imported stock and played an increasingly important part in developing the nation's beef industry.

In the early days, no distinction was made between beef and dairy cattle—most stock performed both roles.

As the grass plains in the interior were discovered, enterprises became separate. Beef raisers were often in the vanguard of settlement as they drove herds further and further into the inland. At the same time, the dairy industry became more specialized and concentrated on the higher rainfall coastal areas.

Governor Phillip's First Fleet arrived at Port Jackson with two bulls and five cows from the Cape of Good Hope in 1788. These were small, humped cattle referred to as Black cattle and appear to be of Africander extraction. These cattle were grazed at Farm Cove but, later in 1788, two bulls and four of the cows went bush. The remaining cow was slaughtered and eaten.

The next consignment of cattle arrived in 1791 with H.M.S. Gorgon when one bull calf and 16 cows were landed. These were Zebu types from India, and by 1793 their number had increased to three bulls, 13 cows and five calves. These animals were grazed at 'Cumberland Park' out of Parramatta and formed the basis for the new Government herd.

From 1799 to 1800, nearly every ship from England brought a few British-bred cattle for use either in the Government herd or for private use. Some stock were used to provide milk for immigrants on the voyage and these were generally sold privately on arrival.

In 1800, the first stud stock were landed in the colony—a Devon bull and a few Shorthorn cows. Through natural increase and importations, stock numbers in 1800 had increased to around 1 000 head of cattle of diverse origin from Africa, India, England and Spain.

At about this time, it was also discovered that the Africanders that were originally lost had survived and had increased. A herd of approximately 170 head of wild cattle was found in what was then called the 'cow pastures' across the Nepean River. By 1801, this herd of wild cattle had increased to 500 or 600 head.

By 1803, the government herd including the wild cattle in the 'cow pastures' totalled 1 530 and those owned by settlers amounted to 640. By 1811, Governor Macquarie reported that the government herd including the wild cattle had increased to about 3 600 and individual settlers were able to buy stock from this herd.

Between 1811 and 1820, the settlement expanded west of the Blue Mountains and more favourable grazing promoted the expansion of beef cattle numbers. By 1820, there were 54 103 cattle in the colony, and by 1840 the number had increased to 371 699. During this period, the development of new settlements and exploration assisted the dispersion of cattle, and the New South Wales colony provided a nucleus from which cattle were overlanded throughout the continent.

Queensland's first cattle

In Queensland, cattle were first introduced in 1827. However, a significant introduction did not take place until 1840 when squatters moved large numbers of stock from the Hunter and New England areas on to the Darling Downs. From here, cattle spread north and west throughout Queensland and into the Northern Territory and the top end of Western Australia.

Subsequently, Queensland developed into Australia's principal cattle-producing State. By 1870, Queensland contained almost 25 per cent of the Australian total, and by 1890 about 50 per cent of the cattle population.

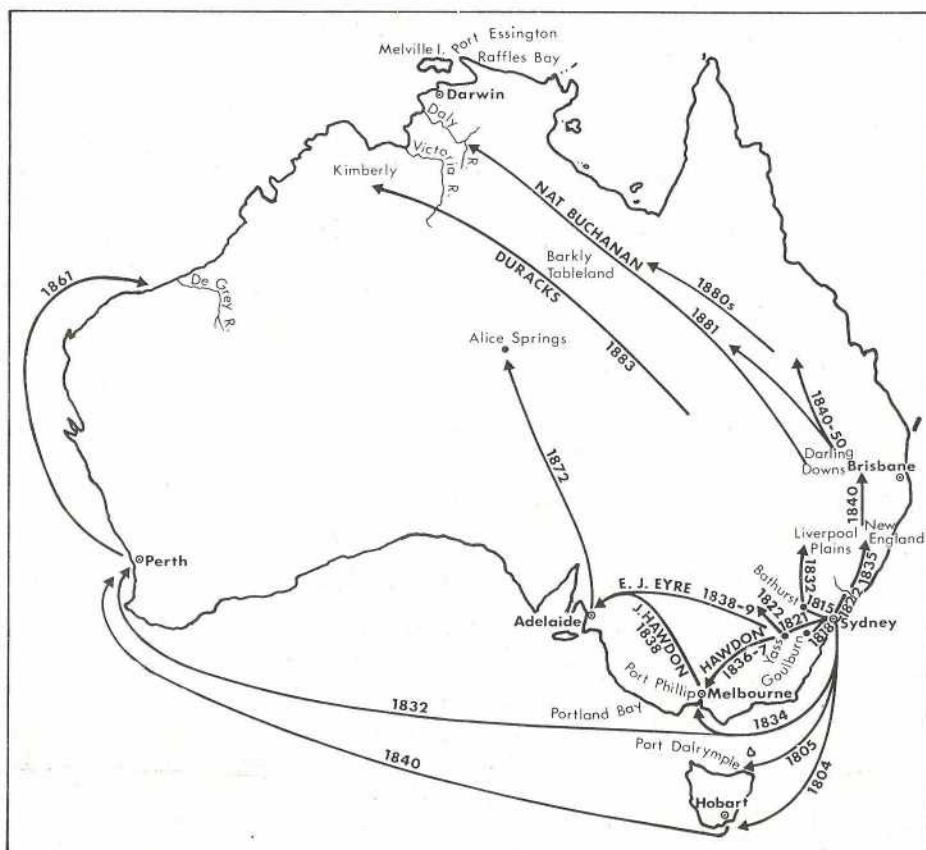
Table 1 shows the expansion of the beef industry within Queensland and Australia.

Early statistics did not list beef and dairy herds separately and, because of this, no distinction has been made between these animals in table 1. At present, Queensland has about 10.5 million head of cattle, with more than 10 million of these being beef cattle. This compares with an Australian total of 29 million cattle, with 23 million being used for beef. Queensland has approximately 43 per cent of the total Australian beef cattle population.

During the 1950s, Queensland cattle numbers fluctuated due mainly to seasonal conditions and increased at an average rate of only 1 per cent per year. During the beef boom and its aftermath from 1970–76, cattle numbers increased at an average of 8 per cent per year and in one year increased by over 13 per cent. Thereafter, numbers were reduced as producers attempted to either get out of beef or reduce the stocking pressure that built up after the crash in beef prices in 1974. Cattle numbers peaked at 11.5 million in 1977 and 1978 and declined to 10.5 million in 1980.

Cattle numbers increased during the 1970s because of world shortages of beef and high prices. After the collapse in beef prices, cattle numbers still increased due to a weak demand and low slaughter rates.

The high rate of expansion in cattle numbers was achieved through wheat and sheep properties diversifying into beef and more cattle being carried on beef properties. The ability to carry extra stock was accommodated in the early stages through property development, improved husbandry practices and the wider use of tropically-adapted breeds. A run of more favourable seasons also assisted.



Historic movements of cattle. (Source: the Australian Encyclopaedia)

TABLE 1
Livestock statistics (beef and dairy)
(Rounded to '000)

Year	Queensland	Australia
1788	..	7
1791	..	18
1794	..	40
1795	..	176
1796	..	227
1800	..	1 044*

Between 1800 and 1860, livestock statistics are defective because of the expansion in the industry and the difficulties in collecting information.

1860	433	3 958
1870	1 077	4 276
1880	3 163	7 527
1890	5 558	10 300
1900	4 078	8 640
1910	5 132	11 745
1920	6 455	13 500
1930	5 464	11 721
1940	6 199	13 080
1950	6 305	14 640
1960	7 012	16 503
1970	7 515	22 162
1975	10 879	32 806
1980 (P)	10 515	26 321

* Excluding the wild cattle on the 'cow pastures'.

(P) Provisional estimates.

weight. Australian exports have been approximately 1.2 million t carcass weight—around 60 per cent of production. Queensland has been exporting nearly 80 per cent of its production and this accounts for over 40 per cent of Australian exports of beef and veal.

In recent years, beef production in N.S.W. and Victoria has increased at a faster rate and is now comparable to Queensland production figures. However, production figures based on slaughtering within a State do not give the full picture of the industry's contribution to Australian production.

In some years, 500 000 head of Queensland cattle cross into N.S.W. and Victoria for fattening and slaughter in those States. Queensland has more beef cattle and breeding cows than the combined N.S.W. and Victoria total beef cattle population, but the production in each of the three States is comparable.

Breed distribution in Queensland

In the early development of the cattle industry, Shorthorns were the most popular breed and were dominant in most parts of Queensland. As Herefords were introduced,

this breed became popular in the central and southern coastal and hinterland areas. About the turn of the century, some authorities estimate that Shorthorns and Herefords accounted for 80 per cent and 16 per cent respectively of the Queensland cattle population, with other beef breeds and dairy stock making up the remaining 4 per cent.

Because of the problems involved in getting accurate records on the distribution of breeds, few attempts have been made to collect this data. What appears to be the first attempt at the census in Queensland was made in 1930 when stock returns to Petty Sessions Districts were used to record breeds of cattle held on properties.

There were problems with this collection and a large proportion of returns did not specify breed. However, if the returns of respondents who specified breed are considered as a sample of the population (representing 19 per cent of the cattle), then Shorthorns accounted for 70 per cent of the population, with Herefords at 26 per cent and Angus around 1 per cent. In comparison to other estimates and known trends, these figures seem to fit.

During 1946–52, Mr W. A. Beattie of the CSIRO conducted a survey of the Australian beef industry. Based on Mr Beattie's estimates, Shorthorns represented 53 per cent of the Queensland population, with Herefords about 30 per cent, Angus at 4 per cent and approximately 4 per cent of the population carrying some Zebu (*Bos indicus*) blood. Based on these figures, the most significant change from 1900 to the 1950s was the increase in Herefords and the decline of Shorthorns.

The popularity of the tropical breeds was also increasing but numbers were still small. Small numbers of Zebu type cattle were first introduced into Queensland in 1910, but it was not until the 1930s and 1950s that significant numbers were imported before livestock imports were banned in 1958.

The next insight into breed composition took place in 1965 when the Bureau of Agricultural Economics (BAE) conducted a beef industry survey. At that time, Herefords accounted for nearly half the population and Shorthorns were close to one-quarter. While straight tropical breeds only accounted for 0.1 per cent of the population, their crosses accounted for nearly 12 per cent. These crosses were to form the basis for the formation of new tropical breeds.

Beef cattle breed societies

This list will assist you to obtain further details on any particular breed of beef cattle. Specific information available from the societies will include details on society regulations, breed information, stud registration, membership and the names and addresses of registered breeders.

Africander and Belmont Red Association

Brahman Breeders' Association of Australia

Brangus Cattle Association of Australia
Box 796, Rockhampton, Qld. 4700.

Angus Society of Australia
Enid L. Fisher, G.P.O. Box 4220, Sydney, N.S.W. 2001.

Angus Society of Australia (Queensland State Committee)
Mrs D. Hawkins, 19 Ellena Ave., Greenslopes, Qld. 4120.

Blonde D'Aquitaine Society
Royal Showgrounds, Epsom Rd., Ascot Vale, Vic. 3032.

Braford Society of Australia
Mr B. Richardson, P.O. Box 749, Rockhampton, Qld. 4700.

Charbray Society of Australia
Mrs H. D. Searl, P.O. Box 290, Kenmore, Qld. 4069.

Charolais Society of Australasia
Mr F. Hodder, G.P.O. Box 3963, Sydney N.S.W. 2001.

Charolais Society of Australasia (Queensland Branch)
Miss Linda Cottee, 14 Sutherland Ave. Ascot, Qld. 4007.

Chianina Society of Australia
Mrs S. N. Littlejohn, 95 Bellevue St., Cammeray, N.S.W. 2062.

Chianina Society of Australia (Queensland Branch)
Mr E. R. Greenhalgh, M.S. 150, Pittsworth, Qld. 4356.

Devon Breeders' Society of Australia
Secretary, G.P.O. Box 4317, Sydney, N.S.W. 2001.

Devon Cattle Breeders' Qld. Society
Mr I. E. Clark, P.O. Box 173, Chinchilla, Qld. 4413.

Droughtmaster Studbreeders' Society
Mr J. S. Boydell, Suite 42, Office Block, Indooroopilly Shoppingtown, Qld. 4068.

Durham Society of Australia Ltd.
Box 100 P.O. Wellington, N.S.W. 2820.

Galloway Cattle Society of Australia
Mr H. J. Clappison, Royal Melbourne Showground, Epsom Road, Ascot Vale, Vic. 3032.

Hereford Association—Central Queensland
Miss R. A. McCamley, 'Memmoooloo' Comet, Qld. 4702.

Hereford Society Ltd.
Mr N. Kirk, Manager, P.O. Box 21, North Brisbane, Qld. 4000.

SOME QUEENSLAND



Herefords together with Poll Herefords are the most popular breed accounting for 25% of Queensland's total beef cattle population. Herefords are well distributed throughout the State but are more densely concentrated in the southern districts.



Because of the Brahman's adaptive valuable source of genetic material. The Brahman influence is extensive some infusion of Brahman blood.



Santa Gertrudis were first introduced from the U.S.A. in 1952. This popular breed is well distributed throughout Queensland but is more heavily concentrated in the drier inland areas.



Droughtmasters were developed in Queensland with the idea of combining the most desirable attributes of the Brahman and British breeds. Droughtmasters are popular in coastal and hinterland regions.



Braford were developed to combine the best attributes of the Hereford and Brahman. The Braford is gaining popularity particularly where ticks are a problem.

D BEEF BREEDS



In a tropical environment, this breed is a breeding and new breed formation. Over 50% of Queensland cattle having



Shorthorns were the trail blazers and the dominant breed in the early development of the beef industry. Its good temperament has made the Shorthorn the leading breed in the more extensive areas.



Poll Herefords were developed from the Hereford in the U.S.A. The first Poll Herefords to come to Australia came to Queensland in 1920. The breed expanded rapidly and there are now as many Poll Hereford studs as Hereford studs.



advantages of the Brahman and its popularity in traditional hereford country



The numbers of Africanders and its derivative, the Belmont Reds, are small but their popularity is increasing in coastal and inland areas. With good temperaments and other attributes, they are particularly suited to the arid to semi-arid regions.

SOME QUEENSLAND BEEF BREEDS



Herefords together with Poll Herefords are the most popular breed accounting for 25% of Queensland's total beef cattle population. Herefords are well distributed throughout the State but are more densely concentrated in the southern districts.



Because of the Brahman's adaption to a tropical environment, this breed is a valuable source of genetic material for cross breeding and new breed formation. The Brahman influence is extensive with over 50% of Queensland cattle having some infusion of Brahman blood.



Shorthorns were the trail blazers and the dominant breed in the early development of the beef industry. Its good temperament has made the Shorthorn the leading breed in the more extensive areas.



Santa Gertrudis were first introduced from the U.S.A. in 1952. This popular breed is well distributed throughout Queensland but is more heavily concentrated in the drier inland areas.



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Droughtmasters were developed in Queensland with the idea of combining the most desirable attributes of the Brahman and British breeds. Droughtmasters are popular in coastal and hinterland regions.



Brafords were developed to combine the advantages of the Brahman and Hereford. The Braford is gaining in popularity in traditional hereford country particularly where ticks are a problem.



The numbers of Africanders and its derivative, the Belmont Reds, are small but their popularity is increasing in coastal and inland areas. With good temperaments and other attributes, they are particularly suited to the arid to semi-arid regions.

Limousin Breeders' Society

Suite 901, 309 Pitt St., Sydney, N.S.W. 2000.

Lincoln Red Cattle Society of Australia

General C. M. I. Pearson, Secretary, G.P.O. Box 4317, Sydney, N.S.W. 2001.

Maine-Anjou Cattle Breeders' Association

Royal Showgrounds, Epsom Rd., Ascot Vale, Vic. 3032.

Murray Grey Beef Cattle Society

Mr D. C. Abbott, Office Manager, P.O. Box 904, Albury, N.S.W. 2640.

Poll Devon Society Ltd. of Australia

Mr I. E. Clark, P.O. Box 173, Chinchilla, Qld. 4413.

Poll Hereford Association of Queensland

Mr M. Horan, P.O. Box 621, Toowoomba, Qld. 4350.

Poll Hereford Society Ltd.

Mr G. A. Taylor, P.O. Box 131, North Sydney, N.S.W. 2060.

Poll Shorthorn Society of Australia

Mr J. Hawkins, G.P.O. Box 3854, Sydney, N.S.W. 2001.

Poll Shorthorn Society of Australia (Queensland Branch)

Mr K. J. Kelly, P.O. Box 139, Dalby, Qld. 4405.

Red Angus Society of Australia

'Maintop' Pearcedale Rd., Cranbourne South, Vic. 3977.

Red Poll Society of Australia

Mrs H. Couch, P.O. Box 81, Manilla, N.S.W. 3246.

Red Poll Society of Australia (Queensland)

Mrs J. Hopper, 'Callemondah' Porter's Gap, M.S., Bell, Qld. 4408.

Red Sindhi Society of Australia

Secretary, P.O. Box 290, Kenmore, Qld. 4069.

Sahiwal Society of Australia

Mrs. H. D. Searl, P.O. Box 290, Kenmore, Qld. 4069.

Santa Gertrudis Breeders' (Australia) Association

Mr J. Hanley, G.P.O. Box 1500, Sydney, N.S.W. 2001.

Simmental Breeders' Association Ltd. of Australia

Mr I. L. Bonifant, Manager, P.O. Box 31, Kings Cross, N.S.W. 2011.

Simmental Breeders' Association of Australia (Queensland Branch)

Mr M. Horan, P.O. Box 172, Toowoomba, Qld. 4350.

Shorthorn (Breeders') Association of Australia

Cnr. Darling and Tamworth Sts., Dubbo, N.S.W. 2830.

Shorthorn Society of Australia (Beef)

Mr T. Sampson, G.P.O. Box 3854, Sydney, N.S.W. 2001.

South Devon Cattle Breeders' Association

Mr T. W. Nest, P.O. Box 473, Warragul, Vic. 3820.

