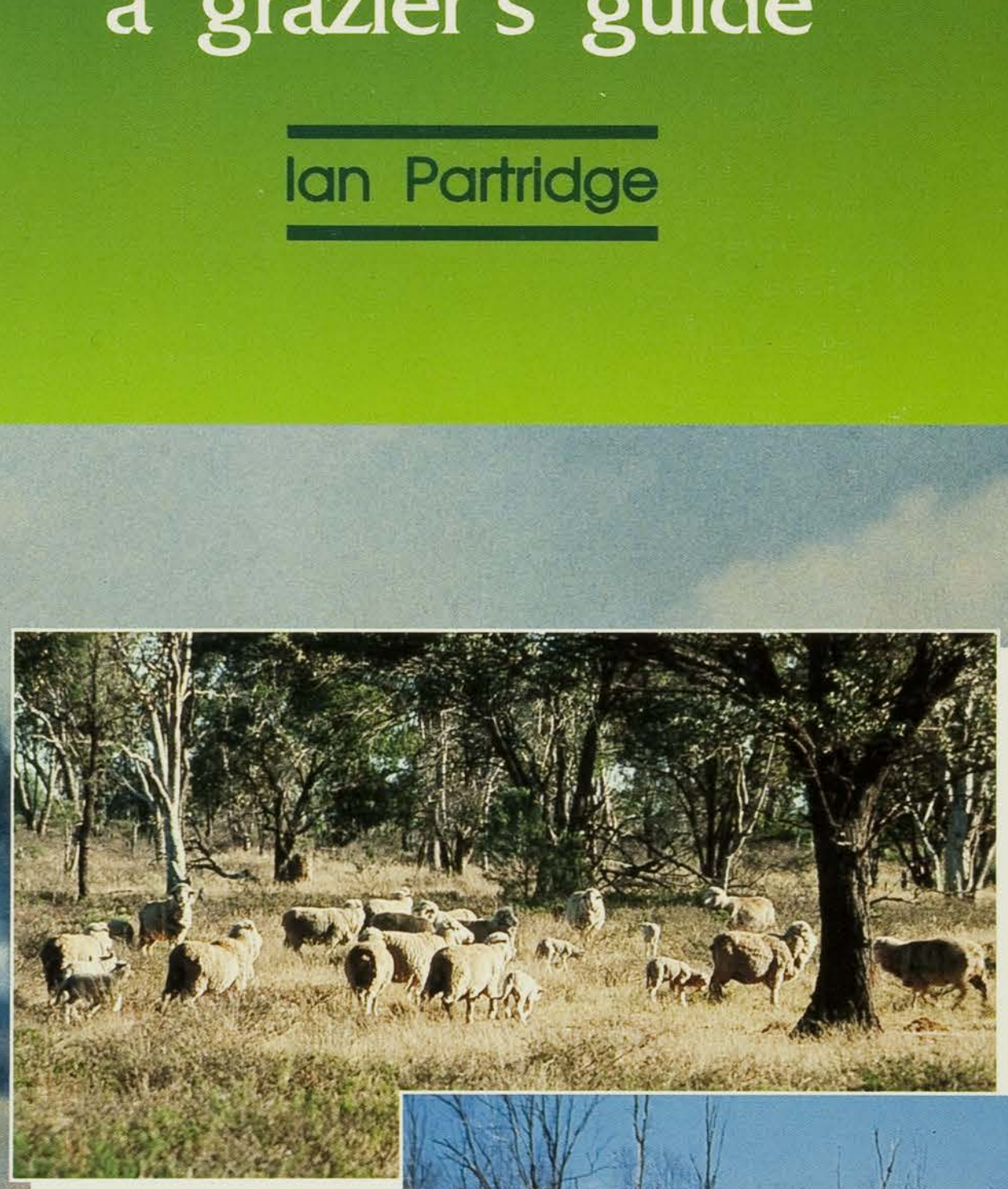
Information Series QI92009

Managing native pastures

a grazier's guide

Ian Partridge



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Department of Primary Industries
QUEENSLAND

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Foreword

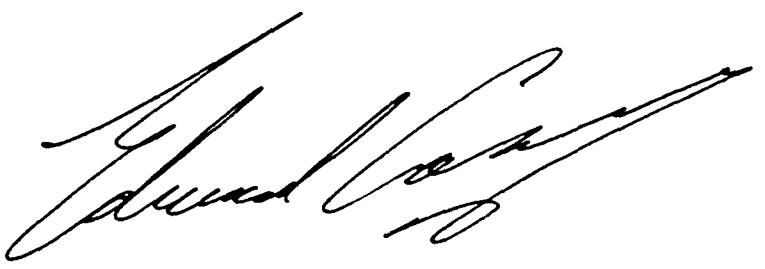
Native pastures feed most of Queensland's cattle and nearly all of its sheep. Native pastures cover nearly 90% of the area of Queensland, some 150 million hectares, and are one of the most precious resources we have for animal production.

They are a resource that we have to maintain in good condition for the future. Once degraded, they will be difficult to reclaim and this will be prohibitively expensive. Low costs are vital to ensure the economic strength of the wool and beef export industries.

Grazing management will remain the main tool available to graziers for maintaining and improving most of this land. Although much research effort has been put into the improvement or replacement of native pastures for the higher rainfall areas, these can be difficult to establish or maintain in more marginal climates.

The Queensland Department of Primary Industries has been studying the ecology of native pastures for many years but it is long-term work that must include our natural cycles of drought and flood. The results from this ongoing research are being used to formulate management recommendations for sustainable production from these grazing lands

This book on the principles of grazing management is written specifically for you, the grazier, to help you understand a highly complex biological system involving animals, plants, soils and climate. It is only through an understanding of causes and effects that you will be able to preserve the native pasture resource.



Edmund Casey, MLA
Minister for Primary Industries

Preface

This guide has been written for those who graze cattle and sheep on native pastures and who want to maintain or improve the condition of their land. In our extensive grazing areas it is rarely economical to sow seed or spread fertiliser; management has to be based on an ecological approach, that is, on an understanding of how the grazing animal and the pasture plants interact. This book ties together many separate facets of our knowledge so that grazing property managers, advisers and students have a better understanding of the whole issue of pasture management.

This volume is the first part of a series. It outlines the general principles of management for a wide range of native pastures, from subtropical coastal open woodlands to tropical semi-arid grassy downs.

The guide has been written for graziers with widely differing experiences and educational backgrounds; it aims for a balance between providing sufficient information for those with much experience or with a college education and too much detail so that it is left unread. I hope that the style will attract the casual reader who will flick through the guide, see a photograph, cartoon or heading and then start to read.

I do not mind whether you read this book fully in the comfort of an arm chair or, as has been suggested by my colleagues, as good dunny reading—a couple of paragraphs today, a few more tomorrow and so on with regularity. My only desire is that you do read it and that it helps you when you have to make those complex decisions that go into managing a grazing property for now and for the future.

The subsequent parts of the guide will have one edition for each type of native pasture community. They will be more like field manuals so that you can relate closely to what is happening in your paddock.

Acknowledgments

The basis for the information in this book has been the QDPI publication *Native Pastures in Queensland: the Resources and their Management* while many principles of range management have been gleaned from the CSIRO publication *Management of Australia's Rangelands*. I thank the editors of both, Bill Burrows, Joe Scanlan and Mal Rutherford, of the former and Graham Harrington, Allan Wilson and Mike Young, of the latter for permission to use their material.

I acknowledge the contribution to our knowledge of the management of native pastures by many members of the Pasture Management Branch of the QDPI. I have received numerous helpful suggestion and comments from officers at the following QDPI centres: Biloela, Brian Pastures Research Station, the Charleville Pastoral Laboratory, Charters Towers, Cloncurry, Emerald, the Arid Zone Research Institute at Longreach, Mareeba, Rockhampton, the Roma Research Station and Toowoomba. The officers may be too numerous to name but this should not detract from their individual assistance. Thank you all. I also thank the following QDPI officers for permission to view and use their photographic collections: Eric Anderson, Trevor Hall, Tony Pressland, Piet Filet, Ken Murphy, Russ Tyler, Richard Silcock, Errol Weston and Peter Johnston; also the Drought Research Unit of the QDPI and the Queensland Department of Environment and Heritage

I thank Sean Leahy of Kookaburra Productions for permission to reproduce one of his cartoons from the *Beyond the Black Stump* and Gordon Burridge for his line drawings.

Finally this book could not have been produced without the significant financial support from the National Soil Conservation Program.

National Soil Conservation Program

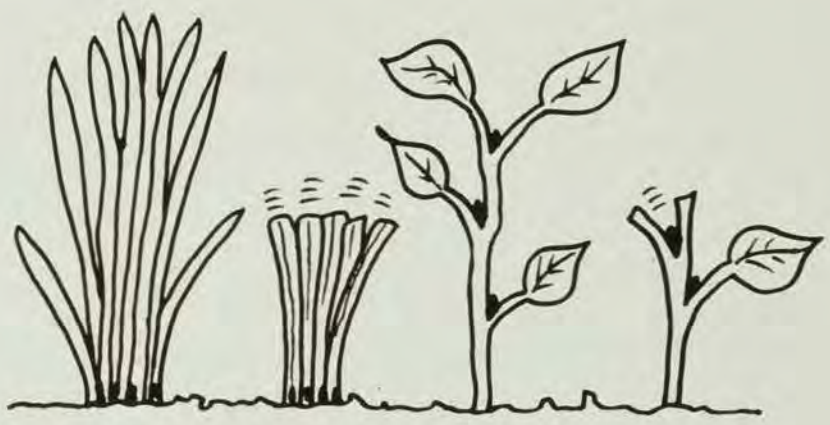
1 Grasses and grazing

The main plants in our native pastures of northern Australia are summer-growing tropical grasses which have evolved under conditions of light grazing and low, often variable, rainfall. There are also many broad-leaved species.

Grasses are nature's selection of plants that can tolerate grazing. Their growing points, at the base of each leaf, are not destroyed when the leaves are eaten. Our most important grasses are tussock species—mitchell grass, blue grasses, black spear grass—with each tussock made up of many separate shoots, or tillers.

Broad-leaved plants grow from the tips of their shoots and have to form new shoots when these are removed. Shrubs and trees are woody broad-leaved plants; the non-woody ones are called 'forbs'.

Cattle on native pasture may eat 20% forbs in their diet, sheep more than 30%. Forbs are often a good source of minerals but they are major weeds if unpalatable, poisonous or if they cause irritation. Native and naturalised legumes are forbs that provide higher protein feed.



▲ *After grazing, grasses keep growing from the base; forbs have to grow from new buds*

How long do grass plants live?

Ephemeral plants are short-lived, often germinating, flowering and seeding on one good fall of rain.

Annual plants live for one growing season only; they seed heavily, then die.