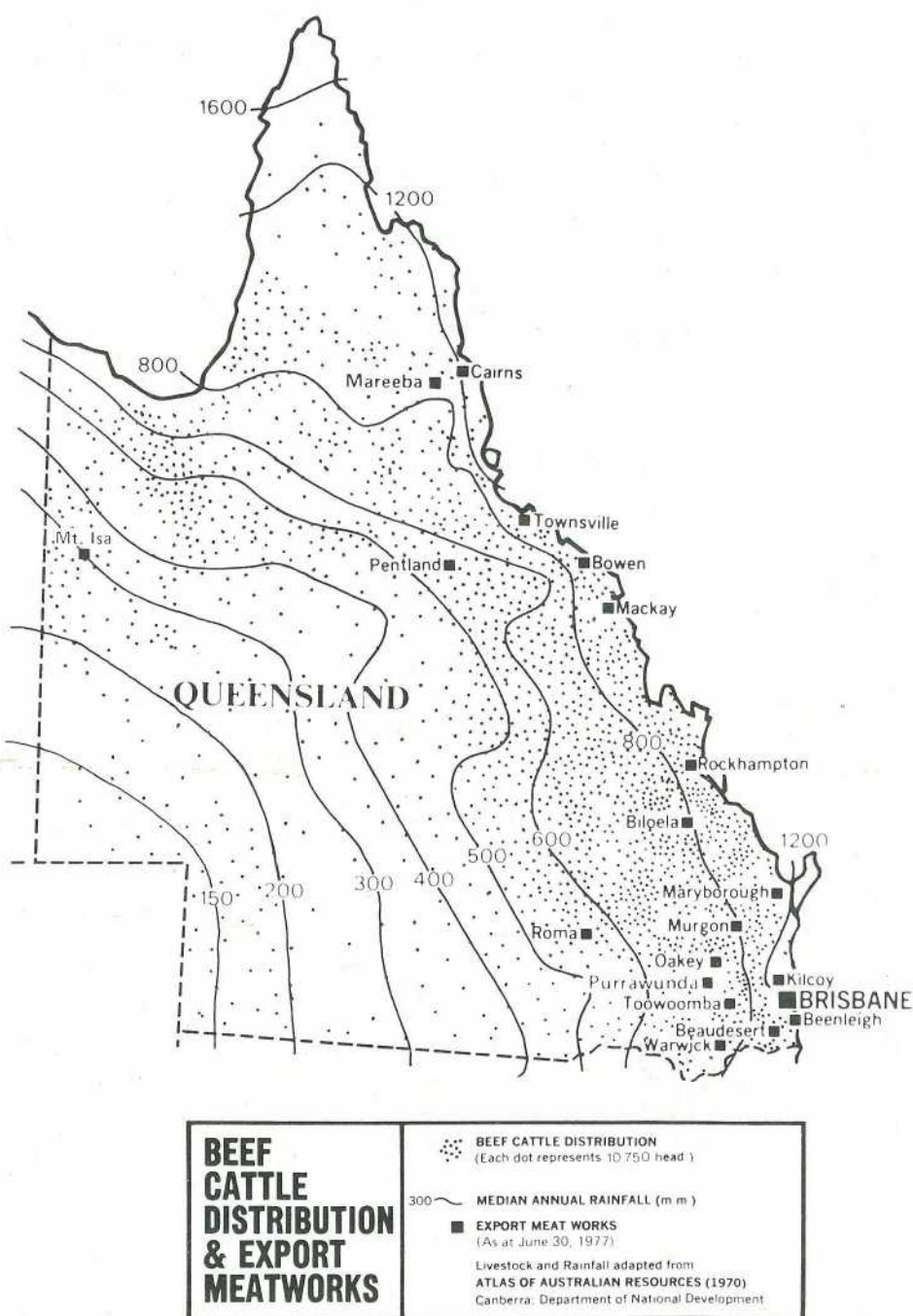
South Devon Cattle Breeders' Association of Australia (Queensland Branch)

Mr D. Dawes, Favourdale Farms, M.S. 636, Mundubera, Qld. 4626.

Tasmanian Grey Beef Cattle Society

Mr J. L. Midson, Secretary, P.O. Box 405, Launceston, Tas. 7250.

Please note: Some of these addresses change over time. For a more up-to-date list, contact your local D.P.I. office and ask for a copy of the Farm Note listing beef cattle breed societies.



The first complete census of cattle breeds anywhere in Australia was conducted by the Australian Bureau of Statistics (ABS) in Queensland in 1973. This indicated a dramatic change in the composition of the State herd over the 1960s and early 1970s. The British breed component was reduced dramatically as the tropical breeds and their crosses increased. British breeds and crosses declined from 88 per cent to 57 per cent, while tropical breeds and their crosses increased from 12 per cent to 43 per cent.

In 1977, the second census by the ABS showed that the trends indicated in the 1973 census were continuing. The proportion of British-European breeds declined still further, while the

tropical component increased to just over half the population. Crises are great motivators of change, and a major impetus to breed change occurred during the beef depression of 1974-78. With low beef prices, a combination of a need to reduce costs of inputs and increasing resistance of ticks to tickicides increased the need for mini-care cattle that were better adapted to the environment.

In 1977, Herefords still remained the most popular breed, with 25 per cent of the population, followed by the Shorthorn with 11 per cent, followed by the tropical straightbreeds. Altogether, the tropical straightbreeds accounted for 15.3 per cent of the population and European breeds accounted for less than 0.1 per

cent of the population. Table 2 shows breed changes in the State herd from 1900 to 1977.

During the beef boom of the early 1970s, a more favourable environment for entrepreneur activity promoted the introduction of European breeds not previously seen in this country. With a continuing trend to lean beef production, the European breeds with their high growth rates appeared attractive for either new breed formation, crossbreeding or as a straight breed. As straight breeds, these breeds appear to be restricted to more favourable parts of the State.

In the early 1970s, live cattle could not be imported into Australia from any country except New Zealand. However, semen could be imported from accredited countries and considerable quantities were imported. In 1979, the Torrens Island Quarantine Station near Adelaide was expanded to take cattle. This expanded live cattle imports to those originating from the U.K. and Ireland. Once the Cocos and Geelong Quarantine Stations are opened, live animal importations can be made from higher risk countries.

Breeds of beef cattle

A breed can be defined as a group of animals that have a common origin and possess certain well-fixed and distinctive characteristics not common to other members of the same species. These characteristics are uniformly transmitted.

The most obvious heritable characteristics that distinguish breeds of cattle are coat colour, presence or absence of horns, presence or absence of a hump, and a body conformation. These characteristics do not have any direct productive significance but are useful markers to identify breeds that have established production characteristics.

All farm animals were domesticated long before historic times. The practice of breeding from those animals that the owner considered were the most desirable ones must have begun with domestication itself. There is evidence that castration was practised at least 2000 BC and so artificial selection has been practised by man for thousands of years.

Over time, both natural and artificial selection led, to breeds and strains with particular uses for man—draught, milk and beef. In more recent times, once a new breed is evolved, a breed association is usually formed to guard standards and ensure survival.

No one breed is best for all environments, and comparative studies of the performance of different breeds in a particular environment have to be interpreted carefully. Environmental and genetic interaction exists, and the productivity of different breeds can vary from one environment to another. However, this subject is controversial. At one extreme are those who suggest that only two breeds are needed, Friesian for milk and the Charolais for beef. At the other extreme are those who attempt to allocate breeds to carefully defined climatic zones.

In Queensland, a wide range of environmental conditions exists. While individual breeds are highly adapted to different environments, greater adaptability and better performance will follow the use of many different breeds. This gives a wide gene pool from which superior stock can be selected.

Individual breeds have particular aptitudes to particular environments. Sometimes gains can be made by combining the attributes of two or more breeds to evolve a new breed selected specifically for a particular environment.

Older established breeds were evolved in this way and supporters of these breeds should be careful to avoid derogatory terms such as 'mongrelization' that are sometimes used when referring to the newer breeds. All breeds were mongrelized at one stage.

In the following section, a brief description will be given of all the breeds now in Australia or being developed through artificial insemination. These breeds will be broadly grouped according to origin into British, tropical and European.

In Queensland, approximately 1 700 producers are breeding and promoting the various breeds discussed in this article. The distribution of these studs gives some indication of the relative popularity and suitability of the various breeds for the differing environments.

British breeds

As a generalization, the more popular British breeds in Australia tend to be smaller and have more subcutaneous fat than other European breeds. Mature weight is influenced by the environment and, under our paddock conditions, British breed bulls have mature weights varying from 550 to 700 kg with cows averaging 400 to 550 kg liveweight.

Because of our historical connection with England, it was inevitable that the early development of the cattle industry should depend largely on locally-adapted British breeds. British stud stock were freely imported until quarantine regulations banned the importation of livestock in 1958.

This ban was imposed to protect Australia from various diseases and parasites that could otherwise have gained entry. The ban tended to

promote the selection of animals more suited to our environment, and strains of British breeds adapted to widely differing environments have been developed.

Hereford ORIGIN

Herefords originated in Herefordshire in England. The early development of the breed is obscure, but a painting by Paul Potter (1625-1654) shows a white-faced red-bodied cow resembling the earlier Hereford. The purebred beef strain was not established until the early 1700s. Early Hereford cattle had varied colours and patterns ranging from red with a white head to grey and light grey.

DEVELOPMENT IN AUSTRALIA

The first importation into Australia took place when the Cressey Company imported a bull and two cows into Hobart in 1826. Herefords reached the mainland a year later when Mr G. Wyndham brought Herefords to 'Dalwood' New South Wales. The first breeder of Herefords in Queensland was Mr J. F. MacDougall of 'Rosalie Plains', who introduced them in 1864.

Other introductions soon followed and the breed gained popularity in the eastern coastal and hinterland areas of Queensland. At present, Herefords are found in most parts of Queensland, but their numbers are more concentrated in the southern half. Queensland has about 220 registered stud breeders of Herefords.

TABLE 2

Breeds of Beef Cattle in Queensland

Breeds	1900	1930	1950	1965	1973	1977
	%	%	%	%	%	%
British, European and Crosses—						
Hereford (Incl. Poll) %	16	26	39	49	27	25
Shorthorn	80	72	53	24	15	11
Angus	NA	0.9	4	0.4	0.8	0.5
Other British	4	1.1	NA	1.3	0.5	0.4
European	Nil	Nil	Nil	Nil	Insig.	Insig.
British and European	NA	NA	NA	13.5	13.3	9.0
Total British, European	100	100	96	88.2	56.6	45.9
Tropical Breeds and Crosses—						
Santa Gertrudis	Nil	Nil	Nil	..	2.7	5.2
Brahman	Nil	Insig.	Insig.	..	2.5	3.8
Braford	Nil	Nil	Insig.	..	1.8	3.0
Droughtmaster	Nil	Nil	Insig.	0.1	1.5	3.0
Other Tropical	Nil	Nil	Nil	..	0.3	0.3
Tropical Crosses	Nil	Insig.	NA	11.6	34.4	38.5
Total Tropical	Nil	Insig.	4	11.7	43.2	53.8
Total Beef Cattle (million)	4.1*	4.4	4.9	6.3	9.2	11.0

* Includes dairy.

BREED CHARACTERISTICS

The Hereford colour is distinctive. The body colour varies from a medium to a rich red with a white face. White is also found on the underline, flank, crest, switch, breast and below the knees and hocks. White colouring at the back of the hocks, high in the legs is objectionable. Likewise, dark or smutty noses are frowned upon by breeders.

The Hereford is rather rectangular in form, deep-bodied, thick-fleshed and possesses a good constitution and vigour. The breed is particularly noted for its foraging which accounts for its popularity in range and hilly country.

In Queensland, selection within the environment has developed a sleek-coated animal of good size that is more adapted to a tropical environment. The good constitution and 'easy care' quality of the breed make it well suited to both intensive and more extensive areas. Although the cows are sometimes criticized for low milk production, they give ample milk to produce a good calf. Herefords have high fertility and good growth rates.

The Hereford has been used extensively in crossbreeding programmes, and has been crossed with the Brahman to produce the Braford which is gaining in popularity, particularly in tropical areas where ticks are a problem.

Poll Hereford

ORIGIN

The Poll Hereford was developed from the Hereford. Warren Gammon, of Iowa, U.S.A., circularized the membership of the American Hereford Breeders' Association with the aim of locating naturally Polled Hereford cattle that normally arise from time to time in Hereford herds. From this he succeeded in bringing together a foundation herd of 11 polled

animals that were registered in the American Hereford Record. From this beginning, the present Poll Hereford breed has been developed.

DEVELOPMENT IN AUSTRALIA

The first Poll Herefords came to Australia from the U.S.A. in 1920 when Hentry Beak and Sons and G. H. Horne introduced the breed into Queensland. The first shipments were followed by larger ones, and the breed expanded rapidly in Queensland and the southern States. In Queensland the Poll Hereford, like the Hereford, can be found in most parts but appears to be concentrated in the southern coastal and hinterland areas. The breed society has a Queensland membership of about 230.

BREED CHARACTERISTICS

The poll character is dominant, and since horned cattle have been used to develop the breed, there is little difference between polled and horned breeds. The Poll Hereford exhibits the same characteristic colour markings as the Hereford.

It is a good forager, has a good constitution and vigour and is exposed to the same criticism of low milk production. The Poll Hereford has high fertility and good growth rates and has done well in Queensland carcass competitions.

Shorthorn

ORIGIN

The Shorthorn is one of the oldest of the beef cattle breeds and the first breed of cattle to have a breed association.

This breed originated in north-east England in the counties of Northumberland, Durham, York and Lincoln. It is called Shorthorn because the earlier improvers of the breed shortened, through selection, the horn of the original Longhorn cattle that were native to the district.

It is not known what breeds or types of cattle were used in the early development of the Shorthorn, but it is probable that the early invaders of England brought cattle which were crossed with the native stock.

As a result of Robert Bakewell's success in improving the Longhorn, the Colling Brothers together with Cruikshank and others applied the same breeding methods to improve the Shorthorns and were responsible for its early development.

DEVELOPMENT IN AUSTRALIA

While Shorthorn stock could have been introduced into the New South Wales colony in the late eighteenth century, the first purebred stock was not introduced until 1800 when a Devon bull and a few Shorthorn cows were landed and grazed on 'Cumberland Park', Parramatta.

The next attempt to introduce purebred Shorthorns was made by the Archer family of Tasmania in 1822, but unfortunately all the cattle died at sea. Potter McQueen of 'Segenhoe', Scone was one of the earliest pure breed importers, bringing in stock in 1825.

Other importations followed and towards the end of the nineteenth century, with natural increase, the Shorthorn became the leading beef breed in the great pastoral areas of western Queensland, the Northern Territory and the Kimberleys. These areas are still strongholds of the Shorthorn.

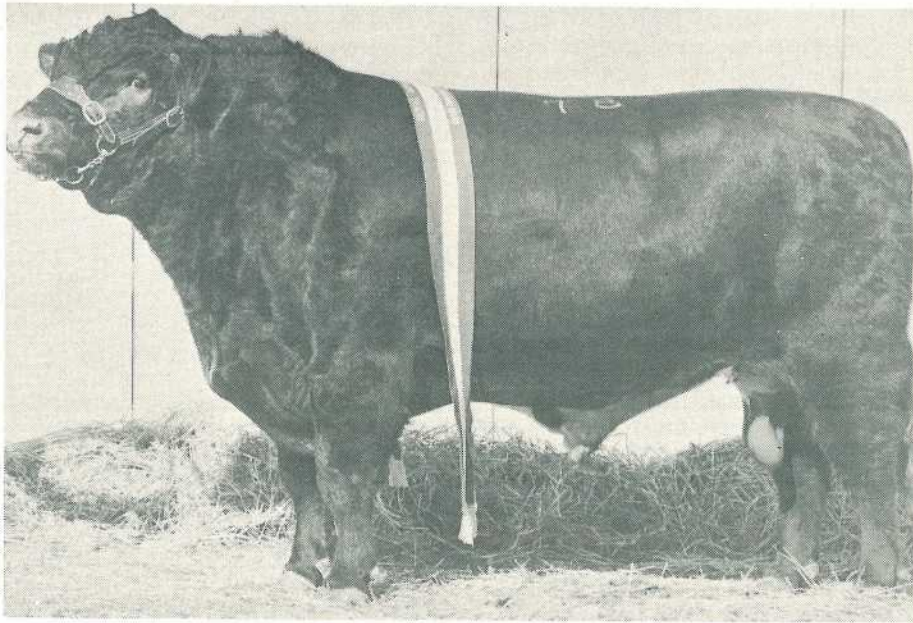
In Queensland, the first introduction of purebred stock was made from New South Wales in 1842 by Mr John Deuchar of 'Glengallan' Stud.

BREED CHARACTERISTICS

The breed has a wide range in colour varying from roans and red to white, with red the predominant colour. The skin should be pigmented and a smutty nose or a dark nose is



Poll Hereford



Poll Shorthorn

To increase the number of polled animals, the breeders mated polled cows to horned bulls. The first man to breed polled cattle was Captain Miller who bred double standard cattle, that is, poll stock registered as both Shorthorns and Poll Shorthorn.

DEVELOPMENT IN AUSTRALIA

In 1874, Mr D. S. McLarty of 'Lone Pine', New South Wales, began breeding Poll Shorthorn cattle from the occasional polled animals that arose in his herd. He may be considered the first breeder of Poll Shorthorns in Australia. Between the two World Wars, the Poll Shorthorn increased in popularity and today appears numerically stronger than the parent breed in herd book registrations. There are approximately 100 Poll Shorthorn studs in Queensland.

BREED CHARACTERISTICS

The Poll Shorthorn is very similar in type to the Shorthorn except for being hornless. The best specimens of both breeds are comparable.

Angus

ORIGIN

The native home of the Angus is northern Scotland in the Counties of Aberdeen, Kincardine and Angus. The area in which they originated is rolling to rough and not particularly fertile. It has a cool climate for most of the year.

objectionable. The horns are rather short and incurving. The breed is normally regarded as one of the larger British breeds, but fads in the stud industry have limited this expression.

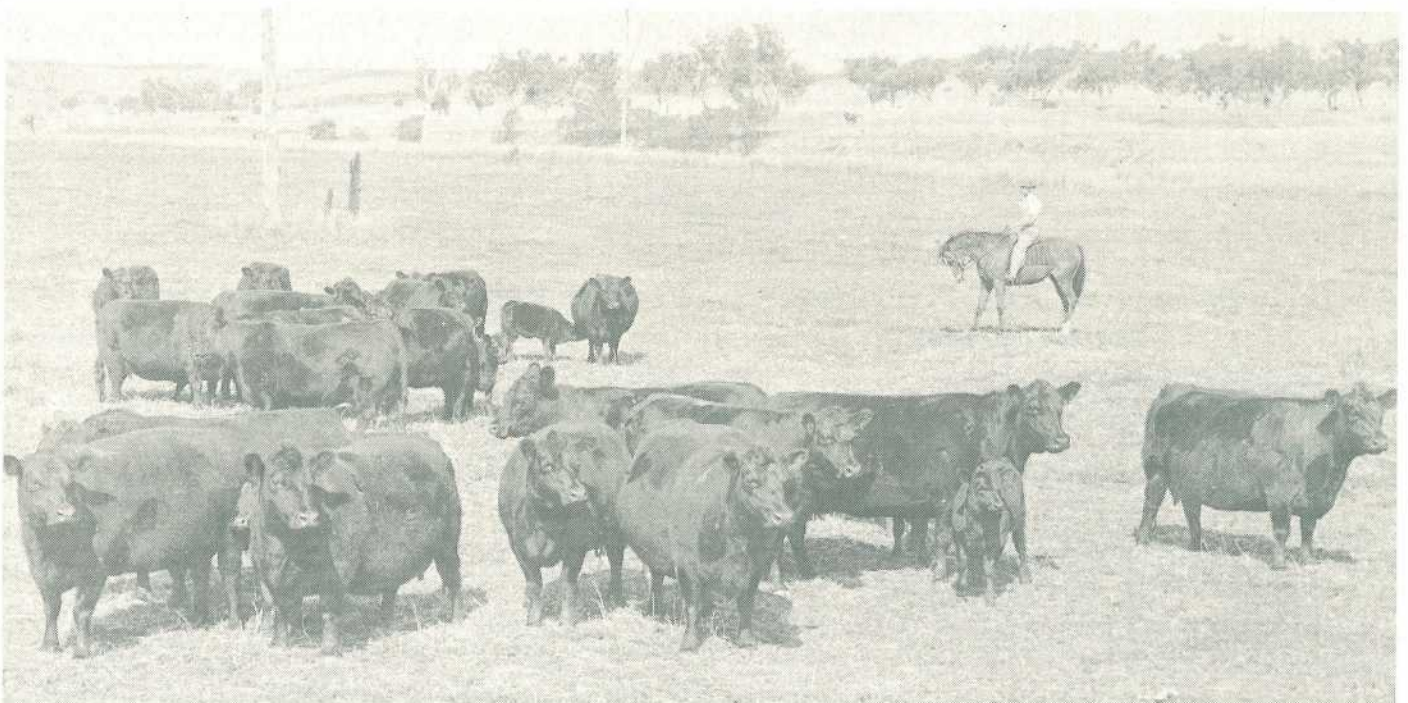
Shorthorns have a good temperament and this has promoted the almost exclusive use of the Shorthorn in the extensive grazing areas of the north and west. In these areas, cattle are handled infrequently and temperament is an important trait.