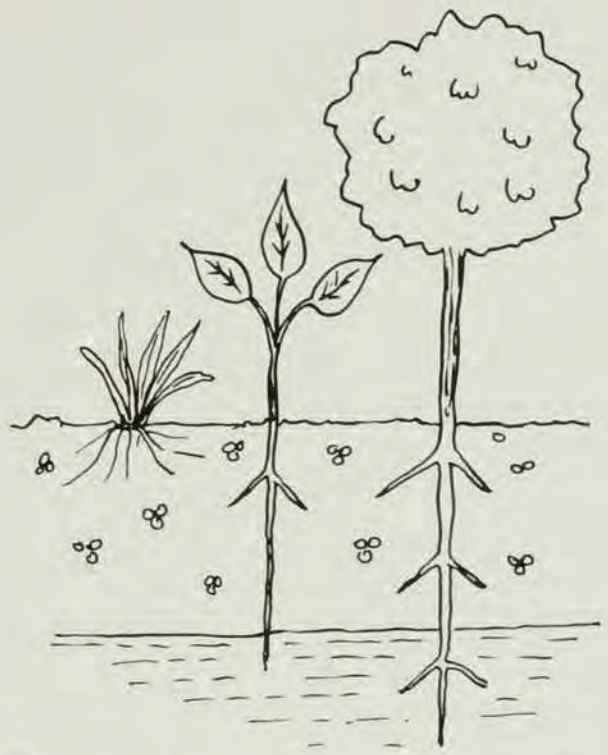
Perennial grasses have variable life-spans; queensland blue grass plants may live for less than four years whereas mitchell grass and black spear grass can live for decades. The individual tillers and roots may come and go but the tussock remains. All perennials must accumulate reserves of carbohydrate so they can send up new shoots after the winter.

Pastures containing perennial grasses are more stable under grazing.

▼ *Rainfall determines how much grass grows*

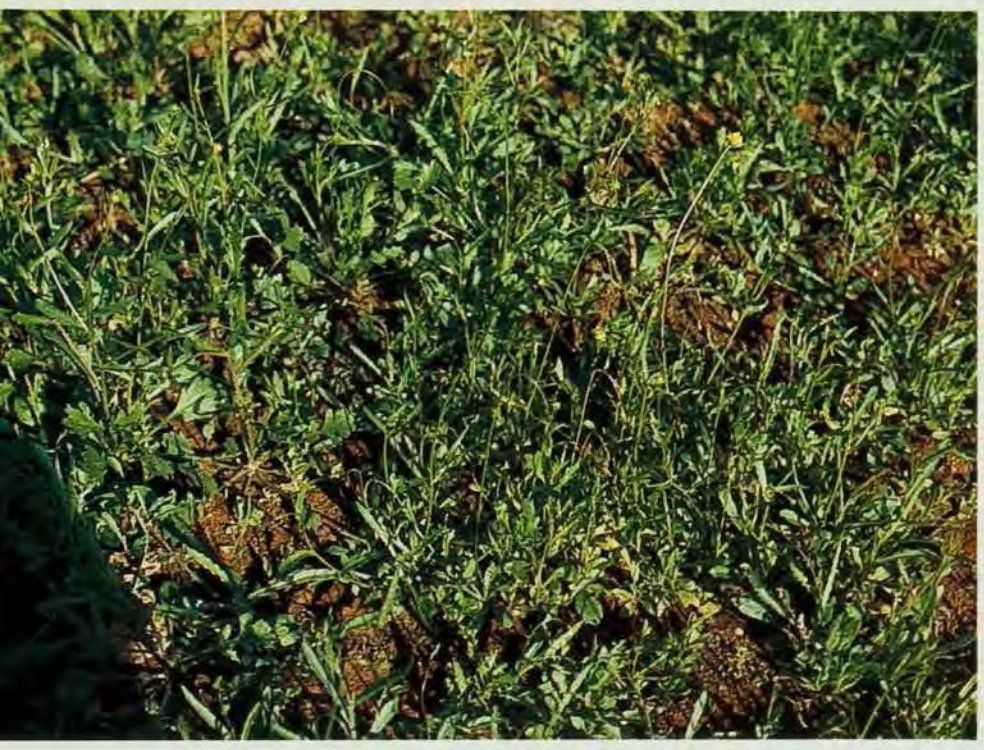
What controls grass growth?

Moisture in the soil has most influence on growth in the dry conditions of Queensland. Temperature and soil fertility (mainly the available nitrogen) only become important when the soil is moist.



▲ *Grasses are most effective with shallow moisture; forbs and shrubs can tap deeper*

▼ *Winter forbs are valuable sheep feed*



▲ *Dense trees greatly reduce grass growth*

► *Thin stands have less effect*

Which plants will grow best?

Although plants growing close together compete above ground for light, most of the competition occurs in the root zone and is for water.

The fibrous root system of grasses can extract water more effectively than the forb's single taproot but is usually more shallow. Thus grasses will win over forbs while the surface soil is moist but, as the depth to moist soil increases, deeper-rooted plants have the advantage.

After rain, established perennials produce new leaf more quickly than annuals starting from seed.

Does rain in different seasons affect pasture composition?

Tropical grasses produce over 80% of their annual growth during summer and so are favoured by summer rain. Late summer rain boosts their seed production but also encourages woody plant seeds to germinate.

Winter rains favour woody plants and forbs, including medics in southern regions.

What is the effect of trees and shrubs?

Trees and shrubs compete strongly with grasses for soil moisture even though they can draw water from different depths.

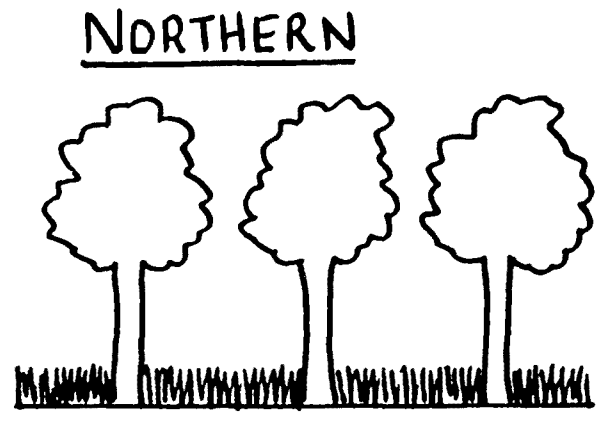
Woody plants may keep growing in winter because they are less affected by low temperatures and frosts and can tap water from a greater depth. Most Australian trees and shrubs are evergreen and can respond quickly to rain.

Is this tree effect different in the north?

There is a difference north of about Bowen (20°S). There competition for soil moisture becomes less important because

- the eucalypt tree density may be only one-third of that in the south
- heavy monsoonal rain gives enough water for both trees and grass in the wet, and none for either in the more severe dry.

Clearing trees benefits pasture growth in most summers in the subtropics but only in dry summers in the tropics.



▲ *Tree clearing has a smaller effect in the north*

Which grasses give the best ground cover?

Creeping species give better ground cover than tussock grasses under heavy grazing. The creeping stems are called stolons if above ground and rhizomes if below. Creeping grasses are often naturalised introductions.

When tussock grasses are heavily grazed, the number of tillers in each tussock is reduced, the tussocks become further apart and the amount of bare soil increases.

Under dry conditions, the tussock base and its roots remain to provide some resistance to erosion while creeping grasses, such as indian couch, may die back to widely spaced individual plants with little ground cover.

A healthy pasture protects the soil against erosion.

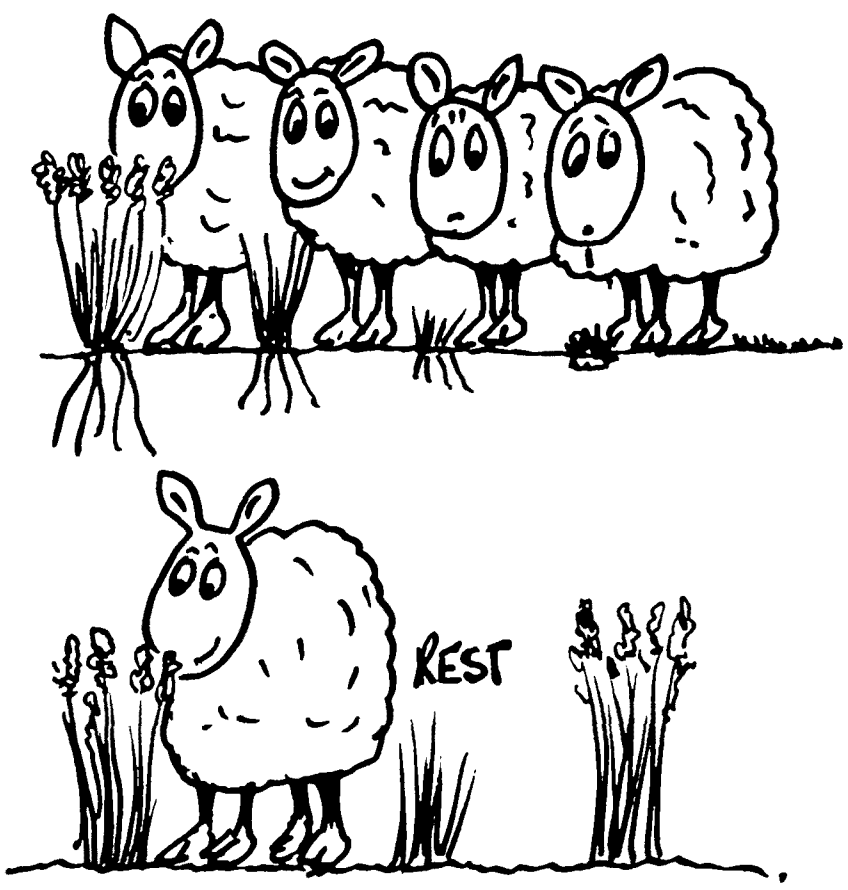
What happens to a grass when it is grazed?