Shorthorns have high fertility, good mothering ability and high growth rates. Compared with other British breeds, Shorthorns excel in milk

Poll Shorthorns

ORIGIN

Poll Shorthorn cattle originated in the U.S.A. in the northern central States, chiefly Ohio and Indiana. In these States, some breeders of Shorthorn cattle kept and bred polled offspring that appeared in their herds. From these matings, the Poll Shorthorn breed arose.



Angus

The origin of the Angus breed is speculative. Some claim that the breed is a sport from an earlier black horned breed of Scotland. Others say that it arose from the polled cattle of Britain.

Two breeders, Hugh Watson and William McCombie, were largely responsible for the major development of the breed in Aberdeenshire about 150 years ago. Some claim that its development is based on cattle from Buchan and Angus with some mixture of Shorthorn, Ayrshire and Galloway blood.

DEVELOPMENT IN AUSTRALIA

The first Angus cattle were imported into Tasmania in 1822 or 1823. Subsequent importations were made to the mainland. In Queensland, Angus cattle were first imported by E. E. Dalrymple of the Darling Downs in 1840. These were soon dispersed. The distinction for establishing the breed in Queensland goes to William Hogart who established a stud called 'Balgownie' at Pittsworth in 1882.

This breed is more popular in the southern States, and expansion in Queensland has been fairly restricted and limited mainly to a few locations in southern Queensland. There are about 40 studs in the State.

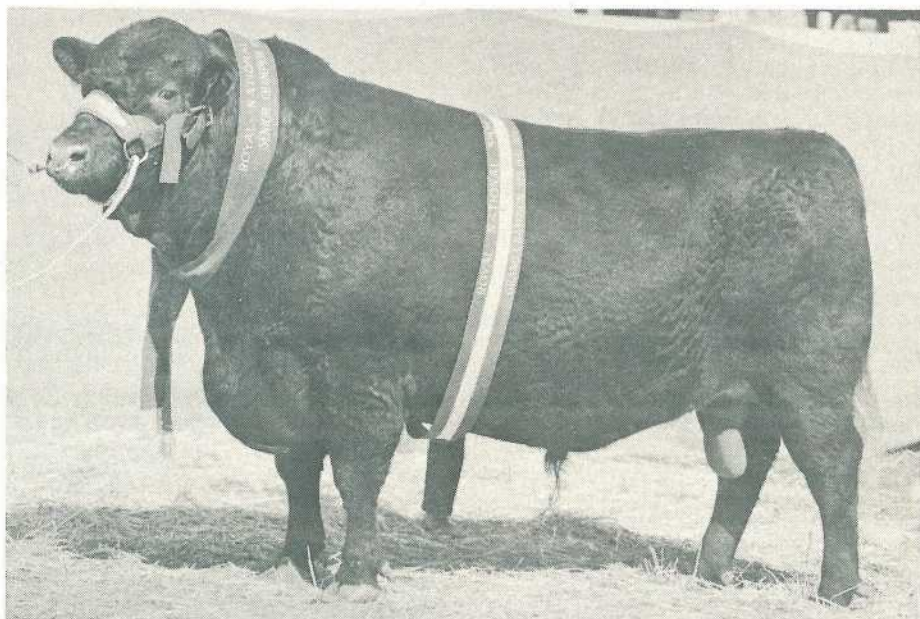
BREED CHARACTERISTICS

Angus cattle are distinguished from other breeds by their black colour, comparatively smooth coat and polledness. A moderate amount of white on the underline behind the navel is permitted. As a rule, Angus are smaller than other British breeds and mature earlier. Because of their compactness and closeness to the ground, there is a tendency to underestimate their weight.

The body of the Angus may be described as cylindrical, compact, well-muscled, and yielding a good quality carcass with a high dressing percentage.

They are good foragers and seem to be able to endure both warm and cold climates. However, because of their early maturity, they are better suited to the more favourable, temperate environments. Their temperament also tends to restrict their use to the more intensive areas.

Because of the dominance of the solid colour and polled characteristics, Angus are used extensively in crossbreeding programmes. They have been crossed with the Brahman to produce the Brangus which has some popularity in the Queensland tropics.



Red Poll

Red Poll

ORIGIN

The Red Poll breed of dual purpose cattle had its origin in the Counties of Norfolk and Suffolk in the eastern middle-coastal area of England. The breed arose early in the nineteenth century as a result of crossing horned Norfolk with Polled Suffolk cattle. The Norfolk were noted for their good fleshing qualities and the Suffolk were bred for milk. Little is known of the origin of the Norfolk or Suffolk cattle.

DEVELOPMENT IN AUSTRALIA

There is some evidence that Red Polls were imported into Victoria in the 1880s by J. H. Graves. The first importation of pedigree stock did not take place until 1891 when Messrs A. Chirnside and Son of 'Werribee Park', Victoria, made importations. Later importations were made into N.S.W. In Queensland, the first pedigree stock were imported by E. G. McConnell, of 'Marshlands', Wondai, in 1905.

The number of Red Poll cattle in Queensland is fairly limited. There are some 20 studs, mostly limited to South-eastern Queensland.

BREED CHARACTERISTICS

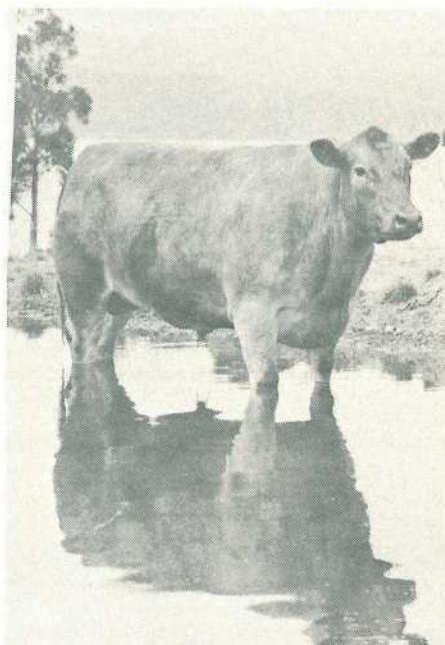
As the name implies, this breed is red and polled. The colour varies from light red to dark red, with the darker colour preferred. Some white is permissible on the underline. The breed is considered as being a fair size and rectangular in shape. Cows are capable of producing comparatively large quantities of milk and raise well-grown calves.

As with other dual purpose breeds, the Red Poll does not have the uniformity of type that exists in strictly beef or dairy breeds. This happens because of the variation in ideals of both breeders and judges.

Murray Grey

ORIGIN

The Murray Grey breed was developed in Australia by Mr K. Sutherland on his property 'Thologolong', Wodonga, Victoria, through mating an extremely light roan Shorthorn cow to an Angus bull. This cow produced a grey calf, and all subsequent crossbred calves produced by this cow were dun in colour.



Murray Grey

Over the next 40 years, the Sutherland family mated Angus and the 'grey' cattle, and the grey colour predominated. Because of this, two grey bulls were retained to establish a new breed, but the plan was later abandoned.

The Gadd Brothers, of 'Mt. Alford', Victoria, had noted an occasional grey arise in their herd of Angus and were impressed by the performance of these cattle. They bought one grey bull from 'Thologolong', and one of the brothers, Mervin Gadd, embarked on a grading-up programme using grey bulls on Angus females.

DEVELOPMENT IN AUSTRALIA

The popularity of the Murray Grey has continued to increase and the breed has extended into most States and overseas. At present, the breed is more numerous in the southern States but representation in Queensland is increasing. There are some 100 studs here.

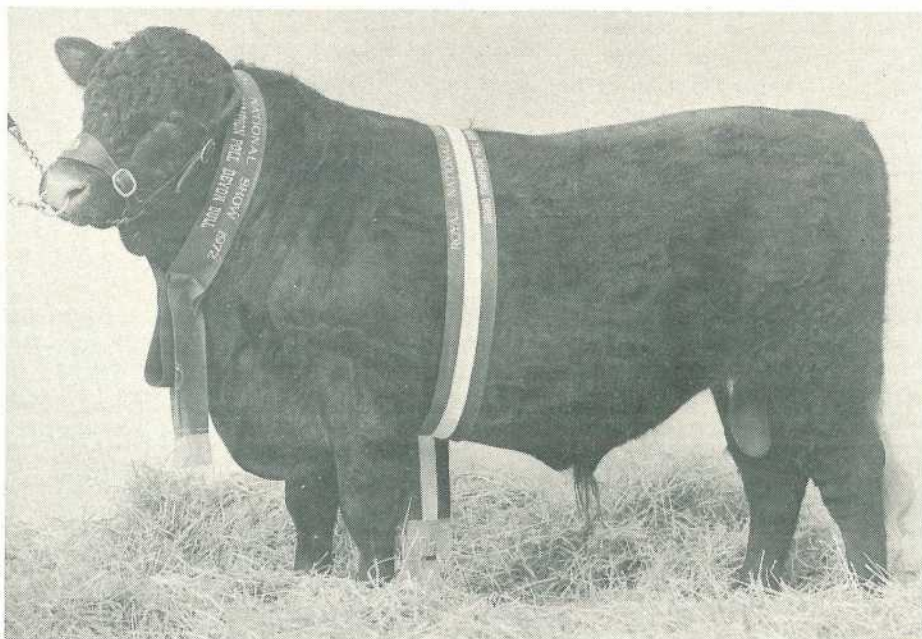
BREED CHARACTERISTICS

The Murray Grey is a polled breed, silver-grey, grey or dark grey and somewhat similar in appearance to the Angus. They are good foragers and have been particularly successful in carcass competitions. The body tends to be cylindrical in shape and well-muscled, yielding good quality carcasses with high dressing percentages.

Devon

ORIGIN

The Devon is one of the oldest breeds of cattle in existence. Its origin is prehistoric, but most authorities claim it descended from the original cattle in Britain. The Devon was first selected as a draught animal, and it



Poll Devon

was not until the nineteenth century that breeders began to select for a beef type.

Towards the end of the eighteenth century, the Quartly Brothers and Colonel John Davy were responsible for the early development of the beef type as seen today. Two types of Devons were developed in England and, according to their location, called North Devon and South Devon. The Devon as we know it originated from the North Devon.

DEVELOPMENT IN AUSTRALIA

The first Devon purebred bull arrived at the Port Jackson colony in 1800 along with a few Shorthorn cows. Subsequently, other importations were made into New South Wales and Tasmania. The expansion of this breed has been similar to that

of the Shorthorns. Because of its foraging ability, the Devon has been widely used in northern coastal Queensland, and in the Gulf and more arid regions of the State as a cross with Shorthorns. There are 11 studs in the State.

BREED CHARACTERISTICS

Devon cattle are hardy and of good size. They were never selected for the compact conformation that has been fashionable with some British breeds in recent years. The body of the Devon is rectangular and wide and deep. It is red with pigmented skin and with medium-sized horns that curve forward and are tipped with a darker colour. The Devon has good fertility and growth rates, and the cows are considered good milkers.

There are relatively few commercial herds in Queensland, though Devon bulls are often used in Shorthorn herds. Queensland has only 12 registered Devon and Poll Devon stud breeders.

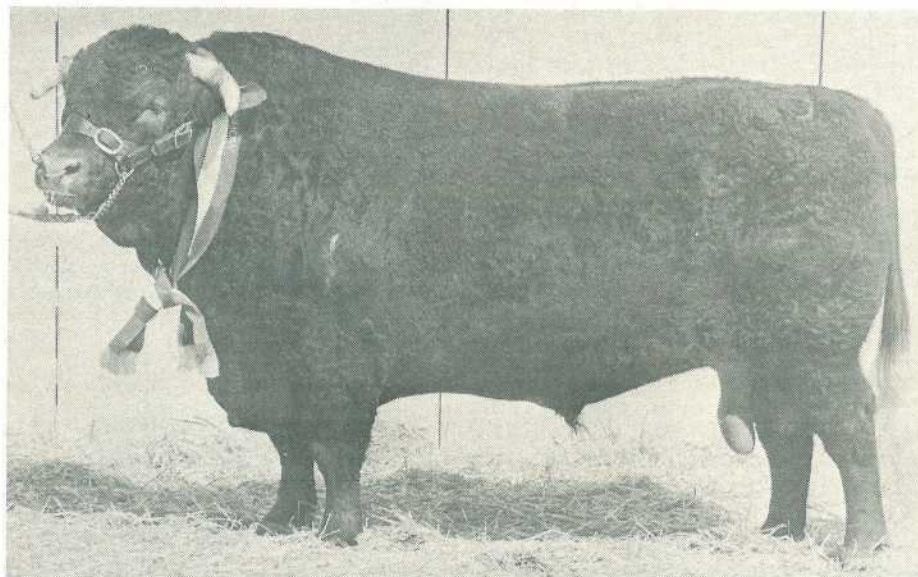
Poll Devon

ORIGIN

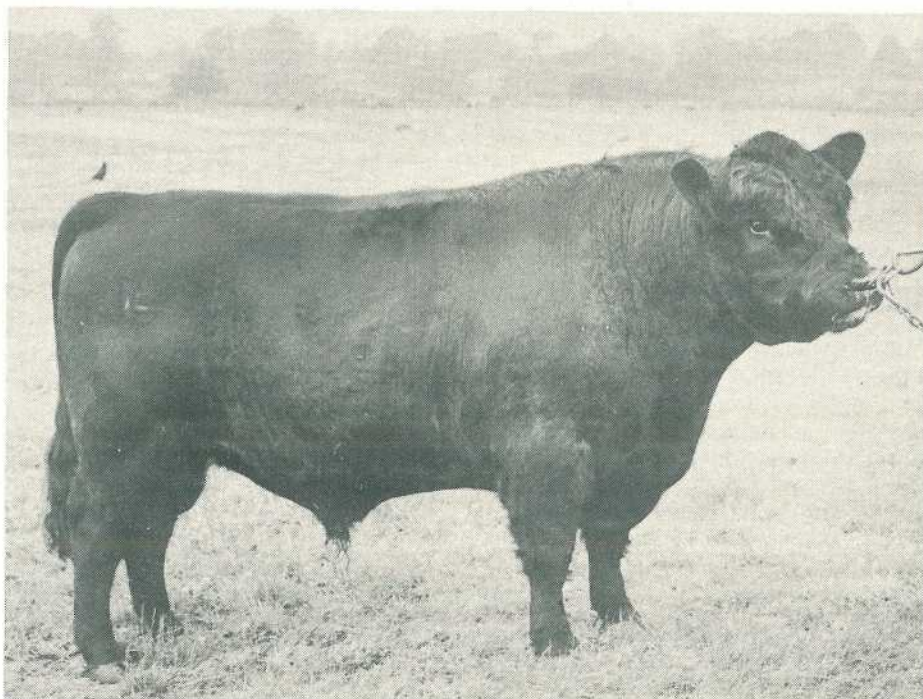
As with other breeds, natural polled animals occurred irregularly in the Devon. In 1915, a Californian breeder, Mr W. E. Gird, purchased Poll Devon bulls from all available sources and developed the new breed. At present, there are relatively few Poll Devons in Queensland and only six studs. These properties have embarked on a development project using natural polled breeds to develop a polled Devon.

BREED CHARACTERISTICS

The Poll Devon is similar to the Devon except that it has no horns.



Devon



Galloway

Galloway

ORIGIN

Before the days of recorded cattle history, the Galloway was raised in south-western Scotland. Of the various theories that have been advanced about its origin, the most probable is that the breed can be traced back to the cattle that the Norsemen brought when they invaded the coastal districts of Scotland.

Towards the end of the eighteenth century, the Galloway began to be recognized as a breed. It continued for some time as a dual purpose animal before selection emphasized the beef characteristics.

DEVELOPMENT IN AUSTRALIA

Galloways were first introduced into Australia in 1951 when H. W. Kater, of 'Swatchfield', Oberon, N.S.W., imported one bull and 12 heifers and the 'Wirriulpa' Pastoral Company, of Hernani, N.S.W., imported two bulls and six heifers. In 1955, the Garnock family, of 'Bukalong', Bombala, N.S.W., imported a bull and five heifers. These were the only cattle brought into the country before the 1958 importation ban on ruminants.

During the 1950s and 1960s as numbers increased, the number of studs expanded in New South Wales, Victoria and Tasmania. In 1969, with the opening up of importations from New Zealand, a few more Galloways were brought in from that country.

There are few Galloways in Australia and these tend to be limited to the more temperate zones. However, there are a couple of small studs in southern Queensland.

BREED CHARACTERISTICS

The colour is normally solid black, often with a brownish tinge, but the occasional dun-coloured animal is not rejected. The hair is long and curly in winter and quite rough but this sheds off to a smooth, fine undercoat in the summer. No white markings are permitted on registered animals.

The breed is rather small and strongly polled. It has short legs and, in comparison with the Angus, is flatter-ribbed and longer-bodied. Galloways are good foragers and hardy hill-type cattle. In cold climates, they are maintained in the open all year round. They produce high quality carcasses.

Lincoln Red

ORIGIN

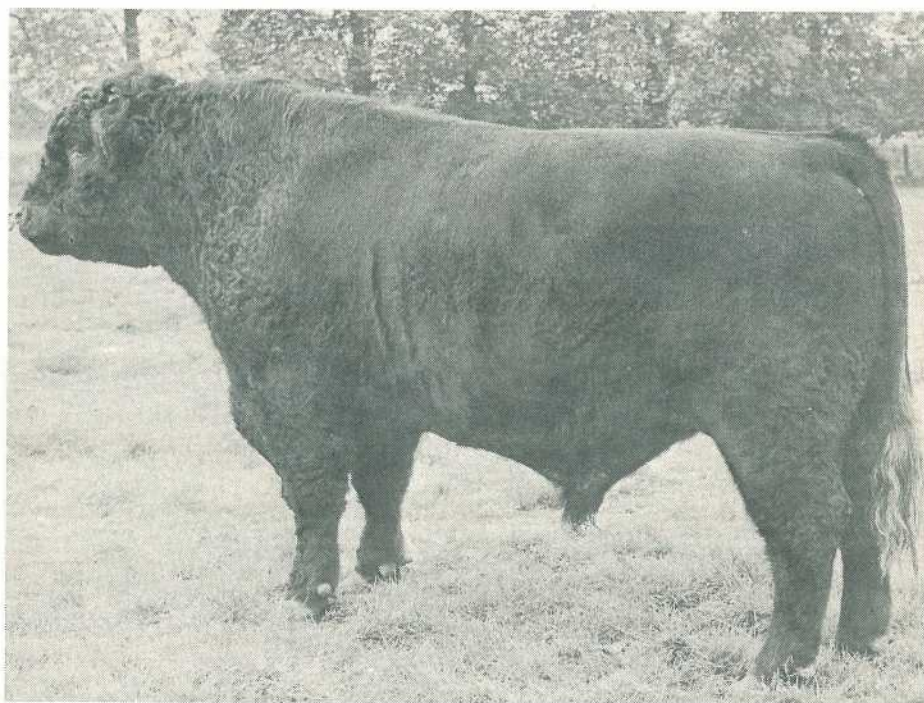
This type of Shorthorn has been segregated in Lincoln County, England, and the surrounding areas for nearly 100 years. The breed can trace its history back for 200 years. It evolved from the improvements made by Robert Bakewell and the Colling Brothers in the late eighteenth century, and the first herd books were set up in 1895.

The Lincoln Red Shorthorn Society was established before the turn of the century. This Society later joined the Shorthorn Society and this association persisted until 1960 when a Lincoln Red Society was formed.

DEVELOPMENT IN AUSTRALIA

Research conducted by Mr R. H. Hayman, formerly of the CSIRO Division of Animal Genetics, F. D. McWater Field Station, N.S.W., shows the earliest recorded imports of Lincoln Reds took place in 1906. In that year, five head were imported by Mr Livingstone of Mullumbimby.

Mr Hayman's records indicate that eight head were imported between 1906 and 1909 and a further six head



Lincoln Red

were imported in the period from 1939 to 1955. A stud was established by Mr W. Killen 'Papanui', Merriwa, N.S.W.

Since 1969, when semen imports were permitted from the U.K., Canada and New Zealand, grading-up programmes were developed in various States and a breed society was formed.

BREED CHARACTERISTICS

The Lincoln Red has a rather bright red colour, is well-muscled and often polled. Pollness is said to come from an Angus or Red Poll influence.

Originally, Lincoln Reds were developed as dual purpose animals, but later more attention was paid to fleshing quality. It is now considered more of a beef breed but, because of previous emphasis on milk production, cows are good milkers with average lactations around 3 300 kg.

The compact conformation of the beef Shorthorn has been avoided and the Lincoln Red has a good frame with high growth rates.

South Devon

ORIGIN

The South Devon breed was developed in the southern parts of Devonshire, England. Although in close proximity to the Devon of Northern Devonshire, the two breeds are distinctly different types. Tradition has it that the breed owes some of its size to the influence of Spanish blood introduced from Spanish ships trading at Plymouth Harbour.

In 1774, the then Board of Agriculture recommended that the South Devon breeders form a breed society. However, this did not eventuate until 1891 when the first herd book was also published with records going back to 1850.

DEVELOPMENT IN AUSTRALIA

South Devons were first imported into Australia in the late 1800s. Royal Melbourne Show records indicate that 13 head of South Devon cattle were exhibited at the Melbourne Show in 1911. Original importations appear to have been absorbed into other populations, and further development did not take place till 1969 when the first semen importations were made and grading-up programmes were developed.

The Australian South Devon Breeders' Association was formed in 1971 and purebred stock were imported from New Zealand in 1973. In Queensland, the first semen imports were made in 1973 and the first purebred was introduced from N.S.W. in 1978. There now are six studs in this State.

BREED CHARACTERISTICS

Originally a draught animal, these cattle were selected for both milk production and fleshing qualities during the nineteenth century. They are the largest of the English and Scottish breeds and mature bulls may weigh more than 1 t. They have a solid, bright, yellowish colour that varies in shade and often have a slightly mottled appearance. They are horned but efforts are being made to develop a polled strain.

South Devons are hardy animals with good longevity. Their conformation is rather rangy but well-muscled. Individual breeders tend to select for either a milk type or a beef type and, in their home County, some South Devons are kept exclusively for milk.

Modern selection practices have not been applied to this breed to the same extent as to some other British breeds and thus their potential as either a beef, milk or dual purpose type appears high.

They have high growth rates comparable with the best European breeds. This ability is not so surprising when it is considered that it is one of the few British breeds to have been selected for draught purposes. They have no calving difficulties and produce well-grown calves with good carcass quality.

Sussex

ORIGIN

Farmers in Sussex, England, during the first half of the nineteenth century began selecting a beef type animal from the red draught cattle then being used in the area. By 1840, Sussex cattle were well known in the area although an official herd book was not published until 1879.

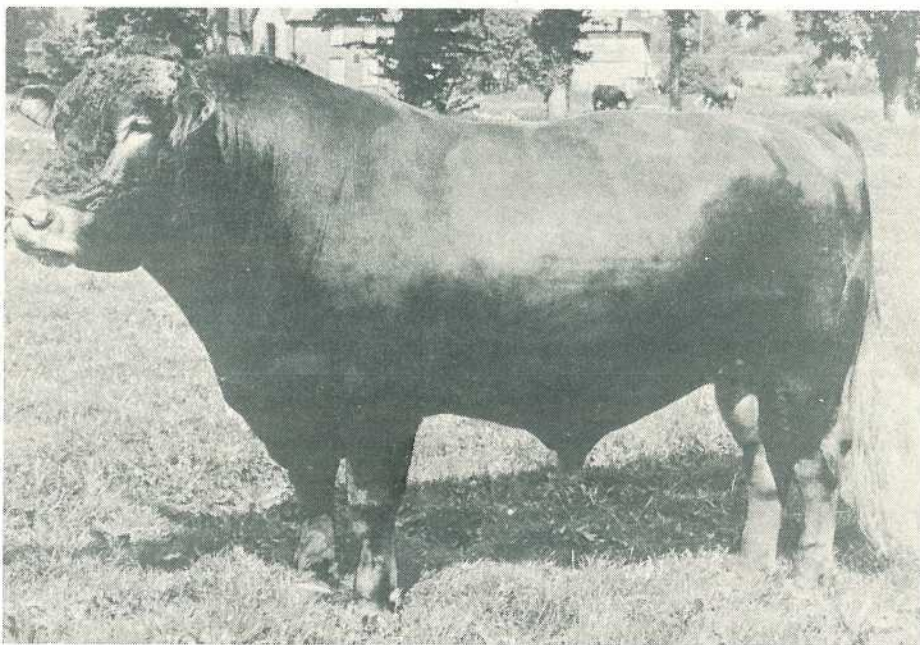
DEVELOPMENT IN AUSTRALIA

This breed was not represented in Australia before the ban on livestock imports in 1958. However, according to research by Mr R. H. Hayman, the Annual Reports of the Stock Branch of the Mines Department show that a single Sussex was imported into Sydney in 1919. Semen was first imported in 1969.

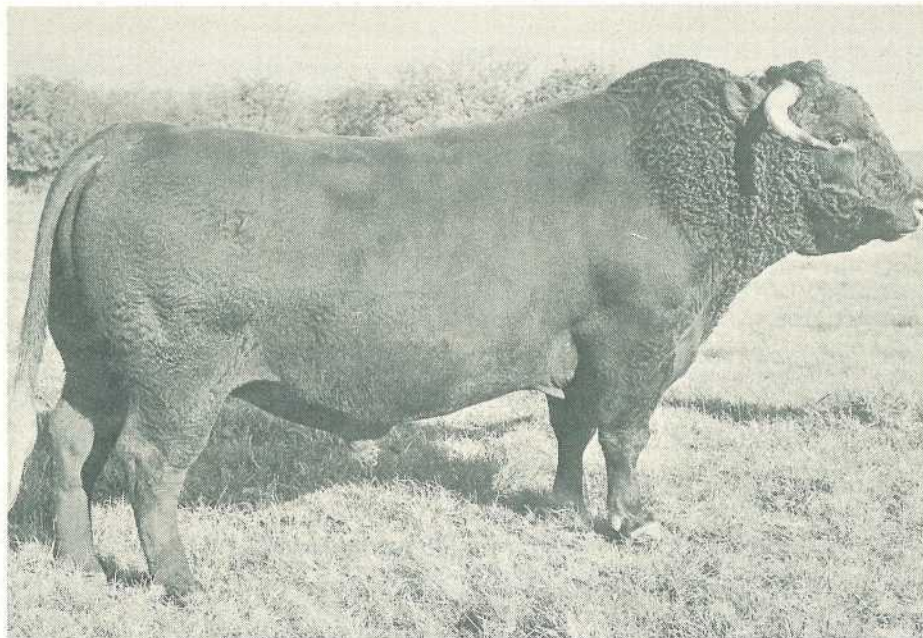
BREED CHARACTERISTICS

This breed is an excellent beef type having a long body that is deep, wide and rectangular in shape. It was never developed as a milk animal. The hair colour is a solid medium-red, quite bright in appearance, with a tail switch that is often white.

Stock have not been bred for the short, compact conformation of some of the other beef breeds, and mature animals are among the larger of the British breeds. Although the Sussex is a strongly-horned breed, a polled strain based on the progeny of a red Angus bull has recently been developed to meet the growing preference of hornless cattle.



South Devon



Sussex

Sussex cattle have been exported in considerable numbers to both the U.S.A. and South Africa, and the breed seems to be doing well in these countries.

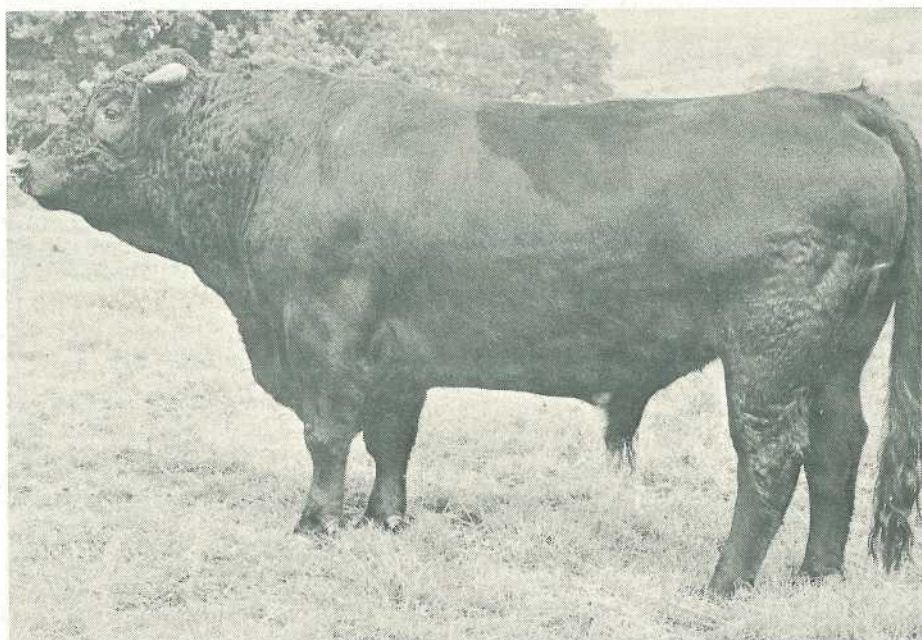
Welsh Black

ORIGIN

Before the days of modern transport, Wales was isolated from England and there was little communication even between north and south Wales. A distinctive type of horned black cattle was developed and it is said to have as its ancestors

the cattle the ancient Britons took with them when they were forced back into the mountains by the invading Saxons.

The cattle raised in northern Wales were considerably smaller than those in the south, and separate herd books were established in 1883. The difference in size was the principal distinction between the two types and undoubtedly arose from the differences in the nutritional levels in the two areas. Both types were combined into the one herd book at the turn of the century under the common name of Welsh Black.



Welsh Black

DEVELOPMENT IN AUSTRALIA

Representatives of this breed were not imported into Australia before the 1958 ban on imports. Semen is now being imported.

BREED CHARACTERISTICS

Because of the conditions under which it was developed, the breed is particularly sturdy. Since butter was at a premium in isolated Wales, early selection was made on butterfat. Preference was also given to a good draught animal. The breed is slow-maturing, but calves grow rapidly up to 1 year of age on good feed.

Welsh Black cattle have horns and a solid black coat which is quite shaggy in winter. Cows are good milk producers, calve regularly and have good longevity under harsh temperate climate conditions.

Tropical breeds

Tropical breeds have various amounts of Zebu blood originating from the humped cattle of India or Africa. Because of this, they are better adapted to a tropical environment where harsh climatic conditions, ticks and other parasites are major influences limiting production.

These breeds perform better than the British breeds in the tropics and are larger in stature but have similar mature liveweight to the British breeds. Mature bulls average from 550 to 700 kg liveweight and cows from 400 to 550 kg liveweight depending on the environment.

Tropical breeds have a different temperament to the British breeds and have to be handled accordingly.

Brahman

ORIGIN

The Brahman was developed in the U.S.A. and is derived from the Zebu humped cattle of India with some infusion of British blood. The dominant Indian breeds in its ancestry were the Gir, Guzaret and Nellore. The first importations of Zebus to America were made in 1849, but it was not until the early part of this century that appreciable numbers were imported.

Since the foundation of the breed, selection has resulted in a breed superior in beef qualities to the Indian breeds but still retaining the distinctive characteristics of the Zebu.

DEVELOPMENT IN AUSTRALIA

In the early days of colonization, Zebus were imported from India but these were either lost or absorbed by the British breeds. Sporadic importation took place at various intervals, but it was not until 1933 that significant numbers were imported. In that year, a syndicate including CSIRO and Messrs Winter-Irving and Allison ('Wealwandangie'), Queensland Stations ('Glenprairie'), Mr Wright ('Waverley') and Merith Menzies and Co. ('Millungera') imported 18 head into Queensland from the U.S.A.

Further significant importations from the U.S.A. took place during the 1950s when a total of 31 head was imported before the importation ban was applied.

In Queensland, the popularity of the Brahman gradually increased after the 1933 importation. However, expansion was slow because of both traditional breed prejudices and restricted numbers. In recent years, with prejudice lessening and an increased availability of stock, Brahman numbers have expanded greatly and this breed has significantly influenced the genotype of the Queensland beef population.

The Brahman has been crossed with both British and European breeds to develop both new breeds and crossbreeds better suited to the tropics. Its influence is greatest along the coast and hinterland areas where ticks and the particular environment favour a *Bos indicus* infusion.

Brahmans have spread to other States, the Northern Territory and the arid areas, but their popularity is greatest in the coastal, tropical and hinterland areas. There are approximately 450 Brahman studs in Queensland.

BREED CHARACTERISTICS

The Brahman is an impressive looking animal with large pendulous ears, a prominent dewlap and hump. The hump is composed of meat and fat and serves as a storehouse of energy.

The Brahman has an upstanding appearance because of its somewhat longer legs. It has a long face and a voice that resembles a grunt rather than a low. The most prominent colour is a grey of various shades, though red is also popular. Colours are either solid or there can be a blending of the two more popular colours. Browns, blacks, white and spotted Brahms are also seen.

Brahmans are intelligent, inquisitive and shy. They are good walkers and foragers and have an ability to survive that is superior to most other breeds. This ability is influenced to some extent by its heat tolerance, tick resistance and resistance to internal parasites.

Brahmans produce light calves, but with the good milk production, calf performance is high. In Queensland, growth rates are high and the Brahman demonstrates an ability to do extremely well under harsh conditions. Carcasses are of good quality with a high dressing percentage.

Because of the Brahman's many qualities suitable to the Queensland environment, it has an important place in crossbreeding and has been used extensively in developing new breeds for the tropical areas.

Droughtmaster

ORIGIN

This breed originated in north Queensland and, like all breeds, has a mixed ancestry. It was developed by crossing the Brahman and largely shorthorn in an attempt to combine the desirable qualities of the two breeds and evolve a breed suitable to the tropics.

The Droughtmaster has approximately one-eighth to five-eighths Brahman blood with the remainder British red breeds. Various British breeds have been used in its development.

Mr R. L. Atkinson of 'Cashmere', Mount Garnet, was the first to experiment with developing the breed in the early 1930s. Mr Atkinson was later joined by Mr R. Rea of 'Kirknie', Home Hill, who began developing his Droughtmaster herd in the early 1940s.

By 1952, sufficient interest had developed in tropical breeds for an association to be formed to improve and promote the new breeds. Droughtmaster, Braford and Brangus breeders formed this association. In 1962, the association was disbanded and separate associations were formed for each breed.

DEVELOPMENT IN AUSTRALIA

With a comparatively recent origin, the breed has expanded rapidly and now has more than 200 studs in Queensland. The breed is popular in the tropical coastal areas, the Peninsula and north-west where ticks are a problem. It has also extended its influence into other States, and exports have been made to many overseas countries. Most Droughtmaster cattle are in Queensland with the heaviest concentrations being along the coast.

BREED CHARACTERISTICS

Droughtmasters are red and may be either horned or polled with medium to large ears, an extended dewlap and a moderate hump. The breed has good body length, a sleek coat, legs of moderate length and a smooth, turned rump.

Droughtmasters have been selected for the tropical environment and, with tick resistance and good foraging ability, are well adapted to harsh conditions. They have good fertility, mothering ability and growth rates. Dressing percentage and resistance to bloat are also high.

Santa Gertrudis

ORIGIN

The Santa Gertrudis breed evolved in Texas, U.S.A. In 1910, King Ranch began crossing Brahman and Shorthorn cattle in an attempt to produce animals that would perform well under local range conditions. In 1920, a superior crossbred bull was born. This bull was used extensively and marked the real beginning of the breed.

By 1940, a large herd of improved cattle had been evolved on King Ranch with animals breeding true to type. These animals were three-eighths Brahman and five-eighths Shorthorn and were recognized by the U.S. Department of Agriculture as a pure breed.

DEVELOPMENT IN AUSTRALIA

The first introductions of Santa Gertrudis were made in 1952 when a total of 75 bulls and 200 heifers was introduced into Australia by King Ranch Australia Pty. Ltd. Further importations were made by King Ranch and several Queensland syndicates in 1954. From these introductions, the breed has spread to all States with the heaviest concentrations being in the eastern States.

The 230 studs are distributed fairly well throughout Queensland with the majority located in the drier inland areas.

BREED CHARACTERISTICS

Santa Gertrudis cattle are red or cherry red. The coat is short and smooth with a loose hide with neck folds and a sheath or naval flap. The male has a small Zebu-type hump. Santa Gertrudis are deep and thick with a good bone structure and free movement. The ears are medium to large in size. White markings not exceeding half of the underline are permitted as is a white switch.

The Santa Gertrudis is adaptable and found in hot and temperate environments and does well under harsh conditions. It has a certain amount of tick resistance which is limited by the lower percentage of Brahman blood. As is common in all breeds with some Zebu blood, mothering ability, resistance to bloat and dressing percentage tend to be high.

Braford

ORIGIN

Brafords were first bred in the U.S.A. and Australians used a similar technique to evolve the breed here. Mr Adam Rea of 'Eden Garry', Kunwarara, central Queensland, began developing this breed in 1946 when he introduced Brahman blood into his high grade Hereford herd and evolved what is now known as the Braford. After that, most Queensland Braford herds were based on 'Eden Garry' blood.

The Braford has approximately three-eighths to five-eighths Brahman blood and the remainder Hereford. The motivation to evolve this breed was to combine the special attributes of Brahman and Herefords to give a breed more suited to tropical areas. The Australian Braford Breeders' Association was formed in 1962.

DEVELOPMENT IN AUSTRALIA

Since its formation, the popularity of this breed has increased and spread to other States. In Queensland, this breed is most popular in the central coastal areas and it seems certain to increase in popularity in the traditional Hereford areas and on the tropical coast. There are more than 100 studs in Queensland.

BREED CHARACTERISTICS

Brafords have a sleek, rich red coat with white markings similar to the Hereford and a loose pliable skin with neck folds. It may be polled or horned, with medium to large ears either straight or drooped and a slightly rounded rump. It has pigment around the eyes. The males have a slight hump.

The Braford is a good forager and has demonstrated an ability to do well under harsh conditions. It has good fertility, mothering ability, tick and bloat resistance. With good growth rates, it produces a carcass of good quality with a high dressing percentage.



Brangus

Brangus

ORIGIN

Like the Braford, the Brangus breed was developed in the U.S.A. and a similar technique was used to develop it in Australia. The first known attempt to establish the breed in Australia was made by Mr L. De Landelles in the Rockhampton district in 1951. Mr De Landelles crossed a Brahman bull with a draft of Angus heifers to evolve the breed and over the years significantly influenced the development of the breed in Australia.