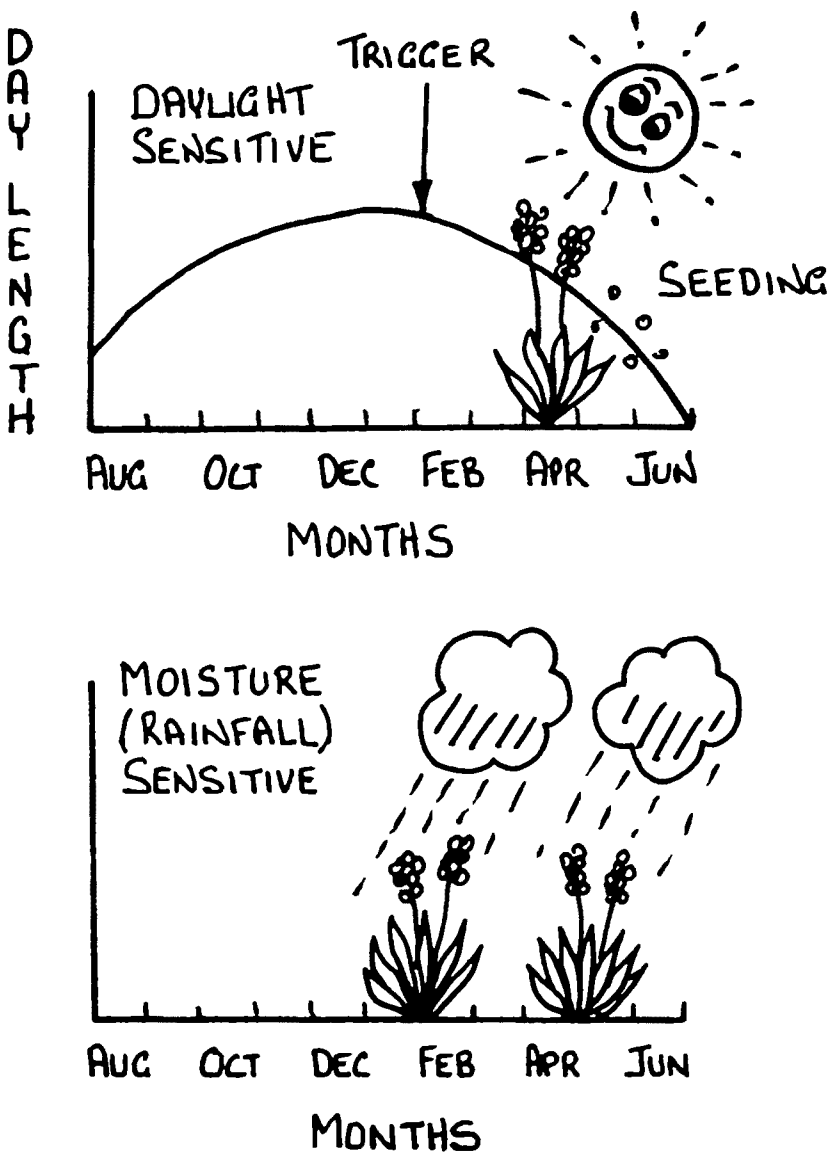
After the younger, active leaves have been eaten the plant grows more slowly for a time.

If the plant is grazed heavily and repeatedly, the old roots are not replaced because new leaves have first call on the reserves. The root system is reduced and the tussock gets smaller as tillers die and are not replaced. As the flower stems or heads are eaten, no seed is dropped. If the plant eventually dies, it cannot be replaced because there is no seed on the ground.

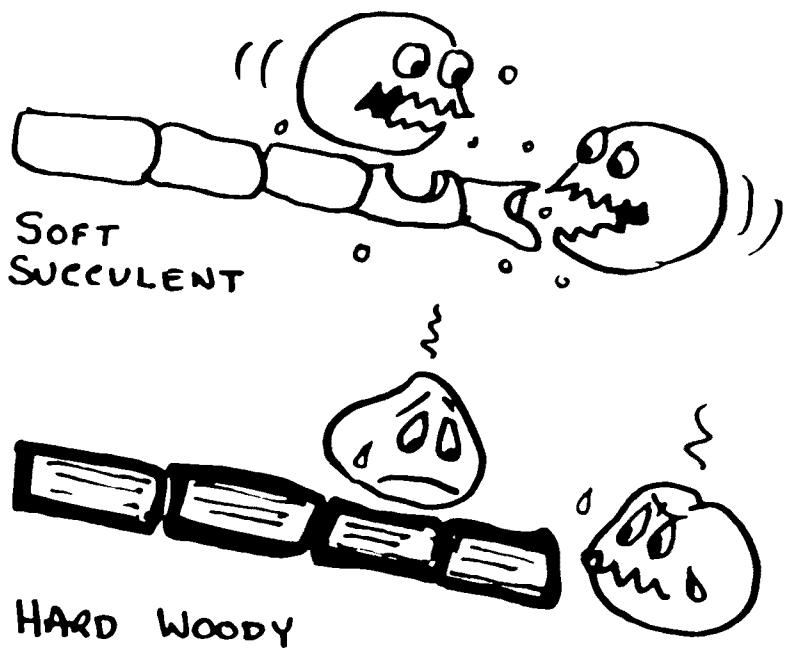
Grasses are stimulated by light grazing, can tolerate moderate grazing but will weaken under constant heavy defoliation.

▼ *Constant heavy grazing weakens grass; lighter grazing and spelling allow grass to recover*





▲ *Daylength or rainfall can trigger flowering*



▼ *Rumen bacteria take longer to break down old woody feed*

When is the grass plant most susceptible?

Most damage from grazing occurs when a grass is sprouting from its reserves after a dormant period—in spring or after a drought or fire. Grazing during flowering and seed set will reduce seed reserves.

Grazing will do least damage when the grass is dormant and not trying to send up new leaves—in winter.

When do grasses flower?

Flowering in many grasses is triggered as the days shorten in autumn. Flower stems emerge about three weeks later and seeds drop within six to eight weeks.

In more arid regions, many grasses will flower whenever there is enough soil moisture and the temperatures are right. A month after good rains, the whole paddock may be covered with seed heads.

All native grasses must be allowed to drop good seed periodically for regeneration.

How long can seeds survive in the soil?

Grass seeds rarely last more than three years but some forbs, especially the weeds, can survive for years.

Seeds are lost if they germinate with false starts to the wet season. They then do not survive. Many seeds are dormant for several months after shedding which prevents them from germinating in the season when they were dropped.

Seed harvesting ants, where prevalent, can remove a lot of seed.

What is grazing quality?

Good quality forage is broken down quickly by the bacteria in the rumen of the grazing animal and releases a lot of nutrients. The forage, and bacteria, are then digested in the intestine and so pass quickly through the animal. The animal can keep eating and producing.

Poor quality feed takes a long time to break down in the rumen because it is woody and the nutrients the bacteria need—nitrogen, sulphur—are deficient. The feed stays in the rumen and the animal cannot eat more. Minerals, such as phosphorus, needed by the animal's body may be deficient.

Young fresh leaf early in the growing season is high in minerals and easily-digestible sugars and carbohydrates. As the leaves age, the plant's cell walls become more woody and quality drops.

What influences quality?

The fertility of the soil and the stage of growth of the grass. You cannot do much about the basic soil fertility in extensive grazing areas but you may be able to manage the stage of growth of the grass, mainly through the use of fire.

Once flowering has been initiated, the grass tiller forms no new leaves as its energy goes into the flower stalk. This thickens until flowering and then turns woody to support the ripening seed head. Meanwhile the leaves are ageing and dying.

The quality of a grass declines very quickly after it flowers.

If the flower stalk is eaten, the plant may produce new leaf. New tillers may form but, if it is late in the season, these also send up flower stems.

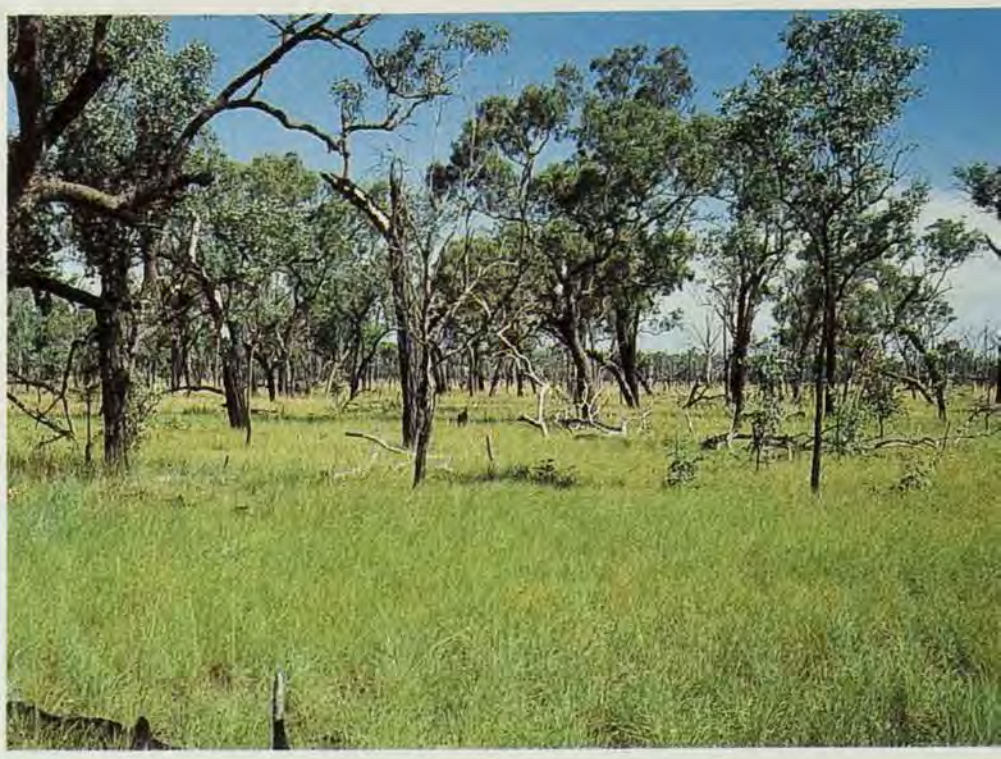
What else influences quality?

With too much rain, the leaves keep growing but the minerals become diluted. Pastures in the monsoon regions often provide a 'green desert'—a great bulk of low quality feed.

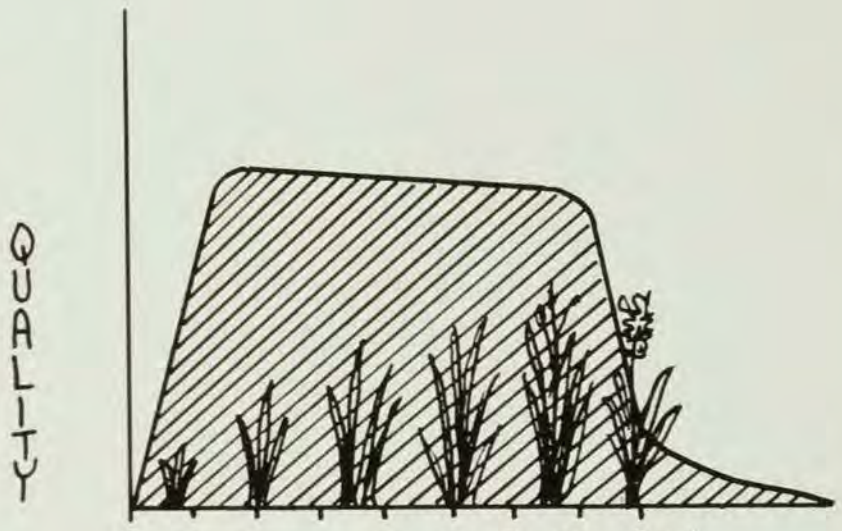
Following a good year, much of the available nitrogen may be tied up in the old standing grass and new growth can be limited and protein-deficient.

The best years for cattle and sheep growth have extended 'grass rains'—just enough rain to keep producing high quality shoots without a bulk of ageing leaf or seed heads. But when the rains stop, there is little carry-over feed and no new seed.

Frosted green grass, and even mature dry grass, can be nutritious until dew or rain encourages moulds and leaches out the nutrients.