During the 1950s and 1960s, the breed expanded in the tropical coastal districts of Queensland and spread to southern States. The aim of the studs in Queensland was to combine the special merits of the Brahman and Angus and develop a breed suited to the tropics. The Brangus has three-eighths to five-eighths Brahman blood with the remainder Angus.

As with the Braford, until 1961 all stock were registered with the Australian Tropical Beef Breeders' Association. In 1961, a separate authority was founded and the Australian Brangus Cattle Association was formed to promote and improve the breed.

DEVELOPMENT IN AUSTRALIA

The popularity of the Brangus breed has increased, but its expansion in Queensland has been retarded because there are few Angus herds in this State.

It is particularly well suited to the tropical coastal areas and, while it has spread to other States, its potential

expansion tends to be concentrated in the tropical areas. The Brangus Association in Queensland has approximately 60 members.

BREED CHARACTERISTICS

Brangus are black or red-coloured, polled animals with a sleek coat and pigmented skin. They have medium to large ears and loose skin with neck folds. The Brangus has a slightly rounded rump and, in males, a moderate hump.

Like other tropical breeds with Brahman blood, it is a good forager and does well under harsh conditions. It has good fertility, mothering ability and tick and bloat resistance. The Brangus has good growth rates and produces a carcass of good quality with high dressing percentages. It has done well in carcass competitions.

The particular merits of the Brangus make it suited to the tropical coastal areas of Queensland.

Africander

ORIGIN

The Africander has developed from the native Hottentot cattle of the Cape of Good Hope. The Hottentot cattle appear to have resulted from a crossing of the Egyptian Longhorn and the Longhorn Zebu that took place round 2 000 to 3 000 B.C.

The original Hottentot cattle first observed by the early navigators on the Cape survived early colonization. Dutch and British settlers first used the breed for draught, and it was not until after the Boer War that steps were begun to improve it as a beef producer. The breed's preservation was ensured when the Africander

Cattle Breeders' Association was formed in South Africa in 1912. After this, more emphasis was placed on breed improvement.

At present, the Africander is the most important commercial breed in South Africa. More than 30 000 pure-breeds are registered and its popularity is extending to other southern African States.

DEVELOPMENT IN AUSTRALIA

In the early days of colonization, what seem to have been Africanders were imported from Africa. However, only small numbers were introduced and these were either lost or absorbed by the British breeds.

Re-introduction had to wait until April, 1953, when Dr R. B. Kelly of CSIRO introduced five bulls from the U.S.A. for research work at 'Belmont' near Rockhampton. Another two females were imported in 1956.

As numbers built up at 'Belmont', Africanders were released to other research institutions including the Queensland Department of Primary Industries, and the breed was dispersed and tested in various northern environments.

The first release of stock to the public took place in 1960 when full-blood bulls from 'Belmont' were sold at open auction. Since 1960, various sales have been made and new studs have developed in various regions. The Australian Africander Association was formed in 1969. This Association now has 32 members and more than 4 000 cattle registered or eligible for registration.

BREED CHARACTERISTICS

The distinguishing feature of the Africander is its red colour which may vary from light tan to a deep, cherry red. It has a sleek coat and a hump that is smaller, more rounded and set farther forward than the hump of the Brahman. Horns in the classical form spiral horizontally from the skull.

The face is long and flat, and the eyes are deeply recessed. Ears and dewlap are of normal size and the prepuce is not pendulous but more like that of the British breeds.

Like other Zebu breeds, it is tick and bloat resistant and has an ability to do well under harsh conditions. The tick resistance of the Africander is not quite as good as that of the Brahman.

Africanders have an extremely good temperament and this, as well as their high fertility and ability to handle severe conditions, tend to favour this breed for the arid and semi-arid regions of Queensland.

It has good reproductive performance and tends to be more fertile than other Zebu breeds. Under tropical conditions, Africander cows are superior milk producers to British breeds and raise good quality calves.

Belmont Red

ORIGIN

This breed is a by-product of the research programme of the CSIRO Division of Animal Production at the Tropical Cattle Research Centre, Rockhampton.

The original research programme was not designed to develop a new breed but to compare the performance of Brahman cross, Africander cross and British breed genotypes in a tropical environment. However, once the advantages of the Africander genotype were seen, it would have been a waste of resources not to capitalize on its particular attributes and release it to the industry. The



Belmont Red

Belmont Red is normally one-half Africander, one-quarter Hereford and one-quarter Shorthorn.

The original research programme was developed by and came under the control of Dr J. M. Rendel. The programme got underway in 1954 when the first crossbred animals were produced.

First cross animals were produced from 1954 to 1960. From 1957 to 1964, first cross animals were crossed to produce a second generation of one-half Africander, one-quarter Hereford and one-quarter Shorthorn. These were then crossed to produce the third generation which were selected objectively for growth rate and resistance to ticks. By 1968, the first sale of Belmont Red bulls took place when eight bulls were sold at auction.

DEVELOPMENT IN AUSTRALIA

Since the first release of stock to the public in 1968, numerous sales have released additional stock and studs have developed in different regions. In 1972, Belmont Red bulls were used as part of a co-operative programme to evaluate the breed in different environments on private properties. At present, about 10 properties located in various parts of Queensland, N.S.W. and W.A. are involved in this evaluation programme.

Stud breeders of Belmont Reds register their stock in the C Appendix of the Australian Africander Belmont Red Association. The main methods for developing the breed are:

- By grading up from any base cow herd through three generations of mating to Belmont Red bulls. The fourth calf drop can be registered as Belmont Reds.
- Through using purebred Africander bulls over any base cows to produce halfbred progeny. These progeny are graded up to Belmont Reds through two generations of mating to Belmont Red bulls.

For registration purposes, herds breeding bulls are required to adopt a performance recording system approved by the Society. All bulls produced have to be rated on their growth rate so their performance can be compared with group averages.

At the present time, there are about 30 stud herds breeding Belmont Reds or in the grading-up stage.

BREED CHARACTERISTICS

Though no selection was practised for colour, Belmont Reds are predominantly red with some stock having white patches. They are either polled or horned, have a sleek coat and a hump similar to the Africander.

Other conformation characteristics reflect the combination of Africander and British breed origins.

Research at 'Belmont' compares the performance of Belmont Reds with Brahman cross British cattle, representing the Brahman-based tropical breeds and British breeds. These comparisons show the Belmont Red is well adapted to the tropical environment, with high parasite resistance and low maintenance requirements giving high survival rates.

In environmental adaption, it is superior to British breeds but not quite as good as the Brahman-based breeds. Belmont Reds have a lower tolerance to worms which suggests that the breed may be better adapted to the drier zones in the tropics.

Fertility levels of the Belmont Red in a tropical environment are superior to the Brahman-based breeds and the British breeds. This is a decided advantage and can more than compensate for disadvantages in other production traits.

Belmont Reds and Brahman-based breeds have better growth rates than British breeds in a tropical environment. The slightly better environmental adaption of the Brahman-based breeds means that these animals grow at a slightly better rate than the Belmont Reds, but the Belmont Reds are reducing this difference over time.

This is probably due to a higher selection intensity for weight for age and tick resistance in the Belmont

Reds which is made possible because higher fertility levels provide more stock for selection. If this trend continues, the Belmont Reds could be superior in growth in two or three generations.

Carcass data on the different breeds show that the Brahman-based breeds have higher dressing percentages than the Belmont Red and British breeds which have similar dressing percentages. However, in terms of trimmed meat in retail cuts, Belmont Reds had the highest (72%), with Brahman-based breeds and British breeds similar (70%). Yields of choice hindquarter cuts tended to favour the Belmont Red and British carcasses (30%) over the Brahman-based breeds (29%).

Belmont Reds have not got the nervous temperament of the Brahman-based breeds.

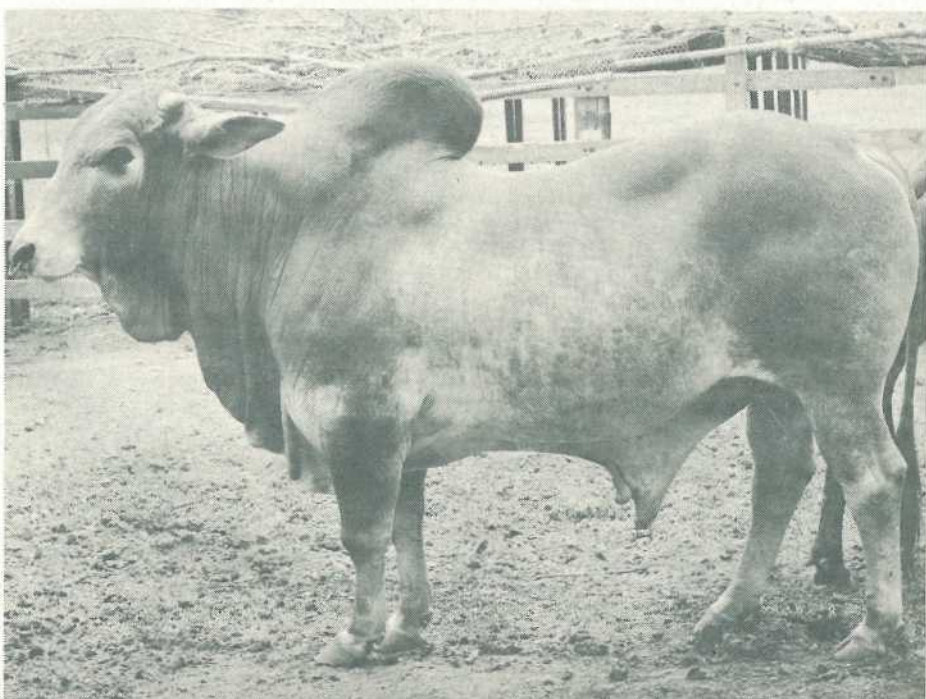
Sahiwal

ORIGIN

Sahiwal cattle originated in the dry central and southern areas of the Punjab in Pakistan. This breed has a rather well developed udder for a Zebu and, while it has good fleshing qualities, was used primarily as a dairy breed.

DEVELOPMENT IN AUSTRALIA

The need to import tropically-adapted cattle breeds grew from the work of Dr R. B. Kelly, of CSIRO. In a world tour, Dr Kelly investigated breeds of cattle that might be of value



Sahiwal

to the northern Australian cattle industry and listed 10 breeds as possibilities for importation.

Following this investigation, a group of Brahman and Africanders were first imported from the U.S.A. In the second project, a group of Sahiwal and Sindhi cattle were imported from Pakistan.

Because of quarantine regulations, the cattle from Pakistan were quarantined in Papua New Guinea before final importation into Australia. Two shipments were made to Port Moresby. The first consisting of four buffaloes, two Sindhis and four Sahiwals, arrived at the Jackson airport on 4 December 1952.

The second shipment of 11 head, including five Sindhis and six Sahiwals, arrived on 18 December 1952. These animals were a gift from the Government of Pakistan and were selected by Dr Kelly from Government and private herds. In selecting the Sahiwals, Dr Kelly chose beef-type animals but a proportion of dairy types were also selected.

On reaching New Guinea, the stock were transferred to specially constructed animal quarantine facilities at Kila Kila, a wartime airstrip, where the stock were to remain for 1 to 2 years. Eventually, 10 Sahiwals (five males and five females) and eight Red Sindhis (five males and three females) were transhipped to the tick-free CSIRO research station at

Badgery's Creek, N.S.W. This was done to avoid possible introductions of tick fever organisms. Progeny of these animals were eventually sent into the northern Australian States.

At the F. D. McMaster Field Station at Badgery's Creek, Sahiwals were used to develop the Australian Milking Zebu. The Queensland Department of Primary Industries also embarked on dairy crossbreeding experiments in the coastal and tableland areas with good results.

In Queensland, investigations into the beef production of Sahiwals were limited to CSIRO and Department of Primary Industries Research Stations until 1969. In 1969, the first large-scale public release of fullblood Sahiwals took place at Badgery's Creek and a breed society was formed. A second reduction sale took place in 1970.

At present, the number of Sahiwals throughout the country is relatively small. There are six studs in Queensland and two in New South Wales which have fullblood Sahiwals and some 35 other studs (mostly in Queensland) that have graded-up animals.

BREED CHARACTERISTICS

Sahiwals are not big cattle. Mature males in good condition are unlikely to weigh above 726 kg. However,

their bodies are long and deep with relatively short legs and well-developed eye muscles and thick, deep thighs. Colour varies from creamy-brown to reddish-dun or reddish-brown with varying amounts of white on the neck and underline. In males, the colour darkens towards the extremities which may be black. The coat is short and sleek, and in the male the hump and dewlap are quite large with the sheath not overpendulous.

The breed has the Zebu characteristics of tick and parasite resistance, bloat resistance and hardiness under unfavourable climatic conditions. They are the heaviest milkers of the Zebu breeds, and their crosses with European breeds exhibit a high degree of hybrid vigour (heterosis).

Charbray

ORIGIN

Charbrays were first developed in the U.S.A. in the late 1930s when cattlemen imported Charolais bulls from Mexico and crossed these with Brahman cows.

Australia had no Charolais until the lifting of the semen import ban in 1969. With the lifting of this ban, some Brahman breeders began experimenting with the infusion of Charolais blood. Some of the earliest breeders involved in these programmes were Messrs Hec Maynard



Charbray

of 'Greenfields', Jambin, Graham McCamley of 'Tartrus', Marlborough, Ted Kirk, 'Hazelton', Gayndah, and George Robertson of 'Birrablee', Ridgeland. These breeders commenced crossbreeding programmes in 1969.

Breeders involved in evaluation programmes were attempting to combine the growth potential of the Charolais with the environmental adaption of the Brahman. Results were promising and over time, a number of people began developing Charbray-type stock.

With developing interest in this breed, enthusiasts got together and finally launched the Charbray Society of Australia at a meeting in Brisbane during August, 1977. At this meeting it was agreed that purebred matings of Charolais and Brahman cattle would be recognized as Charbrays and that animals with one-quarter to three-quarters Brahman blood would be eligible for registration.

These limits were decided to allow for the development of strains that would be adapted to different Australian environments. In tropical areas, a high Brahman content is required, while in more temperate areas a lower Brahman content is probably more suitable.

DEVELOPMENT IN AUSTRALIA

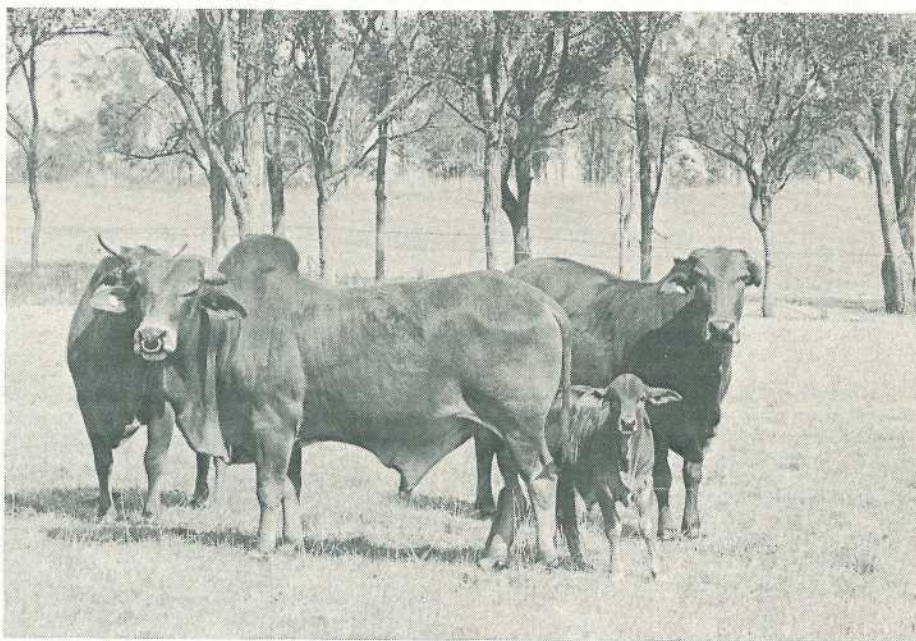
Since 1977, the popularity of the breed has increased and there are now 45 studs breeding Charbray cattle. These are located in quite different areas—extending from Yass and Bemboka in southern N.S.W. to Yungaburra and Tolga in north Queensland.

BREED CHARACTERISTICS

The Charbray with higher Brahman content has environmental adaption with tick and parasite resistance, high growth rates and good carcass quality. Cows have minimal calving problems, good mothering ability and good longevity.

The Charbray has a flesh-coloured, pigmented skin with a sleek silver-grey to creamy coat—reflecting the dominant coat characteristics of the Charolais. They have medium to large ears, either straight or drooped, and a slightly rounded rump. Males have a slight hump.

Charbrays have a large frame and large mature size typical of late-maturing breeds.



Red Sindhi

Red Sindhi

ORIGIN

As the name indicates, the Red Sindhi originated from the province of Sindhi where they were bred by migratory stock breeders. Because the country is so isolated, the breed has retained its purity and today it is one of the most distinctive Zebu breeds.

DEVELOPMENT IN AUSTRALIA

A total of five males and three females were imported with the Sahiwal and were given to the Australian Government by the Government of Pakistan. These animals were used by the CSIRO in dairy crossbreeding experiments and a group was later sold as a nucleus herd to the Queensland Agricultural College. The College is using these animals in both dairy and beef crossbreeding experiments.

A Breed Society was formed in 1969 and at the present time there are only two fullblood herds (one in Queensland and another in N.S.W.) and three other herds using fullblood sires (two in Queensland and one in N.S.W.). There are relatively few Red Sindhi cattle and good prices are being paid for any stock that come on the market.

BREED CHARACTERISTICS

The characteristic colour of the Red Sindhi is a deep, rich red. However, this can vary from a dun-yellow to almost dark brown. Males are darker than females and, when fully grown, the extremities may be almost black. A white mark on the forehead is permissible as is a sprinkling of white on the dewlap and

underbody. Pronounced patches of white or grey are held to indicate a mixture of blood.

The Red Sindhi is somewhat smaller and more active than the Sahiwal but has good fleshing qualities and is well-muscled with good hindquarters.

Development of the hump and dewlap is prominent in the males but less so in females. Red Sindhi cows are quite docile.

Red Sindhis are good foragers, are hardy and possess the Zebu resistance to ticks to a high degree. They are recognized more as a milk breed rather than a beef breed but, when crossed with British breeds, produce ideal beef types. The females are good mothers.

European breeds

Because most of the breeds in Continental Europe were originally developed for draught, or were evolved from breeds used for draught, European breeds are generally larger than the British breeds. They also mature later, have less fat, and grow faster under favourable conditions. The operative word here is favourable conditions. As purebreds under Australian conditions, they will need favourable conditions to give full expression to their genetic potential.

Generally, the European breeds tend to be bigger and heavier than both the British and tropical breeds, with the larger breeds averaging 1 150 kg and 725 kg for mature bulls and females, respectively. However, not all of these breeds have such heavy mature weights.

Interest in these breeds first developed during the beef boom in the early 1970s. Overseas breed comparisons had demonstrated the superior growth performance of these breeds. With good beef prices, entrepreneurs could afford the cost of imported semen and the extensive A.I. programmes. Breeding costs were high, but because of the live animal import ban, live animals attracted a scarcity price in a market prepared to pay dearly for live animals.