▲ *Young fresh grass after a fire*

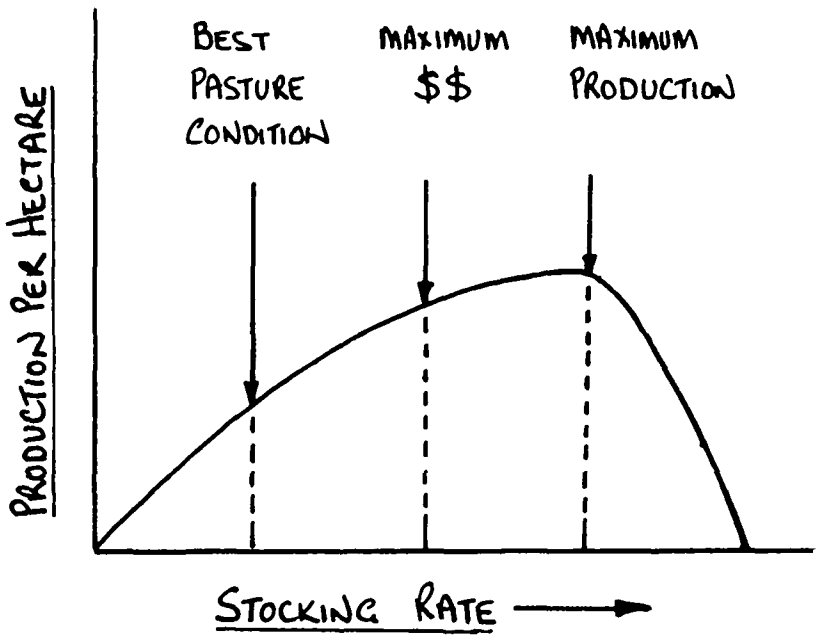


▲ *Grass quality drops quickly after flowering*

▼ *Cattle graze poor quality feed on the roadside after eating out the paddock*

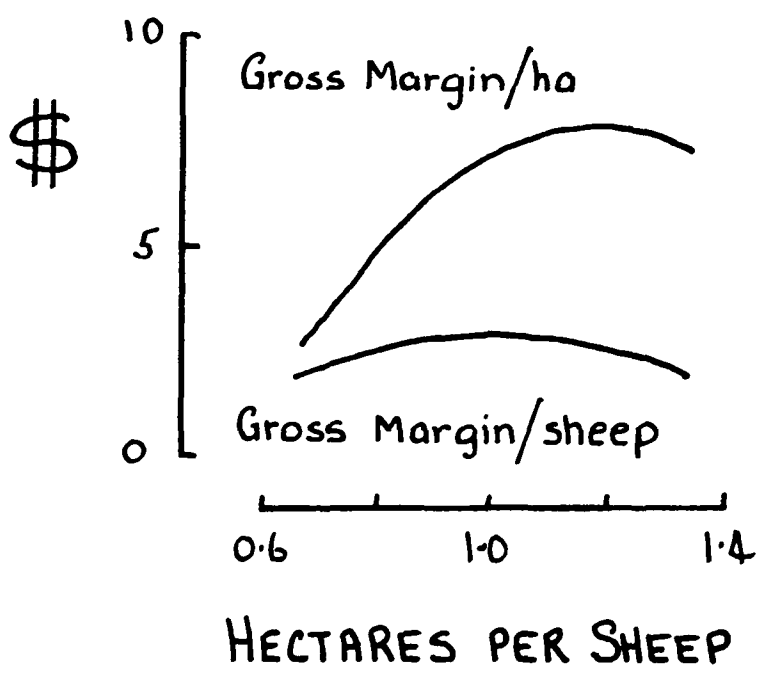
2 Stock and stocking

'Carrying capacity' describes the productivity of land. Carrying capacity is referred to when land values are expressed as 'per beast area'. If the safe carrying capacity is exceeded, the extra stock put pressure on the pasture and it deteriorates.



▲ *Grazing for maximum short-term profit usually degrades native pastures*

▼ *Lightening the stocking rate does not penalise the gross margin per sheep*



How do we measure stocking pressure?

Two common terms describe the pressure that stock can put on pasture.

Stocking rate

Stocking rate describes how many animals graze an area of land, for example, 2 head per hectare. In extensive areas, the stocking rates can be expressed as hectares per head, or as head per 100 ha.

As the stocking rate increases, each animal is less able to select the more nutritious leaves and so produces less. Milk production is affected more than meat, and meat more than wool. Production per hectare can be calculated from the production of each animal multiplied by the number of head per hectare. The optimum stocking rate for economic returns is lower than the theoretical maximum because of the costs of running each animal.

The best stocking rate for long-term stability of pastures is always lower than that for the highest economic returns per hectare. But conservative stocking may well produce the highest long-term profit on a whole property basis.

Grazing pressure

Grazing pressure describes the amount of feed available for the weight of animal grazing it. We will use grazing pressure in a general way—high, medium or low.

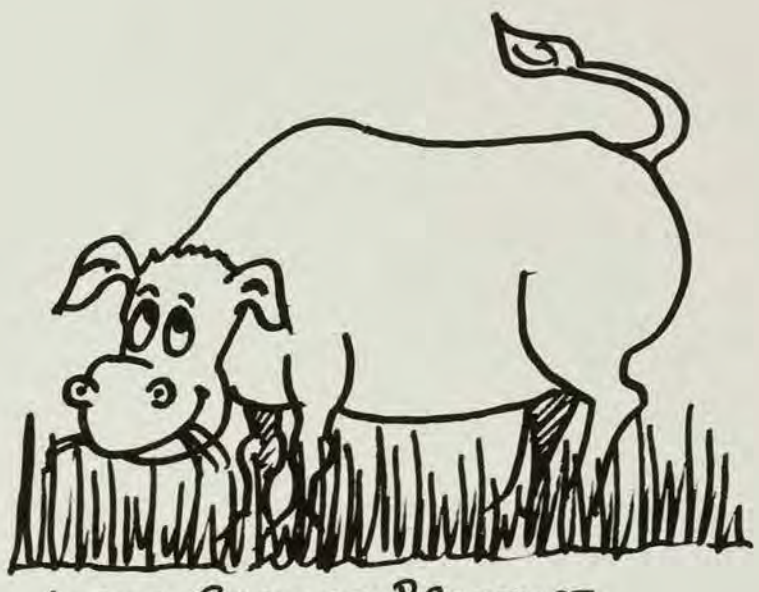
Although the number of head in a paddock (the stocking rate) may remain constant, **the grazing pressure on the pasture will vary greatly between wet years with plenty of grass and drought years with little.**

What is utilisation?

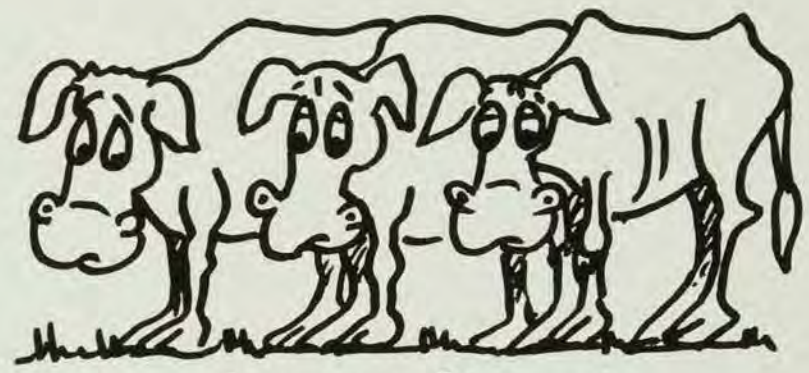
Utilisation is another way to describe grazing pressure—how much of the herbage growing during the season is eaten.

Eating, say, 15% of the grass grown is low utilisation, eating 70% is very high. **Most native pastures will remain in good condition when less than 30% of the summer growth is utilised.**

While low utilisation appears to 'waste' feed, it allows grasses to remain vigorous and to seed, while dry old leaves provide fuel for burning. If a pasture is neither grazed nor burned for several years, there is little nutrient recycling and the pasture will become moribund. High utilisation may seem more profitable in the short term but will degrade any native pasture—perennial species are eaten out, bare soil increases and weeds invade.



LIGHT GRAZING PRESSURE
LOW UTILISATION



HEAVY GRAZING PRESSURE
HIGH UTILISATION

▼ *light and heavy utilisation*

How do I determine a suitable stocking rate?

From long term experiences of local graziers, or by calculation from the amount of grass growing during summer and a desirable utilisation. The former may be available from local consensus, the latter with help from a local pasture adviser.

The ideal stocking rate matches stock numbers to available feed each year. But it is not easy to predict the coming seasons or to alter stock numbers on extensive properties and you may have to compromise with a lower, but relatively constant, stocking rate.

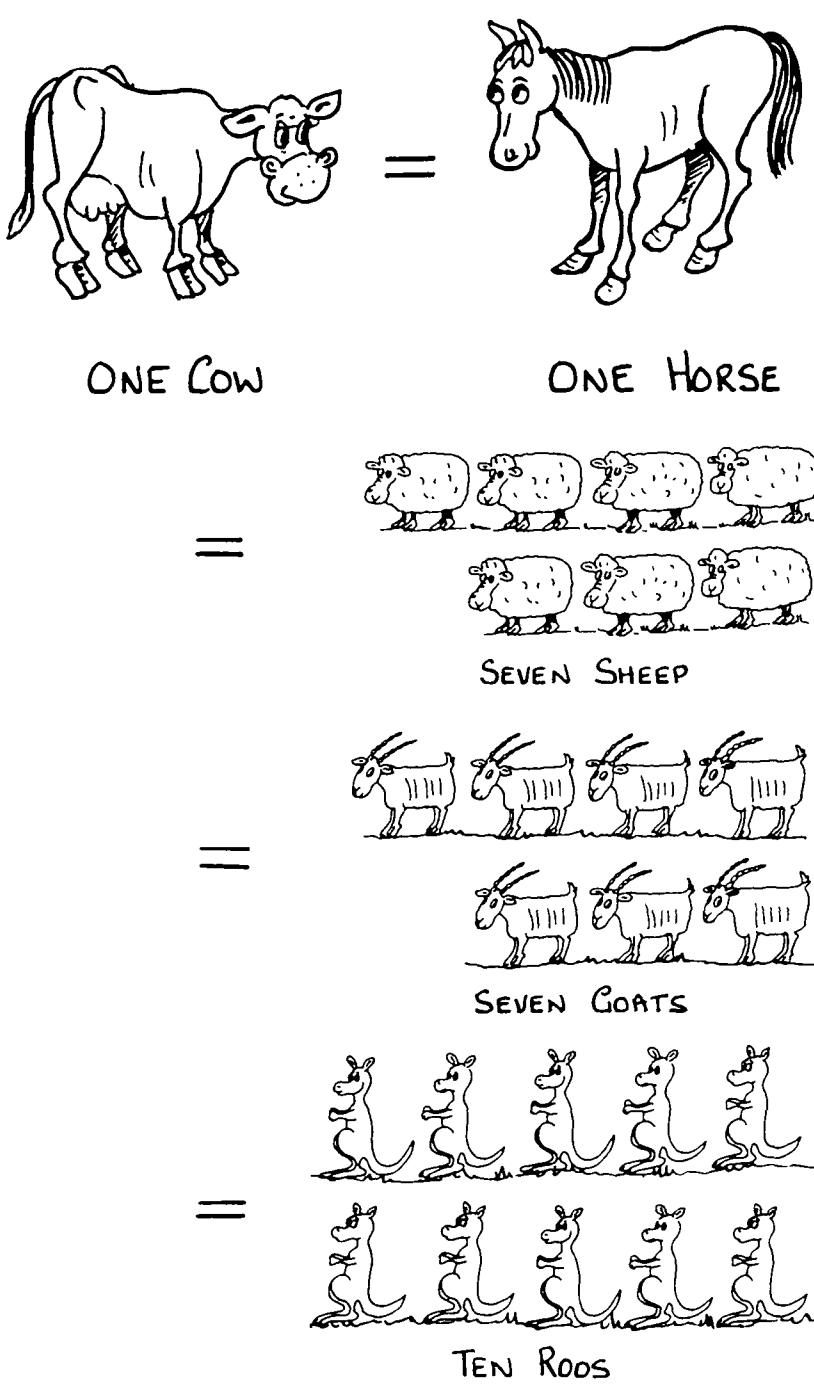
Sustainable constant stocking rate

The pasture scientist's rule for calculating a constant stocking rate for sustainable grazing of native pastures is to use less than 30% of the summer grass growth in 80% of years.

The rule is based on eight years in ten rather than stocking for the 'normal' year (five out of ten) because pastures recover more slowly than they decline. They may take two or more years to recover from a one-year drought.

Annual assessment

In drier regions, the amount of standing feed is assessed in March-April and stock numbers limited to those that could be carried if it did not rain again for the coming nine months. The feed is re-assessed at the beginning of the wet. The amount of standing feed can be compared against the photo standards provided in the pasture community supplements.



How do I compare different types of stock?

So many 'head' per unit area says nothing about the size of the animal. As they eat about 3% of their body weight each day, feed intake varies with body weight and also with different stages of life and reproduction.

Feed intake can be standardised using 'stock equivalents', 'adult equivalents' (AE) for cattle or 'dry sheep equivalents' (DSE) for sheep or mixed animal grazing.

Which stock can do most damage?

Under high grazing pressures, sheep and kangaroos can do more damage than cattle, and goats are worse than sheep. The smaller animals can crop closer to the base of the plant and so survive longer when feed is short; they thus put more pressure on the remaining plants.

Will stock graze a paddock evenly?

Stock rarely graze evenly under light grazing. They start on a small area, for example after a localised fire, and concentrate there because the grass is younger and 'sweeter'. The adjacent areas become rank and stemmy. The position of grazed patches may move around the paddock from year to year.

Patch grazing allows the ungrazed grasses to build up reserves and set seed while new plants can establish from seed on the grazed area.

What do stock prefer to eat?

Animals select plants which are easy to harvest, are plentiful and which taste good. Animals prefer green leaf that can be digested quickly. They don't select directly for deficient nutrients, except for sodium.

Some animals like browse—the leaves of shrubs. Goats will eat *palatable* browse but most of our eucalypts and acacias are not palatable. Horse paddocks are often full of uneaten weeds. Kangaroos prefer grass to forbs or shrubs, and eat much the same diet as sheep.

Mixed stock can exploit the differences in grazing behaviour—cattle can open up tall pasture for sheep. Goats can help to control some shrubs, but this is usually only after most of the grass has gone.

The feed preferences of some herbivores are shown.

	% of diet		
	Grass	**Forbs**	**Browse**
Horses	90	4	6
Cattle	70	20	10
Sheep	60	30	10
Goats	30	40	30
Kangaroos	60	30	10

What do kangaroos eat?

The larger greys and reds compete directly with sheep for valuable feed. The smaller euros tend to inhabit rougher country that is often not grazed commercially.

As many roos can congregate in a paddock when it is spelled from commercial livestock, spelling becomes pointless. Culling of kangaroos should concentrate on the spelled paddock.

You have to control kangaroo numbers persistently for effective pasture management. The best time is when the population is low after a drought.

▲ *Large numbers of kangaroos prevent effective management of native pastures*

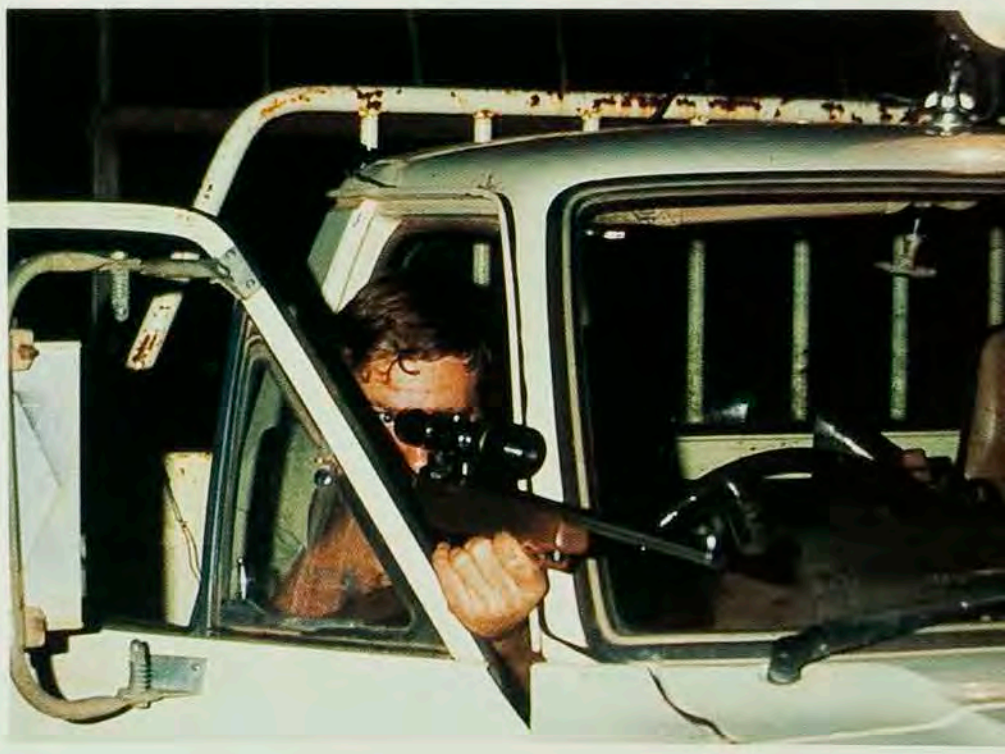
Kangaroos

The development of the grazing industry through the better supply of water in the semi-arid grasslands has boosted the populations of most species of kangaroo.

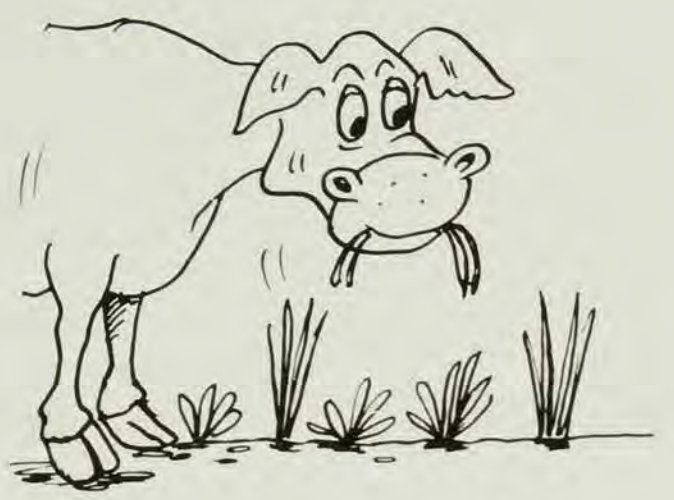
Kangaroo numbers fluctuate with the feed supplies. In good years, there may be more roos than sheep in some places and, when conditions turn dry, they compete for feed, contributing significantly to overgrazing.

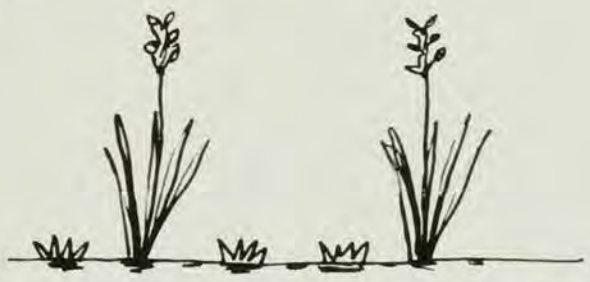
Kangaroo populations have to be controlled if we are to manage grazing pressure on our native pastures.

▼ *Roo culling and harvesting are most effective at critical times and in spelled paddocks*



3 Are pastures declining?





▲ *Overgrazing 'soft' grasses allows weed grasses to take over*

▼ ***Top.*** *This Mitchell grass paddock could recover.* ***Below.*** *This pasture probably won't recover*

Most graziers are great stockmen—they monitor the condition of their stock closely—but stock can be in top condition on a pasture that is not.

Animal condition can change quickly from season to season but pasture condition may decline gradually over a period of years.

What is meant by 'pasture decline'?

The grassland is not as good as it once was and, if it keeps getting poorer, it will become degraded, less productive and expensive to reclaim.

What damages native pastures?

Pastures are damaged by overgrazing—regular overgrazing and continuous overgrazing.

What is the effect of overgrazing on a pasture?

We have seen, in the first chapter, the effect of heavy grazing on a single grass plant. The tussock gets smaller as fewer tillers are produced, the root system contracts, the plant does not set seed, and may die out.

These effects are most severe on the species that stock prefer, the palatable ones, and least severe on the unpalatable species. The former become '**decreasers**', the latter thrive on the reduced competition for water and take over—the '**increasers**'. New plants may colonise the bare ground—the '**invaders**'.

Some unpalatable species may be nutritious but not taste so good to stock. If the stock have no choice they will eat less-palatable plants and thrive but, if the increasers are very stemmy or are protected by fibrous, sharp-edged or sharp-pointed leaves, the stock take longer to eat and digest a gutful and therefore produce less.

How quickly do pastures decline?

Most of our native pastures are fairly resilient and may stand a couple of years of severe over-use, as in a drought.

The grasses will recover if rested and allowed to seed but may disappear if they are kept under constant pressure for more than a couple of years.

Much of our native pasture has been grazed by domestic stock for over 100 years; some of it is still in excellent condition, some has been so degraded that it is almost worthless and cannot be revived.

▲ *Yard paddocks are often overgrazed*

▼ *Brahmans—the great survivors!*

What hastens decline in pasture?

Heavy grazing! Too many animals. This may be the result of a conscious management decision, a run of dry years or the un-intended result of some good animal or pasture husbandry.

Be aware of management practices that allow you to put extra grazing pressure on the pasture. You still have to adjust stock numbers to the feed available. Aim to utilise no more than 30% of the summer grass growth.

Some of the practices that allow you to keep more stock during the times of stress are–

Brahman cattle

Hardy Brahman cross cattle can put more pressure on pasture because they survive when grazing pressure is high. When the drought breaks, there are more mouths feeding on the growing grasses. The British breed cows, especially those with calves, are less resilient and may die, or have to be removed, before damaging pastures.