Almost a mania in demand developed for these breeds, but with the crash in beef prices, demand decreased and prices of both semen and livestock moderated. Interest in these breeds still continues, but their expansion in Australia appears to be restricted to the more intensive areas.

Their use in crossbreeding programmes appears to be quite extensive, particularly in producing dairy-beef and in crosses with Zebu types for the tropics. They also have an important role in new breed formation where the desirable attributes of two or more breeds are combined.

Charolais

ORIGIN

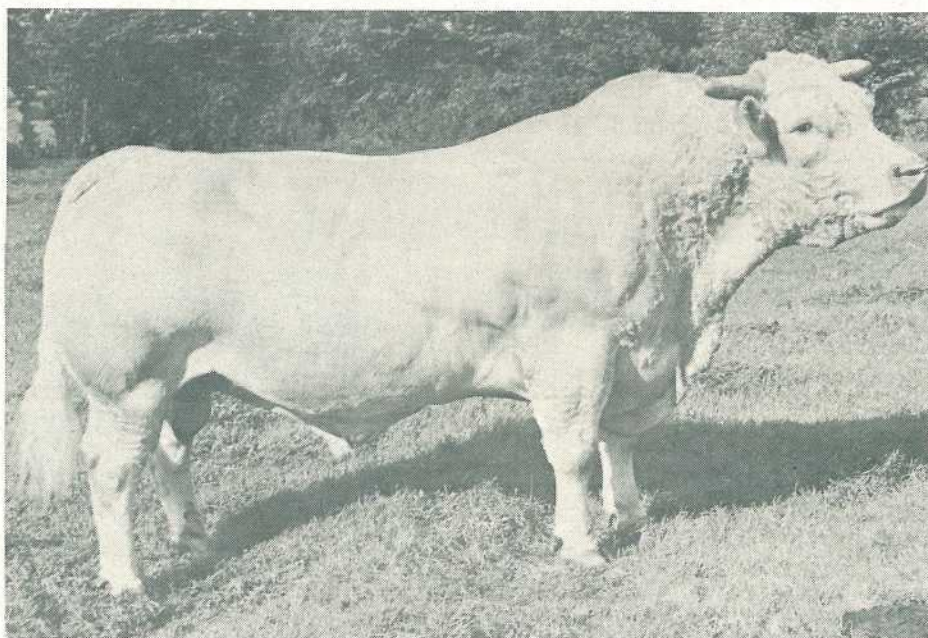
The Charolais is the most prominent breed of Continental Europe. The history of the Charolais dates back to the seventeenth century in the French province of Charolles and later the adjoining province of Nivernais.

Nineteenth century publications refer to the Charolais as a strain of the Jurassic breed of the Jura Mountains that lie between France and Switzerland. This strain was developed by France in the province of Charolles—where cattle had to perform a dual role of draught and meat.

However, as a breed, the Charolais was considered too heavy and not suited for draught and so were selected and kept primarily as beef producers. The breed society was founded in France in 1887, and today this breed is the second most numerous breed in France.

DEVELOPMENT IN AUSTRALIA

It is only in recent years that Australian breeders have become interested in using Charolais blood. This is because of the breed's increasing popularity in other countries and the reports of comparative performance studies in the U.S.A., U.K. and Europe.



Charolais

Until recently, quarantine regulations prohibited the importation of live animals, and the ban on semen imports from certain countries was lifted only in 1969. Since then, hundreds of thousands of doses of semen have been imported from the United Kingdom, Canada and New Zealand. Crossbred stock have been bred and numerous studs have been formed to grade up to pure Charolais. A breed society has been formed and at present more than 60 Queenslanders are involved in grading-up programmes.

BREED CHARACTERISTICS

Charolais cattle are white or cream in colour with flesh-coloured pigmentation of the skin and mucous membranes. They are horned, stoutly-built and rugged. The breed is noted for its large size, rapid weight gains and good carcass quality.

Calves are large at birth and calving difficulties are often linked with this. The extent of this is difficult to determine because of breed prejudices and the difficulties of interpreting overseas trial results.

The future expansion in the breed in Queensland is difficult to predict. It has a potential to make high growth rates in temperate environments. Its real future in Queensland appears to be in crossbreeding either with British or tropical breeds (but more particularly with tropical breeds) to give an animal more adapted to the environment.

Simmental

ORIGIN

The Simmental breed is found in many European countries and originated in the Simme Valley of Switzerland. It is one of the most popular dual purpose milk-beef breeds of Europe and probably the largest in number with more than 35 million head scattered over the Continent.

It is the major beef breed of eastern France, southern Germany, Czechoslovakia and Hungary. In Austria, Romania and Yugoslavia, it makes up about half the total cattle population. Significant numbers are also found in the U.S.S.R., Poland, Bulgaria and Italy.

In recent years, Simmentals were exported to the United Kingdom, Africa and the Americas, and this breed's popularity appears to be increasing in these countries.

DEVELOPMENT IN AUSTRALIA

Large quantities of Simmental semen were imported into Australia and many properties have programmes to develop purebred stock. Its future expansion is difficult to predict but, because of its markings, it could be favoured by Hereford breeders in crossbreeding programmes. When crossed with the Hereford, the progeny of the cross is markedly similar to the Hereford. There are approximately 90 studs in Queensland.



Simmental

BREED CHARACTERISTICS

The breed is a dual purpose type, larger than the British breeds, with a well-muscled body and an absence of excess subcutaneous fat.

The basic colour is creamy-tan to medium red with a white face and white markings on the legs, tail switch and underline. In Switzerland, the cream to tan colour predominates in most districts, but there is a trend to a red shade. The horns are of medium size and turn outwards and upwards in the cow but are straighter and less upturned in the bull.

The Simmental does not possess the double muscling gene that has been linked with large calves and difficult calving in the Charolais and

Maine-Anjou breeds. However, some calving difficulties have been reported.

Milk yields of recorded cows in Switzerland average 3 990 kg per lactation with 4 per cent butterfat. This is comparable with the average production of Friesians in Queensland. However, in Queensland, the Simmental is likely to give less milk. Along with good milk production, Simmentals have excellent fleshing qualities and produce calves with high weaning and yearling growth rates.

Limousin

ORIGIN

The Limousin is the second most important breed of Continental

Europe. The Limousin may have the same ancestors as the German and Austrian Yellow cattle. The breed was developed in south-central France first for draught and later for beef, but never for milk.

DEVELOPMENT IN AUSTRALIA

Large quantities of Limousin semen were imported into Australia, and the grading-up to purebreds is being undertaken on many properties. Its potential expansion as a pure breed tends to be limited to the more favourable areas, but its use in cross-breeding could be extensive. There are 20 studs in the State.

BREED CHARACTERISTICS

Limousin cattle are particularly hardy and, in the hilly region of their origin, display an ability to survive winters without housing. The hair colour is solid, rather reddish-tan with no white markings except on the udder. The extremities are a lighter shade, and there are often lighter rings around the eyes. The horns of the bull are out-thrust with a slight curve, while those of the cow bend forward without much upturn.

Limousins are large animals though somewhat smaller-boned than the Charolais. It is an excellent beef animal with a long body and high growth rate. This breed is currently gaining popularity in the U.S.A. and Canada where it is of particular importance as a vealer producer. The breed is also noted for the absence of calving difficulties that may be troublesome with some of the other larger breeds.



Limousin



Chianina

Chianina

ORIGIN

The Chianina is the largest breed of cattle in the world, and accounts for approximately 6 per cent of the total cattle population in Italy. It is named after the Chianina Valley in central Italy where it is considered to have originated. Although developed as a draught animal, the Chianina is now grown primarily for its meat which is of excellent texture.

Claims are made that the Chianina goes back to the ancient days of Rome where it was used as a sacrificial cow. In Italy, animal geneticists speculate that the breed is related to the *Bos indicus* cattle even though it does not exhibit the characteristic hump or excessive dewlap.

In 1932, the Italian Government assisted in promoting and improving the breed by sponsoring a herd book and a scientific approach to testing and selection. In recent years, the breed has been exported to countries in North and South America where it appears to be doing well.

DEVELOPMENT IN AUSTRALIA

Like the other European breeds, its introduction into Australia depended on semen imports. The expansion of the breed in this country is difficult to predict. Presently, some herds are grading up to purebreds and some are experimenting with Chianina and tropical breed crosses.

BREED CHARACTERISTICS

This is the largest of all breeds with bulls in good condition, but not fat, standing 1.8 m high at the withers and weighing up to 1 800 kg. Mature cows weigh up to 1 080 kg and stand 1.5 to 1.7 m high at the withers.

Both males and females are pure white, though the brush of the tail is frequently black. The skin has black pigmentations except for the underline. Calves are born tan in colour and gradually change to white at about 60 days of age. When crossed with other breeds, the white hair is usually recessive but the pigmented skin is dominant.

Breed comparison studies in Europe have indicated that in growth rate the Chianina is as good as or superior to any other European breed. It is an efficient converter, has high fertility and an absence of calving difficulties.

Milk production of dams is not as good as that of some of the milk-beef breeds but is sufficient to rear good calves.

Maine-Anjou

ORIGIN

Beginning round 1840, the Maine-Anjou breed was developed in Brittany through crossing Shorthorn bulls imported from Britain with the local red and white breed known as the Mancelle. This native breed was used for both draught and milk.

The original aim in crossing with the Shorthorn was to produce a better draught animal. The name is derived

from the provinces of Maine and Anjou where the cattle originated. Over time, the selection emphasis has shifted to produce a dual-purpose beef-milk type.

DEVELOPMENT IN AUSTRALIA

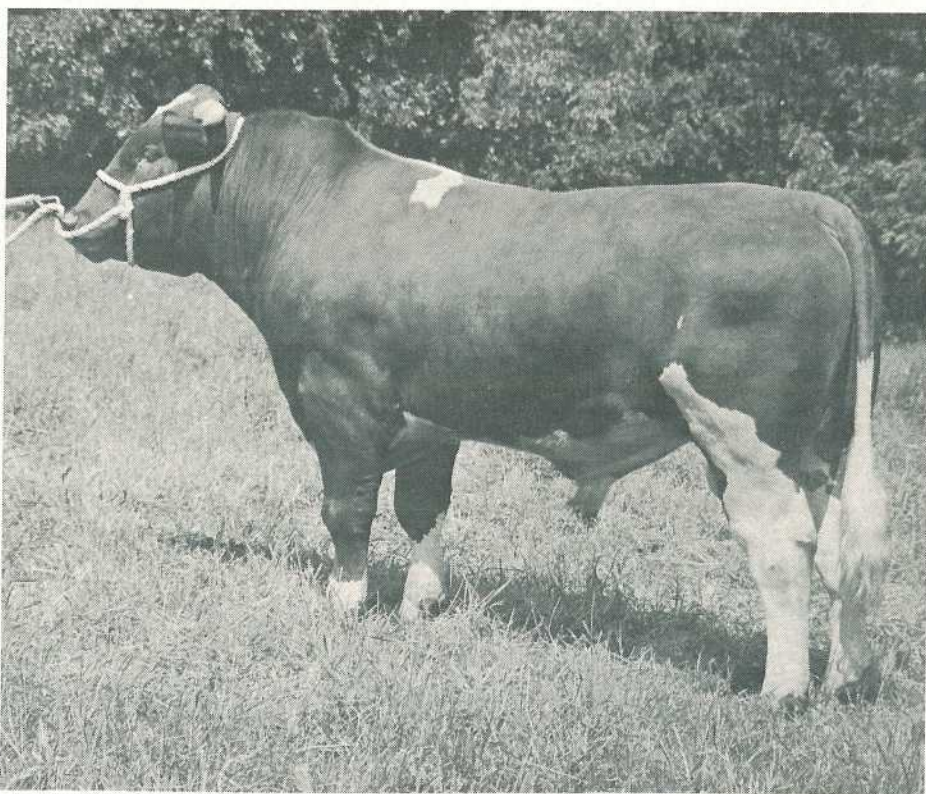
Semen has been imported, but the final distribution of this breed is difficult to predict.

BREED CHARACTERISTICS

This breed is probably the largest of all the French breeds with mature bulls weighing up to 1 360 kg and cows up to 900 kg. They are dual-purpose cattle with the emphasis on beef production.

Colours range from a solid red to red with some white markings to dark roans. They are a long, upstanding breed with moderate depth and a long rump. The skin is loose and of medium thickness and pigmented. Bone structure is not as heavy as in the Charolais.

Maine-Anjou cattle have a high growth rate and good carcass quality. It has been reported in the U.S.A. that some calving difficulties have followed the use of Maine-Anjou bulls.



Maine-Anjou



Blonde D'Aquitaine

Blonde D'Aquitaine

ORIGIN

Blonde D'Aquitaine is a French breed of comparatively recent origin formed by uniting two varieties of local cattle. In the 1920s, cattle in the Garonne Valley south-south-west of the Limousin area were known as the Garonnais, while those in the uplands which carried some Limousin blood were known as the Quercy breed. In 1961, these breeds were joined to form the Blonde D'Aquitaine.

DEVELOPMENT IN AUSTRALIA

Semen has been imported, but it is difficult to predict this breed's future expansion.

BREED CHARACTERISTICS

Blonde D'Aquitaine is one of the most thoroughly tested and selected breeds of France. It is wheat-coloured (yellow or yellow-brown) and of large size. It has high growth rates, good carcass qualities and an absence of calving difficulties.



Meuse-Rhine-Yssel (MRY)

Meuse-Rhine-Yssel (MRY)

ORIGIN

The Meuse-Rhine-Yssel (MRY) breed originated in the Netherlands but is found in most Western European countries. The breed probably shares its origin with the same ancestors as the Friesian which it almost equals in productivity.

DEVELOPMENT IN AUSTRALIA

Semen is being imported.

BREED CHARACTERISTICS

The colour is red patches on white, but the markings are not as sharply defined as those of the Friesian. The neck and shoulders are usually red and the face, if red, usually has a white streak extending from the forehead to the muzzle. Red over most of the body now predominates on most individuals. These cattle are horned.

Milk production of the MRV almost equals that of the Friesian, but the fat content is somewhat less and the MRV has a better beef conformation. It is a milk-beef type with more emphasis in selection standards on muscling.

German Yellow

ORIGIN

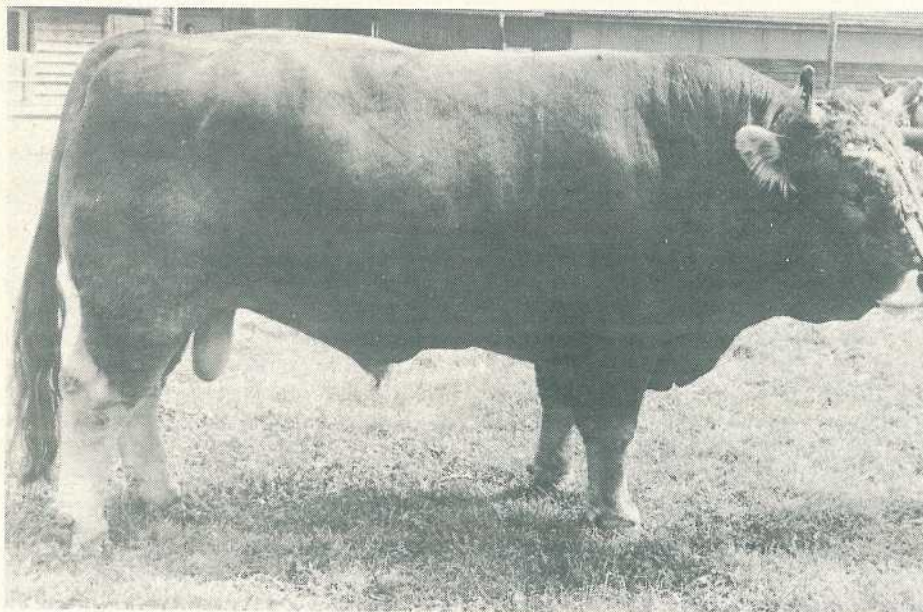
The German Yellow or Gelbvieh breed is similar in appearance to the Simmental and probably carries a fair proportion of Simmental blood. It is found in East and West Germany and Austria, with the largest concentrations in the south-western areas of the West German highlands near Wurzburg-Nuremberg.

DEVELOPMENT IN AUSTRALIA

Semen is being imported.

BREED CHARACTERISTICS

Colour varies from yellowish-tan to reddish-tan with lighter coloured rings around the eye. It is a dual purpose type having been selected for both milk and beef production with the greater emphasis on beef. The hindquarters are particularly well-developed, and stock have high growth rates and good milk production.



Brown Swiss

Brown Swiss

ORIGIN

The Brown Swiss appears to have developed simultaneously in the alpine regions of Switzerland, Germany and Austria. Due mainly to exports from Switzerland, this breed is more widely scattered over the world than any other continental European breed except the Friesian.

DEVELOPMENT IN AUSTRALIA

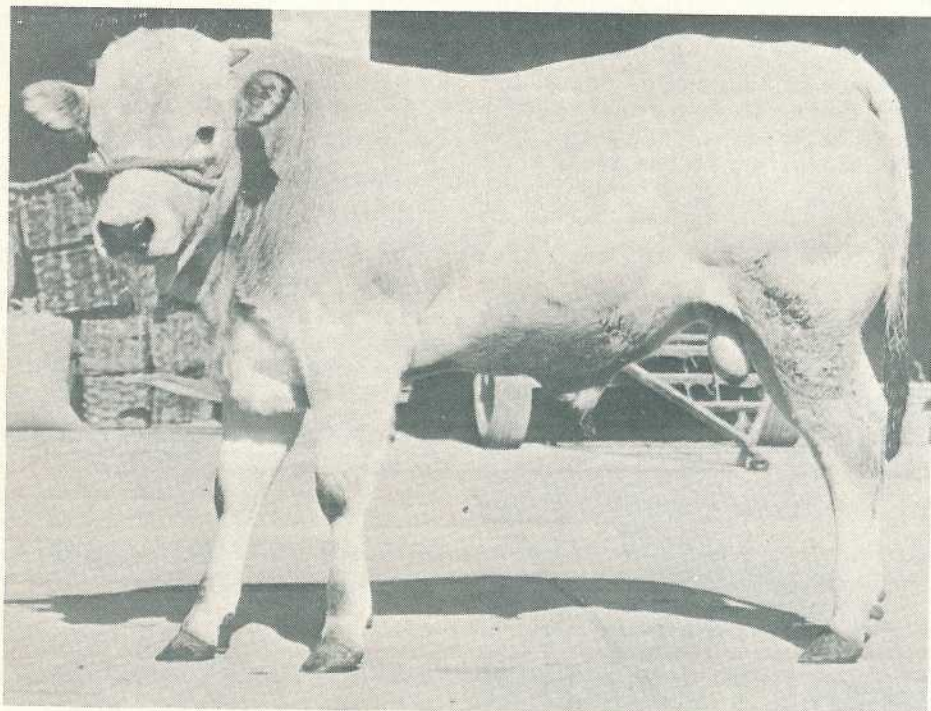
Semen is being imported.

BREED CHARACTERISTICS

It has a brown colour varying in shade from light grey to rather dark brown which is solid over the animal's body except for a lighter, nearly white colour on the udder and lower legs of some animals.

In some countries, it has been selected more for milk production, in others as a dual purpose breed, and it shows excellent response to both kinds of development. In the U.S.A., a milk-producing animal is preferred, but in Germany a milk-beef animal is usually selected.

As the breed now exists in Switzerland, mature bulls average about 950 kg and cows 600 kg. Milk production of recorded cows averages around 3 625 kg with a fat content slightly less than 4 per cent.