Supplements

Supplements also keep stock alive in times of stress. Whereas once stock had to be agisted or they died in times of stress, they can now be carried throughout the year.

Browse

In pasture communities such as mulga, browse can be a valuable source of feed in drought. But if browse allows you to keep extra stock on the land, these extra animals can hammer any grasses that try to grow after light rain.

Feed browse in one paddock and keep the stock there until the grasses in the other rested paddocks have set seed.

▲ *Lopped mulga browse*

▲ *Use hardy legumes to put more weight on each animal, not to carry more stock*

▼ *Badly degraded—bare soil, little herbage, etc*

Legumes

The new tough legumes, such as the stylos, promote better utilisation of poor quality grass and can encourage higher stocking rates.

Legumes should be used to improve weight gains per animal rather than to increase the stocking rate, unless they are fertilised.

Carrying more stock leads to increased grazing pressure of the new growth after the dry season and this weakens the pasture.

What are the signs of pasture degradation?

Pastures are becoming degraded when there are signs of:

- more bare soil, poor ground cover
- little bulk of herbage, even in summer
- sparse seed production
- little mulch on the soil surface
- pillars of soil under plants or pebbles
- decreased perennial grasses
- increased - unpalatable grasses
  - annual grasses
  - broad-leaved weeds
  - woody plants

To manage grassland successfully, you need to know which plants are beneficial and to understand how grazing, resting or burning can favour them.

The prevalence of certain grasses, forbs or shrubs can indicate the state of your pastures. These are the **indicator species.**

As we explained previously, indicators can be 'increasers', 'decreasers' or 'invaders'.

How do I recognise the indicator species?

Each native pasture community may have its own set of indicator species. These are listed and illustrated in the separate grazier guide supplements for each community.

4 Grazing management

Your native pastures have to be managed to produce now and remain productive in decades to come. At the same time, you have to manage your stock and the property, and make a living for your family.

It is not easy to balance management for stock now and management for the pasture for the future.

▲ *You need to balance management for both stock and pasture*

How do I manage my native pastures?

You will need to understand first how the desirable and undesirable species in your pasture react to grazing, fire and variable rainfall. This may involve combining the knowledge of local graziers and experienced QDPI officers.

You can't control the rainfall but you can control grazing pressure and burning.

What are the basic principles of grazing management?

Give the best species a chance to recover from grazing and to set seed.

The best species are going to be grazed most. Give them a chance by:

- using a stocking rate that does not put them under undue pressure and
- spelling periodically when they are flowering and seeding.

This will usually occur if you **'graze your pastures so that they *could* carry a fire'.**

Should I burn the paddock?

Fire is a cheap and useful tool if managed—a prescribed burn; it is destructive and dangerous in careless hands—a wildfire.

Burning can:

- remove dead grass so stock can reach new growth
- stimulate new growth
- alter pasture composition and control woody weeds
- reduce wildfire hazards
- prepare seedbeds
- attract animals (including roos) to ungrazed areas.

▼ *Fire is a useful tool*

Fires

Much of our most valuable grazing land would be under woodland or woody weeds if there were no fires. Fires do occur naturally from lightning but the major influence has been man; firstly the aborigines who used fire for hunting and then the white man who used fire and the axe to create extra grazing.

Even areas that appear to be natural open grasslands, such as the mitchell grass downs, are now showing that they can be over-run by woody plants as the introduced prickly acacia and mimosa spread in the absence of fire.

▼ *Prickly acacia has invaded open grassland*

Does fire damage pastures?

Occasional fires do not damage native pasture species; fire is a major reason why the vegetation is open grassland rather than closed woodland.

It is the animals grazing the new growth and new seedlings after the fire that do most damage.

What is the difference between grazing and fire?

Fire is not selective. Grazing animals select between plant species, preferring green leaves; fire consumes everything over a very short time.

How often should I spell or burn?

The frequency of spelling, for seeding or burning, will depend greatly on your rainfall. In arid regions, it may be possible only once in eight years whereas some coastal spear grass gets burnt nearly every year.

Burning

Never burn for the sake of burning.

Be sure you need a fire and

- burn only enough to achieve your aims
- plan burning months ahead as part of management
- burn only if there is good sub-soil moisture
- don't burn an area more than once in three years

Generally a pasture should not be burnt more often than once in three years. This depends on a number of factors:

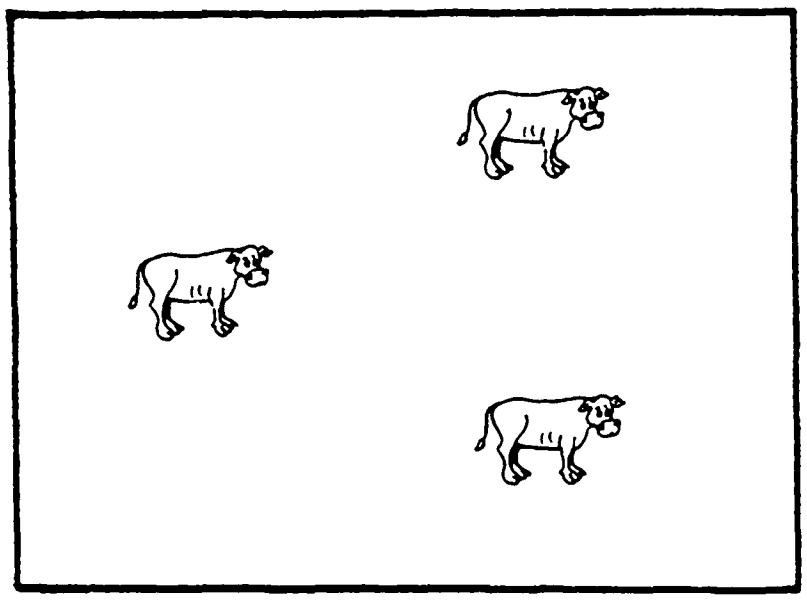
- total stock numbers may have to be reduced to prevent overgrazing the other paddocks
- woody weeds must not be allowed to grow so tall that they can withstand fire or suppress grass growth.

For how long should I spell?

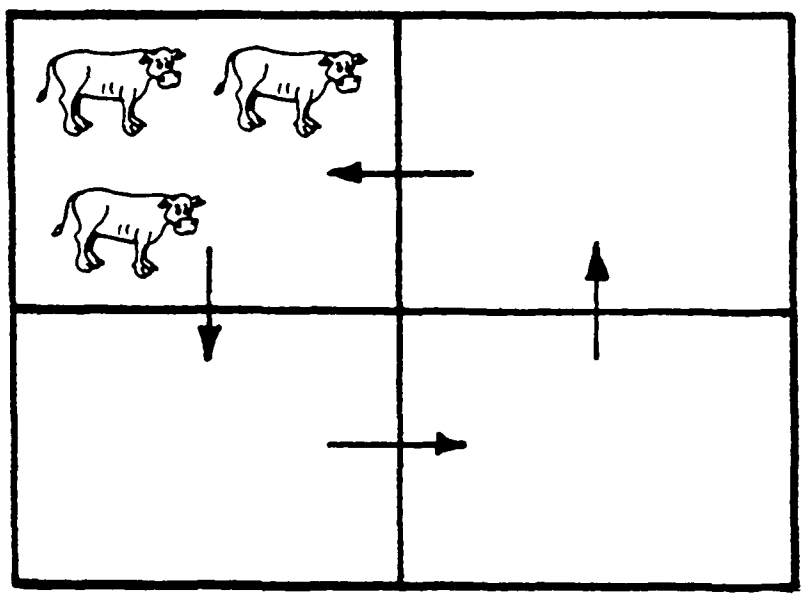
For seeding. You need to remove stock before the grass flowers (see the first chapter for flower initiation) so it can send up plenty of seed heads. The seed must then ripen and fall—about 6 to 8 weeks.

For burning. The paddock may have to be rested for the whole growing season to get the fuel load needed to control woody regrowth.

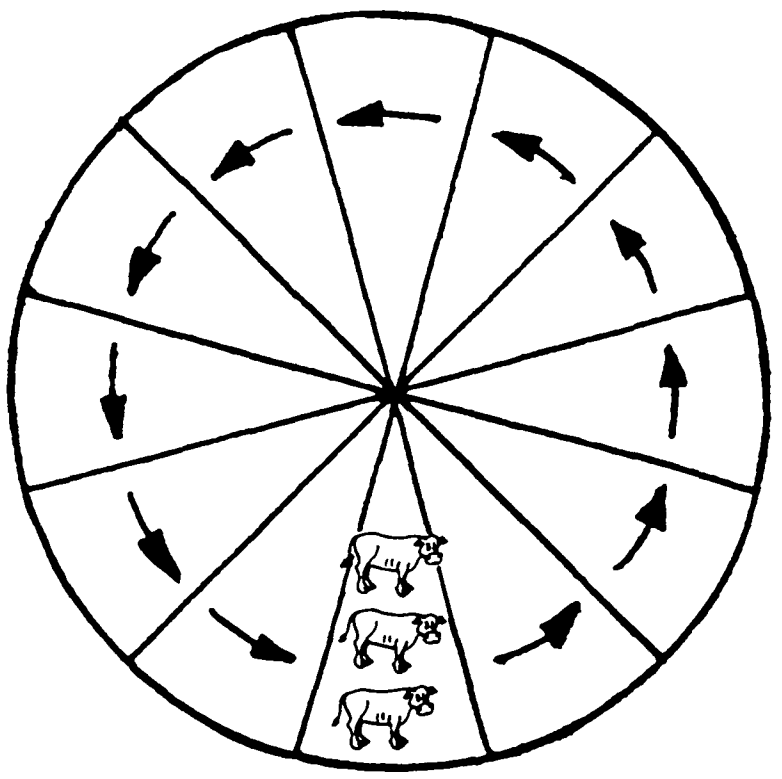
▼ *A hot fire will check woody regrowth*



▲ *Continuous grazing gives highest production per animal*



▲ *Rotational grazing may encourage better herd management*



▲ *Short duration grazing; if stock numbers are increased, pasture is damaged*

What is the best grazing system?

The best grazing system is the one with the right stocking rate. Stocking rate has a far more important effect on animal production and on pasture composition than any grazing system.

It matters little whether all the stock are moved around one subdivision at a time, effectively overgrazing it for a short time then resting it for a longer time (rotational grazing) or whether the *same number of animals* are spread out over the whole paddock all the time (continuous grazing).

What is important is that the numbers of stock are adjusted to the amount of summer growth of the pasture, whatever the grazing system.

Continuous grazing gives the highest production per animal.

Rotational grazing may give better herd management because the stock are supervised and handled more regularly but the mustering and subdivision fencing cost money.

Is spelling the same as rotational grazing?

Spelling or resting is not the same as rotational grazing. Rotational grazing describes the regular movement of stock around subdivisions of a paddock within the year. In spelling, a whole paddock is rested *during the flowering and seeding season* every third or fourth year. Total stock numbers have to be reduced if the remaining grazed paddocks are not to be overgrazed, unless there is some improved pasture or fodder crop.