Piedmont

Piedmont

ORIGIN

The Piedmont is a native of Italy and was developed as a draught animal in the upper Po Valley. It was also used to supply milk. Over time, the emphasis has moved towards a milk-beef type of animal.

DEVELOPMENT IN AUSTRALIA

Semen is being imported.

BREED CHARACTERISTICS

Colour is a solid, creamy, light grey which blends to a much darker shade on the shoulders of males. Bulls also usually have a characteristic black patch around the eyes, and both sexes have a black tail brush and medium-sized horns. This breed is well-muscled, heavy-boned and produces a carcass of good quality.

The Mirbelias of South-eastern Queensland

by Beryl A. Lebler, formerly of Botany Branch

The first collection of seeds from Australia was sent to London in the latter part of the eighteenth century. Among the plants raised from these seeds was one with bluish-purple pea-flowers.

It was given the name *Mirbelia* in honour of C. F. B. Mirbel, a contemporary French botanist.

Mirbelias are always small, woody shrubs or undershrubs with simple leaves. Some are erect and bushy while others have slender ascending stems less than 0.5 m high. In most species, the leaves are arranged in whorls of three, but some have leaves which are alternate and scattered. Some Western Australian species have pungent-pointed lobes or teeth on the leaf margins. In Queensland mirbelias, the leaves are always entire with recurved margins.

The flowers are either solitary or clustered in the leaf axils or are in axillary or terminal racemes. In other States, mirbelia flowers can be blue, bluish-purple, purple-red, yellow and red, yellow or orange. In South-Eastern Queensland, the colours found are deep pink to purple, bright purplish-blue, or orange-yellow.

Mirbelia flowers are typical pea flowers with five sepals joined together to form a calyx tube, five petals, 10 free stamens and a sessile or stipitate ovary which ends in a short incurved style. The pod is ovoid or oblong and is swollen. Both dorsal and ventral margins are inflexed so that the pod becomes divided longitudinally into two cells. This is the character which distinguishes mirbelias from other pea flowers.

Mirbelias are found only in Australia, with the largest number of species in Western Australia. In South-Eastern Queensland, three species are found: *Mirbelia pungens*, *M. rubiifolia* and *M. speciosa* subsp. *ringrosei*.

Mirbelia pungens

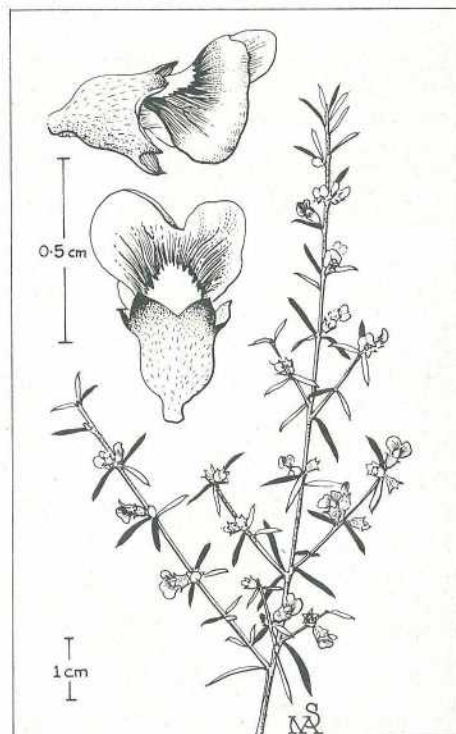
Allan Cunningham found this plant at Cox's River in the Blue Mountains in New South Wales and gave it the name *pungens* which means ending in a hard, sharp point. It describes the tips of the leaves.

DESCRIPTION. This is a multi-stemmed shrub to 0.3 m high with slender ascending branches and scattered leaves, often in irregular whorls. They are dark green, narrow-linear, about 0.8 cm long, sessile and stiff and end in a pungent point 0.1 cm long.

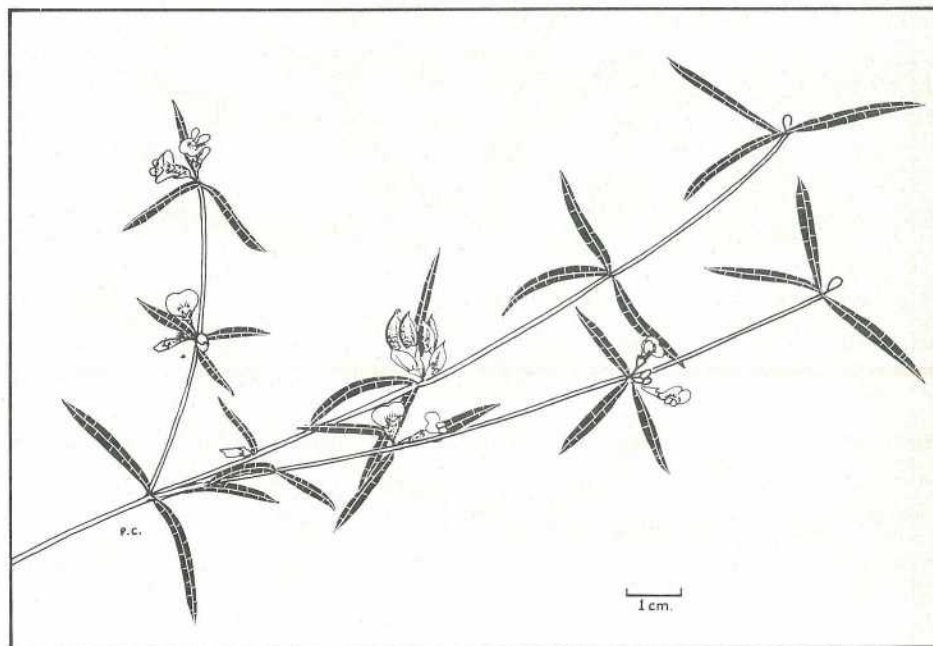
The flowers are axillary and usually solitary but occasionally in pairs. They are on such short pedicels that they appear to be sessile. The calyx teeth are about one-third the length of the calyx and minute hairs are scattered over the outer surface. A purple flush sometimes covers the calyx lobes. The standard is about 0.5 cm long and as wide. It is orange-yellow with a wine red arc at the base, and is reflexed, spreading and emarginate. The wings and keel are wine red. The pod is ovoid, a little more than 0.5 cm long and is hairy.

FLOWERING TIME. It flowers early in springtime.

HABITAT. This plant is found in open eucalyptus forest on rocky mountain slopes.



Mirbelia pungens



Mirbelia rubiifolia

DISTRIBUTION. It grows only in New South Wales and Queensland from as far south as Braidwood, west of Bateman's Bay, to as far north as Isla Gorge, Nathan Gorge and the Blackdown Tableland in central Queensland. In south Queensland, it is found as far west as Chinchilla.

Mirbelia rubiifolia

In 1804 when this plant was incorrectly described as a *Pultenaea*, it was called madder-leaved *Pultenaea*. Madder was a well known cultivated plant *Rubia tinctorum*. Like madder, this Australian plant had rather stiff, prickly leaves arranged in whorls. It was this character which provided the specific epithet. In the following year, the

new genus *Mirbelia* was described from this plant and the generic name was altered to *Mirbelia*.

DESCRIPTION. This is an under-shrub about 0.5 m high. The branches are angular and slender but firm. They come from a common root stock and may be prostrate, procumbent or twine around or sprawl over surrounding vegetation. Although occasional pairs of opposite leaves can be found, they are usually arranged in whorls of three.

They are just under 2 cm long, dark green and glossy on the upper surface and paler beneath. The midrib is pale green, and the pale green lateral veins show clearly as widely-spaced transverse lines joining the midrib to the leaf margin.

The leaf is slightly concave and ends in a pointed tip which is more or less pungent.

The flowers are axillary, usually in pairs and on pedicels 0.25 cm long. Very short, closely appressed, white hairs are scattered over the peduncles and calyx tube. The calyx is two-lobed with two broad teeth united for about half their length forming the upper lobe. The inner edge of the free portion of the lobe is curved and the outer edge is straight. The lower lip is made up of three acute shorter teeth.

The corolla is 0.6 cm from the base to the tip of the keel. The standard curves up but is not abruptly reflexed. It is 0.5 cm wide and 0.3 cm deep. The claw is green and a green oblong blotch extends from its end up into the standard. Lines deeper in tone than the colour of the standard radiate from the green blotch halfway to the edge of the standard. Young fruits are green and swollen, almost 0.6 cm long and 0.3 cm across. They are grooved along the upper surface. Mature fruits are brown.

FLOWERING TIME. This plant flowers from late winter to early spring.

HABITAT. It grows on sandy soil in wallum flats or on rocky slopes in open eucalyptus forests.

DISTRIBUTION. It is found on the coastal lowlands from as far south as the Clyde River in New South Wales to as far north as Fraser Island in Queensland. It has also been found on the Blackdown Tableland, in central Queensland and the Girraween National Park on the Darling Downs.

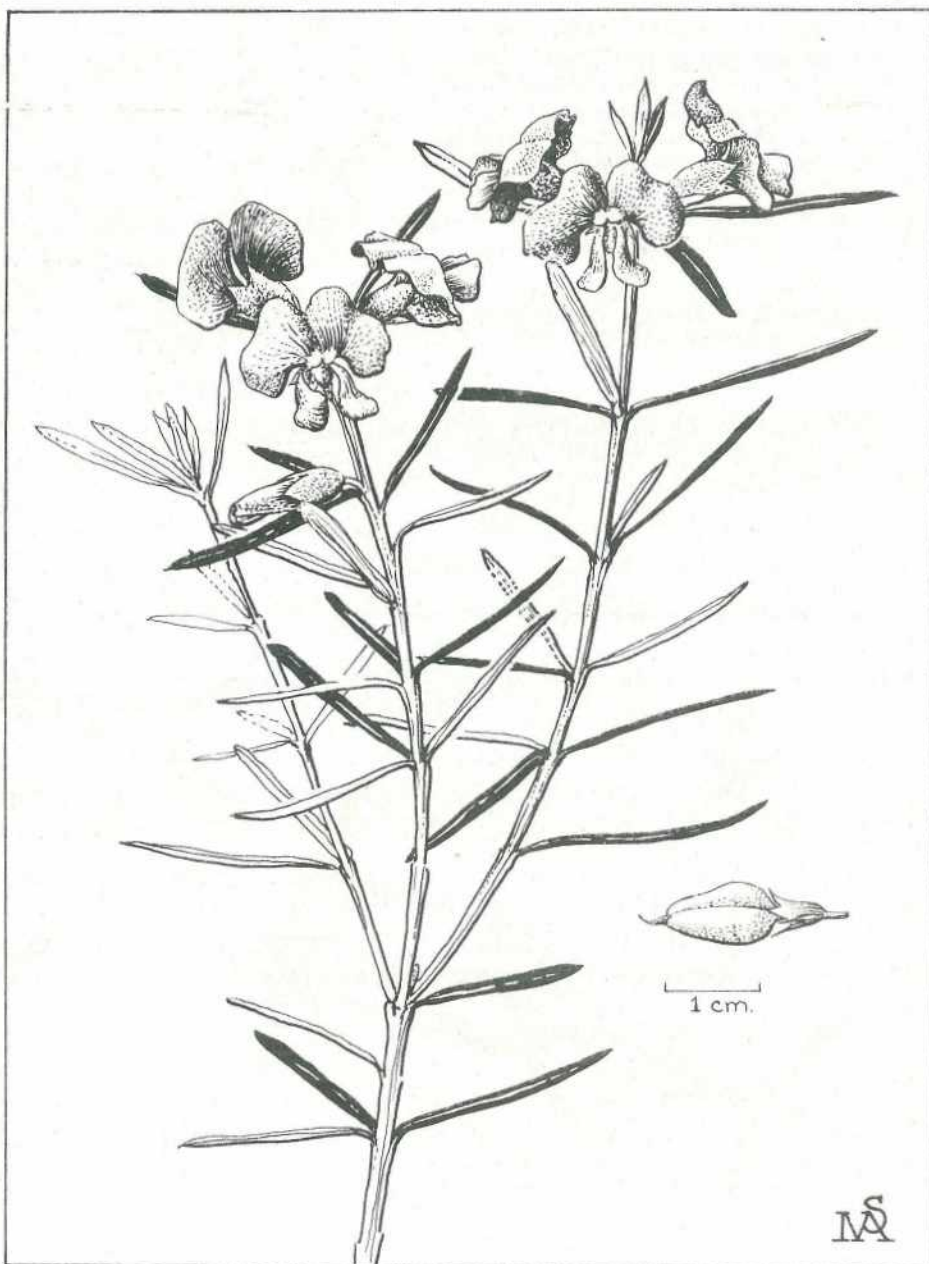
GENERAL REMARKS. This plant has been brought into cultivation.

Mountain *Mirbelia*. *Mirbelia speciosa* subsp. *ringrosei*

The latin adjective *speciosa* means showy and is a very apt description of this plant with its profuse, richly-coloured flowers.

The subspecific epithet is named after P. C. Ringrose who first collected this plant in 1905 from the ranges between Irvinebank and Watsonville in North Queensland.

DESCRIPTION. This is an erect diffuse shrub which can grow to 1 m in height but is often smaller. The branches and twigs are angular and the leaves are arranged in whorls of



Mirbelia speciosa subsp. *ringrosei*

three, each whorl being about 3 cm from the next. The leaves are narrow-linear, up to 4 cm long and 0.2 wide. They are firm in texture, dark green on the upper surface and paler beneath. The margins are strongly revolute and the midrib shows as a sunken line on the upper surface and a raised ridge beneath. It is produced beyond the end of the leaf to form a short, blunt mucro.

The flowers are solitary in the axils of the leaves on pedicels less than 0.2 cm long. The calyx is 0.7 cm long and two-lipped with two narrow, pointed green bracteoles slightly larger than the calyx tube attached immediately beneath the calyx. These are easily seen with the naked eye. Appressed white hairs cover the peduncle and calyx.

The corolla is a rich shade of violet and is 1 cm long. The emarginate, recurved and spreading standard is more than 1 cm across. The claw is green and a yellowish-green heart-shaped patch at the end of the claw is surrounded by a darker shade of violet. The wings are almost 0.5 cm wide at the truncated tips and are more than twice as long as the keel.

The fruit is glabrous, black, ovoid and swollen, and is flattened on the bottom and top. It splits at the tip and opens down the centre line and across the tip to release two ovoid seeds.

FLOWERING TIME. It flowers from midwinter to the middle of spring.

HABITAT. It grows on sandy soil in open eucalyptus forest or on mulch in the crevices in granite boulders.

DISTRIBUTION. It is found only in Queensland from a few widely separated areas—from Herberton and Mt.

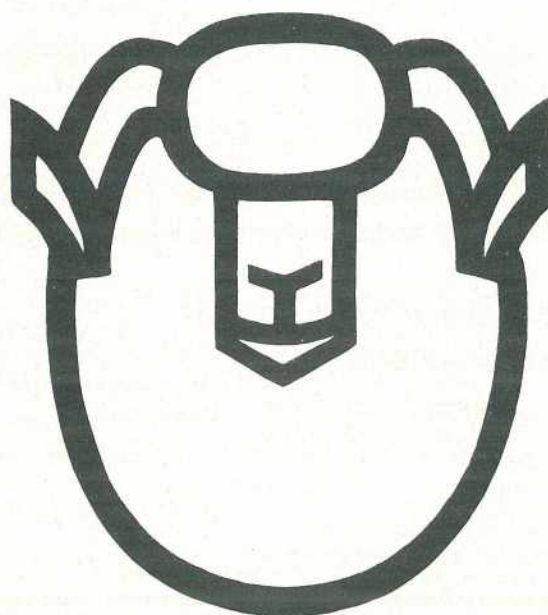
Windsor in the north, the Blackdown Tableland and Carnarvon Ranges in central Queensland and in South-Eastern Queensland from Crow's Nest and the hills north of Helidon.

GENERAL REMARKS. This is a most attractive plant worthy of cultivation. It has been grown in home gardens by scarifying the seeds and planting them in their permanent positions. These plants survived for 3 or 4 years when replacement was necessary. A white-flowered form has also been found in the Helidon Hills.

Field key to the *Mirbelias* in South-eastern Queensland

- | | | |
|---|---|---|
| 1. Leaves mostly in whorls of three, oblong-linear or narrow-linear. Leaflets not pungent. | 2 | |
| Leaves mostly alternate, linear, rigid and pungent. Flowers orange-yellow, with dark wings and keel ... | | <i>Mirbelia pungens</i> |
| 2. Upper surface of leaf strongly reticulate. Flowers deep pink to dark purple or cerise | | <i>Mirbelia rubiifolia</i> |
| Upper surface of leaf smooth. Flowers reddish-purple or bluish-purple | | <i>Mirbelia speciosa</i>
subsp. <i>ringrosei</i> |

**SHEEP
SHEEP
SHEEP**



NEED BRAND RETURNS TOO!

Wheat varieties for Queensland—1981

compiled by J. F. Bourne, Agriculture Branch

Seven varieties are recommended in Queensland by the Department of Primary Industries for 1981. The recommendations are based on agronomic, disease resistance and quality characteristics.

DISTRICT GUIDE TO RECOMMENDED VARIETIES AND PLANTING RECORDS

(To be used in conjunction with the text and map)

District	Region	Varieties in order of preference within each planting period	Planting Period (approx. weeks)															
			APRIL				MAY				JUNE				JULY			
			1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
1	Central Highlands	Oxley Cook, Banks, Kite Gatcher, Songlen	X	X	X		X	X			X	X						
2	Dawson-Callide and North Burnett	*Oxley Cook, Banks, Kite Songlen, Gatcher		X	X		X				X	X						
3	Western Downs and Maranoa	Oxley Cook, Banks, Kite Gatcher, Songlen			X		X	X	X		X	X	X	X		X		
4	South-west	Oxley Cook, Banks, Kite Songlen, Gatcher			X		X	X	X		X	X	X	X		X		
5	Subcoastal	Shortim Cook, Kite, Banks Songlen, Gatcher					X	X	X	X	X	X						
6	Northern Darling Downs and South Burnett	*Oxley, Shortim Cook, Kite, Banks Songlen, Gatcher							X	X	X	X	X	X		X	X	
7	Central and Southern Darling Downs	*Oxley, Shortim Cook, Kite, Banks Songlen							X		X	X	X	X		X	X	X

* There is a high risk of stem rust damage on Oxley in this district.

Note: (a) Where there is an overlap of varieties for a certain planting period, choose the variety which has given proven results in your own area, or plant a combination of the recommended varieties.

(b) For district 6, the medium maturing group of Cook, Kite and Banks, is preferred from early June to mid-July.

Notes on varieties

Timgalen has been deleted from the recommendations due to lower yields in relation to the other varieties. It has also declined in popularity with growers.

Oxley is the preferred long-season variety in all areas, except the subcoastal districts. A risk of stem rust occurs in districts with favourable growing conditions.

Shortim is recommended only in districts with favourable growing conditions because of its very short straw.

The variety Banks has performed well in western areas and is now second choice among the middle group of varieties for those areas.

The varieties Kite, Banks, Cook and Shortim are recommended for irrigation.

It is advisable to grow a number of varieties to reduce the risk of disease affecting the whole crop.

Disease

Preliminary testing has indicated that all varieties are susceptible to yellow spot.

All current varieties recommended are resistant to flag smut.

Herbicides

To avoid crop injury, herbicides should be applied only in accordance with recommendations on the

manufacturers' labels. Cautionary notes are given in this article for Kite and Gatcher.