What about 'cell' systems of grazing?

These systems have many names—short duration, cell, wagon wheel, Savory, time controlled grazing —we will call them Short Duration Grazing (SDG). All involve relatively short grazing periods of 1 to 6 days and rest periods of 30 to 60 days, with stock moving regularly round as many as 24 subdivisions.

Proponents of SDG claim it reverses pasture deterioration, dramatically increases stock numbers and improves individual animal performance. These benefits have never been shown in scientific trials in South Africa or the United States. On the contrary, an American rangeland ecologist has said 'There has been more rangeland depleted [with SDG] in the state of Texas than with any other management practice over the last ten years'.

Today, most native pastures in Queensland are already stocked close to capacity, without further development. Furthermore, our general scientific principles tell us that:

- *higher stocking rates increase the damage* to pastures and soil
- higher stocking rates always result in *lower individual animal performance* and
- a grass has to be rested *while it is seeding* for it to build up seed reserves.

As with other systems of rotational grazing, the more regular handling of stock may promote better herd management but SDG demands a high capital cost for fencing and extra water supplies. Better distributed watering points, by themselves, usually encourage better use of large paddocks.

How can I reclaim degraded pasture areas?

The ease of reclaiming pasture depends on how far it has degraded.

Spelling for seeding and burning. Spelling for one season should help if there is still a reasonable population of desirable species; otherwise it could take two or more seasons of good conditions. Seed may blow in from a neighbouring paddock or road side.

The same paddock:

▲ *before spelling*

◄ *after spelling*

▲ *The Crocodile seeder digs small pits and drops seed*

▼ *Blade ploughing is expensive and can be used only on better soils*

Reseeding if the desirable species have disappeared. Harvested seed can be planted after cultivation.

Cultivating to slow down water run-off and help it soak into the soil. Contour ploughing, checkerboard ploughing, spiral ploughing, pitting or root ploughing have been used.

Controlling woody weeds. Timber can be controlled either chemically or mechanically (pulling, stick raking or slashing); suckers and seedlings can be kept under control with fire by allowing the grass to build up a good fuel load. Woody weed seedlings are easiest to control in their first two years of life. Do not put in more stock immediately after controlling timber to 'use the extra grass' or the bush will soon be back.

Sucker bashing. Sheep and goats will sometimes control seedlings and some young suckers, especially in winter. After this, goats will eat eucalypts and wattles only if they are forced to by very heavy stocking; by then they will have damaged the grasses even more.

Reclamation of degraded native pasture is generally expensive. It is better to maintain good condition by appropriate management in the first place.

▲ *Goats grazed the regrowth (and grasses) on the left*

5 Other feed supplies

Many graziers have to rely on their native pastures for all their grazing; others may be able to integrate some other grazing or feed to allow more options in managing their native pastures.

How can other types of forage improve my native pastures?

A small paddock of high-bulk forage crop, such as forage sorghum, can carry a lot of cattle during spring or autumn. You could then spell a large area of native pasture at critical times without having to reduce your stock numbers greatly.

In the same way, an area of improved permanent or ponded pasture may give you greater flexibility in managing the native pastures.

▲ *Forage sorghum provides great bulk and may allow native pasture to be rested*

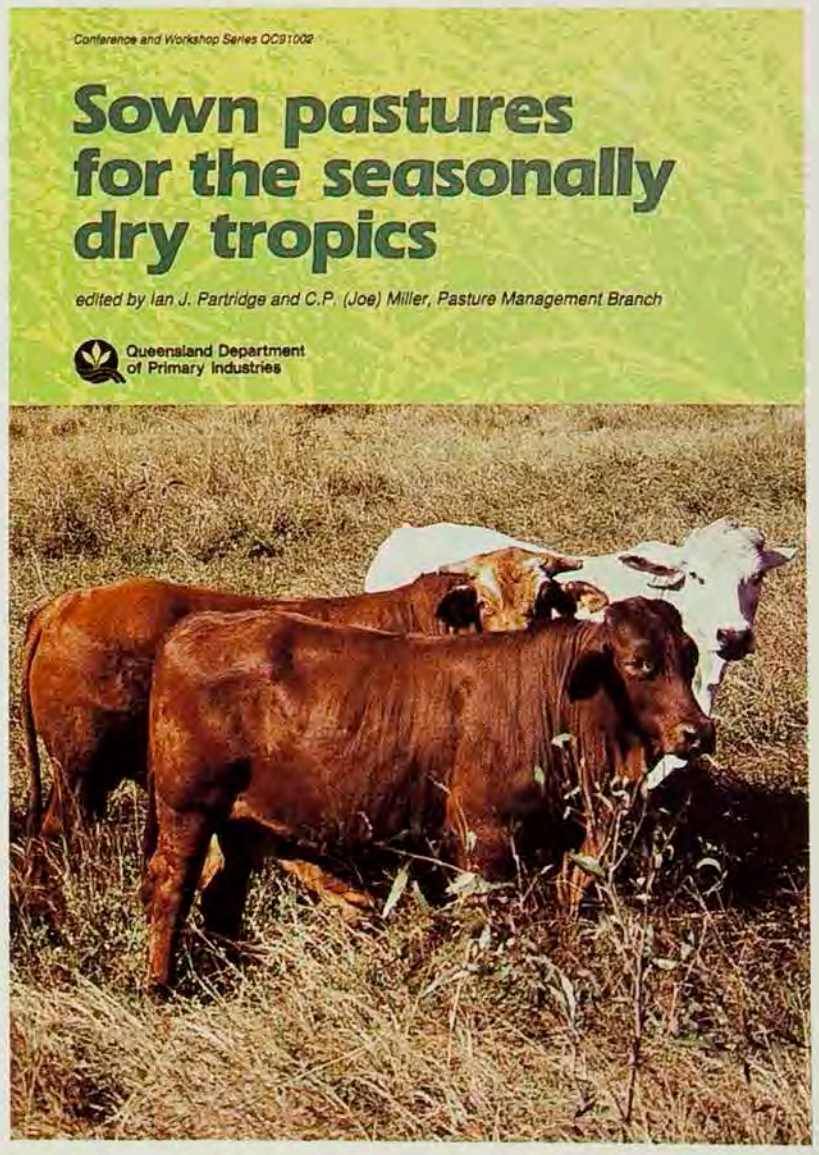
Can I improve my native pastures?

In the regions with better rainfall, you can greatly improve livestock performance from native pastures by oversowing a legume. Weight gains per animal have been improved by 20 to 50%.

There is much information on suitable species, methods of establishment and on management in the QDPI Publication *Sown Pastures for the Seasonally Dry Tropics*.

To protect the native grasses, you should not increase the stocking rates after improvement unless the pastures are fertilised. Although the quality of the herbage is increased by adding a legume, the total quantity may not be much higher without superphosphate.

▼ *Seca stylo will improve many black spear grass pastures*



▲ *Making hay off small areas of good land*

What about conserving feed for times of drought?

Even when you have adjusted your stocking rate to handle the conditions in 8 years out of 10, there are still the years of severe drought. Many managers carry reserves of drought feed even if they can agist stock. Young stock may need good quality feed but older animals will survive on roughage and supplements.

You may be able to produce hay off small areas of your good country planted to improved pastures or forage crops; otherwise foddder has to be bought in.

Improved pastures be made into good hay; hay from young forage sorghum will be of reasonable quality but tall stemmy growth may provide only bulk for use with supplementary protein. Varieties with 'sugar' in the name make the best hay in autumn.

Green native pastures, especially mitchell grass, can be made into good quality hay although this may be difficult in the plentiful but wet years. Native grasses tend to become stemmy and mature very quickly.

Should I feed supplements?

Supplements can be fed to maintain the breeding herd or flock in times of stress. Protein (cotton seed or meat meal) and non-protein-nitrogen (urea) allow stock to use poor quality grasses.

When there is no grass left, an energy ration (cotton seed or molasses) will keep stock alive but keeping extra stock on the property may put undue pressure on the new grass when the rain arrives.

Phosphorus mineral supplement may have to be fed to breeders throughout the year where the soil has very low phosphorus content. Where the herbage has plenty of nitrogen but limited phosphorus, as in an unfertilised grass-legume paddock on a soil below about 5 ppm P, phosphorus supplement will greatly boost steer weight gains. Then stock need it most when they are grazing green feed in summer.

▼ *Feeding molasses in winter*

6 Droughts

What is a drought?

Dry conditions may mean less to a grazier at Cunnamulla than to one on coastal black spear grass, yet both can suffer when it is *much drier than normal.*

'*Much drier than normal*' is the key. The Bureau of Meteorology uses the term 'severe rainfall deficiency' to describe when an area gets less than the rainfall received in the driest 10% of calendar (January to December) years. Although this picks out the major droughts, most do not run from January to December. The RAINMAN decision support program can look at droughts starting and ending in any month.

On average there will be one severe drought every 10 years. Man-made droughts are more frequent when native pastures are constantly overgrazed.

But won't the dry weather break next month?

There's always a hope it will rain but it pays to be a realist. You can look up the probability of getting rain, based on long-term rainfall records.

We can also use the Southern Oscillation Index (SOI) to 'predict' whether the coming season is likely to be wetter or drier than normal. Strongly negative values of the SOI in successive months can herald an El Niño and good chances of drought, strongly positive values wetter than normal conditions.

How reliable is the Southern Oscillation Index?

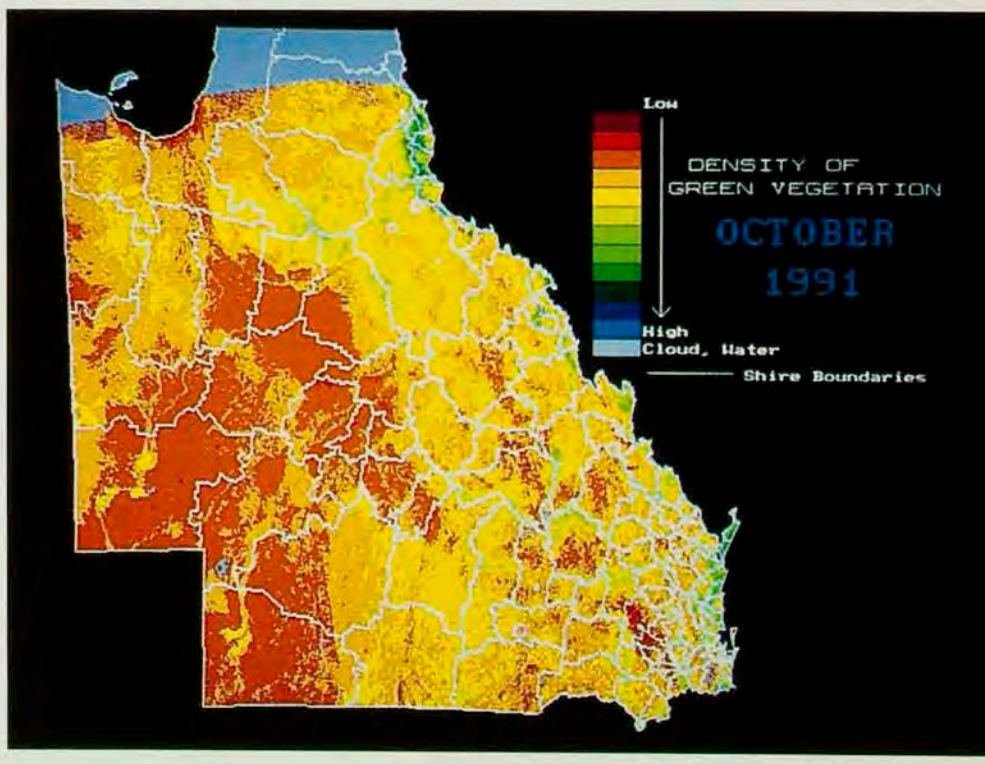
Meteorologists have compared the SOI values over the last 150 years with rainfall patterns. The SOI is not a 100%-accurate predictor—there are too many other factors in the weather—but it can show that, for example, the probability of getting average rainfall in the next three months may be reduced from 70% in high SOI times to 30% when the SOI is low. You, as manager, have then to assess what risks you are prepared to take.