Variety characteristics

The varieties are listed in order of maturity, and their main features described. A table summarizing variety characteristics is included.

Shortim

Slow maturity, suited to early and main season planting; heavy tillering, very short straw, should be sown on good subsoil moisture and avoid rough ground; medium yield potential; awned heads; resistant to stem rust and crown rot, but moderately susceptible to leaf rust; PH grain

quality with medium protein; released by the University of Sydney in 1977.

Oxley

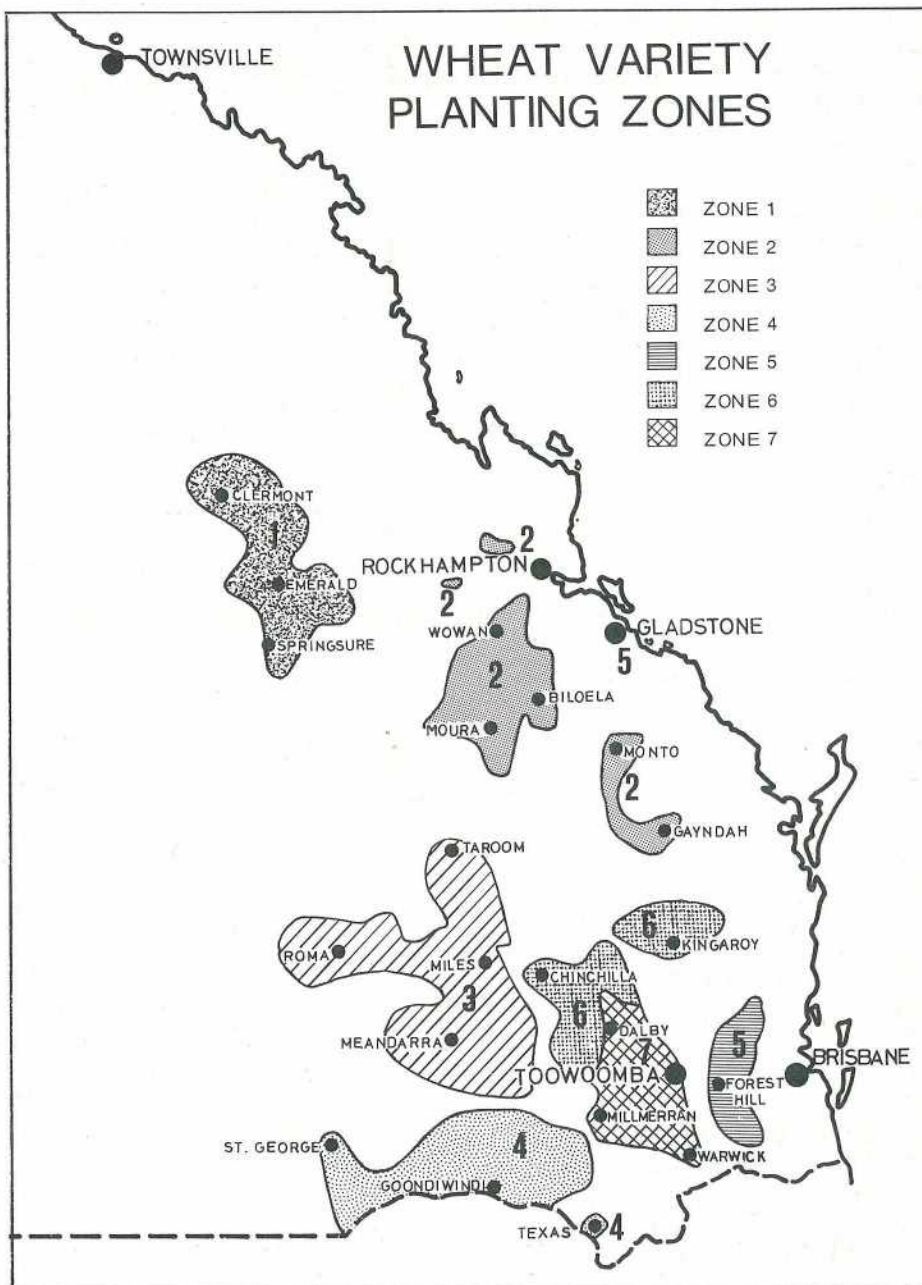
Medium maturity in central Queensland and western areas, where it is recommended for early planting; in colder areas, it becomes quicker-maturing and is recommended for main season planting; **LATE PLANTING SHOULD BE AVOIDED IN ALL DISTRICTS**; heavy tillering with medium straw height and good strength; high yield potential; awned heads; susceptible to the most common strain of stem rust and planting should be restricted, especially in wetter, rust-labile areas; even where recommended, growers should not plant more than 10% of their area to Oxley owing to the risk of stem rust; field resistance to leaf rust; very susceptible to crown rot and losses could occur where crown rot was present in the previous crop; PH grain quality; released by the University of Queensland and the Queensland Department of Primary Industries in 1974.

Cook

Quick to medium maturity, suited to main season planting in all areas; heavy tillering, producing fine straw, medium in height and moderately susceptible to lodging; high yield potential; awned heads, resistant to stem rust and crown rot, but moderately susceptible to leaf rust; PH grain quality; high test weight and some resistance to weathering; released by the Queensland Department of Primary Industries in 1977.

Kite

Quick maturity, suited to main season planting in all areas, can be slow to mature after heading; short, strong straw which is resistant to lodging and suitable for irrigation; high yield potential; awnless heads; sometimes difficult to thresh but satisfactory for grazing in the event of crop failure; some tolerance to ear frosting; flamprop methyl (Mataven) should be applied only between early and mid-tillering; apply difenzoquat (Avenge) only between the two and a-half and four leaf stages to avoid crop damage; resistant to stem rust but fully susceptible to leaf rust; IH grain quality classification only; the best resistance to grain weathering of all current varieties; released by the New South Wales Department of Agriculture in 1974.



Banks

Quick maturity; suited to main season plantings in most areas; straw of medium height and good strength; high yield potential, except on the finer black soils of the Darling Downs where its yield may be lower than Cook and Kite; awned heads; resistant to stem rust, although a few pustules may develop above the stalk nodes late in crop growth; resistant to leaf rust; susceptible to the leaf disease yellow spot which can develop from the carryover of infected stubble; very susceptible to crown rot; more susceptible to frost damage in early growth stages, so areas liable to heavy frost should be avoided; PH grain quality, but low protein; released by the Queensland Department of Primary Industries in 1979.

Songlen

Very quick maturity; suited to main season plantings in all areas; straw of medium height and strength but may lodge in dry conditions when secondary roots are not developed; medium yield potential; awned heads, resistant to stem rust, now susceptible to a strain of leaf rust; more susceptible to frost damage in the early growth stages; in some seasons dark pigmentation on ear and stem may develop-genetic black chaff; PH grain quality with high protein; released by the University of Sydney in 1976.

Gatcher

Very quick maturity; suited to main season and late planting, particularly in districts 1 and 3; straw

rather tall and susceptible to lodging; medium yield potential; awned heads, difenzoquat (Avenge) should be applied only between the two and

a-half and four leaf stages of the crop to avoid crop damage; moderately resistant to stem rust and susceptible to leaf rust; in some seasons may

develop genetic black chaff similar to Songlen; PH grain quality but medium to low protein, released by the University of Sydney in 1969.

WHEAT VARIETY CHARACTERISTICS—1981

Variety	Agronomy					
	Maturity	Yield potential	Height	Awns (beard) present	Resistance to lodging	Early grazing suitability
Shortim	slow	medium	v. short	yes	v. good	light
Oxley	medium	high	medium	yes	good	light
Cook	quick	high	medium	yes	medium	no
Kite	quick	high	short	no	v. good	no
Banks	quick	high	medium	yes	good	no
Songlen	v. quick	medium	medium	yes	medium	no
Gatcher	v. quick	medium	tall	yes	poor	no

Variety	Disease			Quality			
	Resistance to stem rust	Resistance to leaf rust	Resistance to crown rot	Grade	Test weight	Resistance to weathering	Protein %
Shortim	v. high	medium	high	PH	medium	nil	medium
Oxley	low	high	low	PH	medium	nil	medium
Cook	v. high	low	high	PH	high	small	medium
Kite	v. high	v. low	medium	IH	medium	medium	medium
Banks	high	high	low	PH	medium	nil	low
Songlen	v. high	medium	medium	PH	medium	nil	high
Gatcher	medium	v. low	medium	PH	medium	nil	low

For further information, consult your Shire Agricultural Extension Officer.



DON'T FORGET ME
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contact your local D.P.I. office for more information

Parthenium weed threatens Bowen Shire

By D. J. Holman, formerly of Agriculture Branch and I. J. Dale, Lands Department

Parthenium weed (*Parthenium hysterophorus*) has been a major problem in the Belyando Shire since 1973. Following good winter rains in that year, it appeared in large amounts along roadsides north of Clermont.

During the good seasons between 1974 and 1977, parthenium weed continued to spread. In some areas, it colonized cleared scrub country that had been unsuccessfully sown to grass. It also appeared along waterways or where the surface soil had been disturbed.

Parthenium in the Bowen Shire

In the Bowen Shire, there are several outbreaks of parthenium weed which need to be controlled before the weed becomes a major problem.

The Bowen Shire, an area of 21 000 km², is situated on the dry tropical coast of North Queensland. In the south-west it adjoins the Belyando Shire. The principal towns are Bowen and Collinsville.

The main area affected by parthenium weed in this Shire is around Mt. Coolon, some 200 km south-west of Bowen, where substantial development of brigalow (*Acacia harpophylla*) scrubs is currently occurring. There are, however, significant outbreaks in the Collinsville area, with one property experiencing a major outbreak and most properties reporting minor patches of weed.

What is parthenium weed and where is it found?

Parthenium weed is an erect annual that can grow up to 2 m high. It is a very branched plant, and has deeply lobed pale green leaves and masses of small white flowers. Parthenium plants are prolific seeders; once a dense stand is established, it is very difficult to control.

Most parthenium weed occurs on cleared scrub areas which originally supported blackwood (*Acacia argyrodendron*), gidgee (*A. cambagei*) or brigalow, or some combination of the three. All extensive infestations in

grazing land occur on heavy clay soils; less fertile soil types appear to be relatively safe from parthenium weed invasion.

In the Mt. Coolon area, 12 000 ha of brigalow scrub was cleared last year and 20 000 ha is scheduled to be cleared in the next 2 years. It is

important that measures be undertaken by cattle producers to minimize the risks of a massive parthenium outbreak.

In the Collinsville area, both developing and established pastures are at risk. Consequently, control techniques are being investigated.



Specimen plants of parthenium weed at different growth stages.



Roadsides and other disturbed areas are sources of parthenium weed seed.

How do I keep it out of my property?

In the south-western parts of the Bowen Shire, parthenium weed can frequently be found along roadsides, waterways, homesteads and other places that receive constant traffic from man, machines and animals.

Case studies in the Belyando Shire have shown that if parthenium weed has become dominant on cleared scrub areas, the reasons could be:

- stock were left on pulled scrub areas during the development phase.
- producers did not seed pulled areas with improved grass species.
- pulled scrub was not burnt for several years.

The presence of stock on freshly pulled country is the most consistent factor of infested areas.

Effective pasture establishment depends on many factors. The aim of the producer should be logical, quick development to get a good stand of grass. This involves the following features.

Careful programme planning

FINANCE AVAILABILITY—Budget for such costs as seed, fencing and watering points.

STOCK—Keep stock off pulled, unseeded country to allow a build-up of fuel for a good fire.

MANAGEMENT—Manage the developing area separately. This will allow strategic removal of stock to allow pasture spelling.

PRUDENCE—Unless a lease condition has to be met, do not develop too large an area at a time. This can be false economy if parthenium invades.

Fire

A good fire following a scrub pull can create an ash seedbed and may also kill parthenium seedlings. Full advantage of fire should be taken to get the best pasture establishment.

It is hard to get fuel for a fire once parthenium has invaded; consequently, it is important that the initial burn is successful. A hot scrub burn will also kill some of the trees which have regrown after pulling, thus reducing subsequent regrowth problems.

When the pasture is established, fire can be used as an additional management tool to allow flexibility in controlling the regrowth problem.

Seed and sowing

- Use a good ash or ploughed seedbed.
- Plant in December to allow for a maximum growing season.
- Plant at least 2 kg per ha of good quality seed.
- Use superphosphate on phosphate deficient soils.
- Use grass species that are recommended for the area—a mixture of Biloela, American and Gayndah buffels (*Cenchrus ciliaris*).

Grazing management

- Following seeding, keep stock off the area until the grass has seeded.

- Graze the pastures lightly over the first winter.
- Remove stock if possible after early storm rains, and allow the grass to seed again.
- Be careful of developing small areas within a big paddock. Stock may concentrate on these areas and overgraze the improved species.

There are a number of additional points which need to be considered if parthenium weed is to be kept out of a property. Parthenium weed can be carried by animals, machinery or waterways, and attention should be paid to these potential seed sources.

Animals

If cattle are brought in from parthenium weed infested areas, keep them in a holding paddock for at least 48 hours. Infestations in the holding paddock are far easier to control than in pasture situations.

Vehicles and machinery

Be aware of from where vehicles have come. Particular attention should be paid to scrub pullers from contaminated areas. It is a sound practice to wash vehicles and equipment that may be infested in the same spot.

Waterways

These are probably the hardest seed source to control. Regular patrolling, particularly after floods, with spot spraying of plants, is the only control method available at present.

A possible defence strategy which is currently being investigated involves the sowing of vigorous, stoloniferous grass species along the banks of waterways. Such species as Hatch creeping bluegrass (*Bothriochloa insculpta*), Pioneer or Callide Rhodes (*Chloris gayana*) and Indian bluegrass (*Bothriochloa pertusa*) are possible grasses to consider. Thick stands will prevent the establishment and spread of parthenium weed unless the sward is damaged by the flood.

Flooded country should not be stocked until the pasture has had time to recover from a flood. Not only do floods introduce the parthenium seed, but they will also kill out grasses. Pasture management is important.

How do I control it on my property?

Once parthenium weed invades an established pasture, careful management is required to maintain grass competition before the weed seriously reduces pasture productivity. In badly infested areas, fencing and complete destocking for one or more seasons may be necessary to allow pastures to recover, and also to prevent stock spreading seed from these infestations. Once the pasture has thickened, stocking rates have to be carefully adjusted to maintain grass dominance.

Where parthenium weed has become dominant and the grass component is restricted to scattered plants, rehabilitation depends on establishment of further grass seedlings.

It is necessary to reduce the parthenium weed density by use of chemicals or fire. The timing of the burn is important to remove one generation of parthenium seedlings and to improve the competitive position of grass seedlings. Fire will only produce beneficial results after the first storm rains when most of the parthenium weed seed has germinated. Fire at other times will give the competitive advantage to parthenium weed, particularly if the area is grazed after the fire.

Stock should not graze the burnt area during the growing season following the fire. One consideration

in the use of fire is that the grass plants present before the fire must be allowed to produce sufficient seed to cover the whole area. Techniques are being studied for establishing grass in areas where virtually no grass is present.

A possible management routine to decrease the competitive position of parthenium weed in an improved pasture situation is:

- Stock lightly over winter and then remove stock over the wet season. This will allow the grass to seed.
- Lightly graze the paddock over the next winter.
- Burn the paddock following early storm rains, and keep cattle out until the grass has seeded again.
- Lightly graze over the next winter.

Such a strategy has been very successful in the Clermont area. Land that was completely over-run with parthenium weed has been re-pastured by de-stocking and strategic burning. The country has gone from nearly 100% parthenium to nearly 100% buffel grass in a few seasons.

Chemical control

Atrazine at a rate of 8 L of flowable product per ha controls roadside infestations and operational areas around homesteads, yards and

access roads. Atrazine will give some residual control and, in roadside situations, two sprayings each year have been sufficient to control parthenium weed.

The chemical is taken up by the roots and, under dry conditions, slow knock-down may occur. In these situations, 2,4-D amine 50 per cent may be added to the spray mixture for more rapid results. The recommended rate for addition of 2,4-D amine is 8 L of the 50 per cent product per ha. Spraying of large areas of pasture would be expensive and unlikely to give sufficient returns to recoup costs.

Biological control

Studies on insect enemies of parthenium weed for possible biological control agents are currently centred in Brazil and Mexico. Two insects have been introduced to Australia and are presently in quarantine.

Results cannot be guaranteed with biological control and therefore all possible measures should be taken to prevent parthenium weed establishing on a property or to restrict its spread once it has established.

Conclusions

Parthenium is essentially a weed of disturbed situations and is mainly adapted to the more fertile, heavier-textured soils. Before it can invade such country, the grass sward must



Dense stand of parthenium weed and occasional buffel grass clumps established on cleared gidgee scrub.



Dense buffel grass on an area which has been rehabilitated from parthenium weed.

have been destroyed or seriously weakened by some means. Drought, flood, excessive traffic, scrub development or overgrazing are the prime agents of such damage.

Once parthenium has gained a foothold over large areas, stock management becomes the main means of restoring the protective grass sward. In early stages of reclamation from heavy infestations, exclusion of stock

may be necessary. Light stocking rates should then be used for some years. Drought complicates this process and normal light stocking may still be too heavy in dry years.

Care with development programmes and close attention to stocking pressure on susceptible soils can keep parthenium in check and reclaim infested areas.

Further reading

Further information on chemical spraying of parthenium weed is contained in the publication 'Parthenium weed and its control' prepared jointly by the Alan Fletcher Research Station and the Department of Primary Industries. This bulletin is available from local Shire Councils or D.P.I. offices.

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Pests of legumes

Compiled by officers of Entomology Branch

Bean fly (*Ophiomyia phaseoli* (Tryon))

The bean fly is shiny black and about 2.5 mm long. The females lay very small eggs into the upper side of the leaf, the sites being marked by punctures. The maggot eats its way along the leaf tissues into the leaf stalk and down into the lower stem where it pupates near the surface layers. During warm weather, the cycle from egg to egg takes about 3 weeks.

A severe attack on young plants may cause the plant to wilt and die. On older plants, the epidermis of the stem cracks open near ground level and adventitious roots can develop at or above the damaged section. The yield and vigour of the plant is reduced and damaged plants are susceptible to lodging and wind or mechanical damage.

Bean fly is important only during summer months and when successive planting of crops in an area allows large populations to build up. It is an infrequent problem on seedling navy beans in inland areas but is common in coastal areas on cowpeas grown for seed. Soybeans are rarely infested.

Bean podborer (*Maruca testulalis* Geyer)

Adults of the bean podborer are slim-bodied moths, with a wing span of approximately 25 mm. The forewings are yellowish-brown with several translucent spots while the hind wings are mostly devoid of scales except for the brownish fringes. They are active at night, sheltering within the plant canopy during the day.

Crops are invaded at the beginning of flowering. The larvae feed on the buds and flowers, and bore into the pods to eat the developing seeds. The flowers and pods are bound together by frass-covered webs produced by the larvae. Frass is frequently extruded as a plug from the hole made by the older larvae when it bores into a pod. The larvae grow to 18 mm in length and are yellowish-green with several rows of dark marks.

Navy beans and soybeans are two of the less preferred hosts but occasional serious outbreaks do occur. Cowpeas and mung grown for seed can be severely damaged.

Pests of legumes



Bean fly with egg-laying punctures on leaf (x10).



Damaged lower part of a stem with bean fly pupa in crack (left). Undamaged plant on the right.



Podborer in damaged pod (x6.5).



Young podborer feeding on bean flower (x6).