The size of the effect of the SOI varies between localities and between seasons.

QDPI drought programs, such as *Feed Alert* and *Land Condition Alert* which combine probabilities of rainfall and grass growth with satellite images of the vegetation over the whole state, can warn you of impending problems and even show where there is likely to be agistment. Very few droughts cover the whole of Queensland and New South Wales.

▲ *You may pray for this but plan on clear skies*

▼ *Satellite imagery of the vegetation in the 1991 drought*



▲ *A grass tussock that died in the drought*

Most damage to pastures has been done when stock numbers have not been reduced in droughts. The critical period is immediately after the drought breaks.

Drought should be considered as part of any overall management strategy, planned for in a systematic manner with a pre-determined response. The worst way to handle drought is to do nothing and hope for rain; this gives you no options later, with poor stock, no grass, no agistment, a flat market and expensive supplementary feed.

What are the aims of a good drought strategy?

You have three aims to balance:

- maintain your long-term viability
- prevent degradation of your land and pasture.
- provide sufficient cash flow for your short-term needs.

Can herd management protect me from droughts?

Seasonal mating, with pregnancy diagnosis and early weaning in cattle, are the basic strategies for evading the worst effects of drought.

Seasonal mating can prevent calves being born at the wrong time, in autumn; cows do not then try to produce milk when there is no feed. Cows with calves are always some of the first to die—after they have helped to put pressure on the pastures.

Pregnancy diagnosis lets you cull and dispose of poor performing cows six months earlier than by waiting to see if a calf drops. It gets rid of useless mouths, for cash, and saves the grass.

It's dry and it looks like staying dry. What should I do?

'Sell 'em or smell 'em!'

'Sell, sell and regret maybe, but sell'.

It is better to sell and regret than to lose even 10% of your animals through drought. In the second part of your normal wet season, after the end of February in most of Queensland, regard any rain as an unreliable bonus—don't plan on it. Reduce stock numbers before the paddocks are bare.

Whether or what you sell or agist will depend on:

- your type of business—you may need to keep a nucleus breeding herd or flock
- present and likely future stock prices
- interest rates
- your current financial position
- your projected cash flow, and
- how long the drought is likely to last.

If summer rains fail, this strategy should see you through to the next wet season if you implement it early while there is still some grass left.

▲ *Truck them off the pastures—sell or agist*

▼ *Early weaning will save these cows and calves*

Which animals should I get rid of first?

For beef producers

- Sell your normal yearly turn-off early, either as boners or stores. Unfinished animals could go into an opportunity feedlot if the prices of stores and feed and interest rates are right.
- Cull cows, heifers and bullocks in February and March instead of April and May. Out go all breeders without a calf at foot.

Spread the breeders over plenty of paddocks to protect the grass.

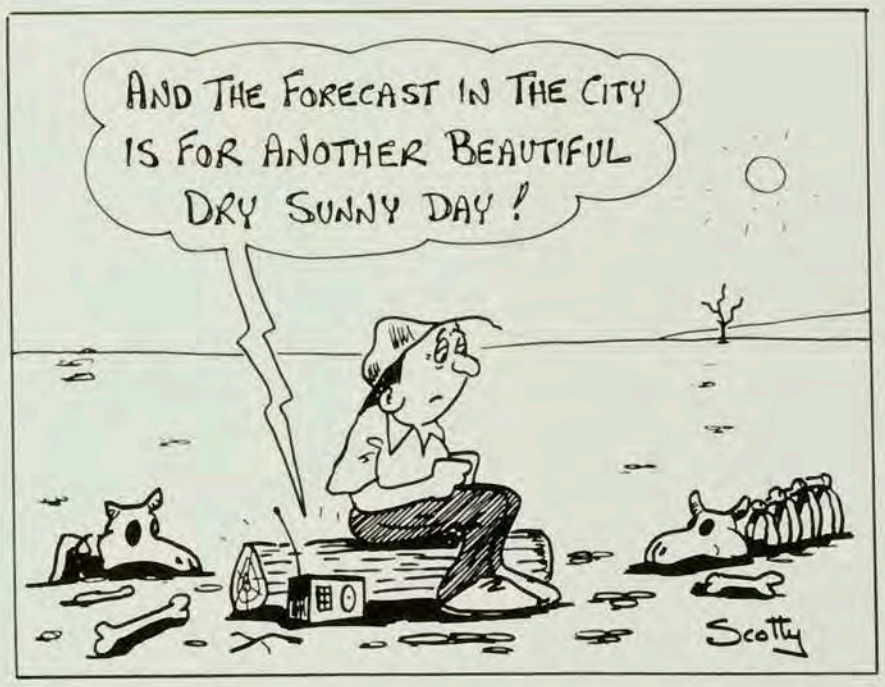
Wean early—as young as three months—and hand feed the calves. They eat much less than the cows which can look after themselves.

After the bulls have been removed, pregnancy test and get rid of the empty cows. In-calf cows will have to be looked after and given the best paddock.

For sheep producers

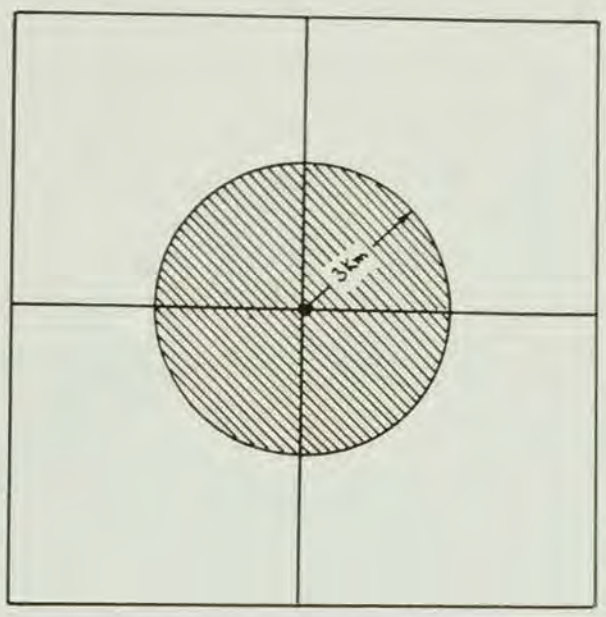
Sheep producers can follow a similar strategy:

- sell cast-for-age ewes (over 5½ years old)
- class young sheep and sell those of poor quality
- reduce wether numbers
- hold only a nucleus of ewes and rams
- join only part of the flock
- supplement only the best sheep.



7 Planning your property

Good property management means making best use of the natural features on the landscape; the good manager wants to locate infrastructure, such as watering points, fences and yards, and plan development to improve productivity without spoiling the resource. The QDPI is encouraging managers to develop self-help property management plans and has information in the leaflets *Planning your property – How to get started in grazing lands* and – *Locating property improvements.*

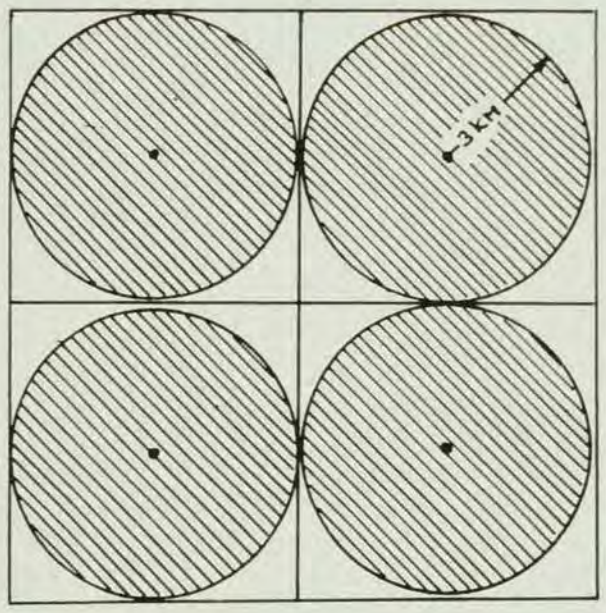


CORNER TROUGH

Are my watering points in the right place?

Many properties use a common watering point in the corners of four adjacent paddocks—where two fence lines intersect. It may be the cheapest way to serve all four paddocks but it encourages the overgrazing of each corner.

The grazing area around a watering point in the corner of a paddock is only a quarter of the area around a centrally located watering point.



FOUR CENTRE TROUGHS

Where should they be?

Placed centrally in a paddock. In summer, sheep will range only about 3 km from water, cattle 5 km, and they may have to return twice a day. Watering points should be within this distance from any part of the paddock. The low cost and ease of laying polythene pipe make it feasible to move watering points, or to provide extra points.

Don't put watering points on areas with erodible soils, and allow stock to approach from several directions to lessen tracking.

If troughs are placed on the opposite side of the paddock to the prevailing wind, stock will walk into the wind and then graze away from the trough after drinking, thereby grazing the paddock more evenly.

Water supplies

Water supply is the most important factor determining where stock graze when the landscape is uniform; forage palatability, terrain and tree density become more critical on variable country. Pasture management should focus on the areas under pressure.

What about feed supplement troughs?

Stock tend to hang around and overgraze the area around supplement troughs. Supplements can be used to encourage better distribution of grazing by moving the troughs away from the watering points. They may be among the trees on stable lands.

Troughs for drought supplements need more frequent vehicle access. Urea-based supplements to encourage use of dry herbage should be placed away from the watering point but, once standing feed runs out, total supplements need to be moved near water to help weak stock.

Should fences be in straight lines?

It is obviously easier and cheaper to build fences in straight lines and it is the best way on uniform country. But it is usually better to follow the boundaries of land types which need different management. Each land type can be managed separately and stock cannot overgraze one area and undergraze an other.

If a fence line runs straight up and down the slope, wings sticking out for 50 metres at right angles to the fence line will prevent tracking and gullies forming.

Stock laneways can be up to 200 metres wide to maintain the grass cover when they are used regularly.

And my access tracks?

Tracks in the wrong place often lead to gully erosion while formed roads can interfere with natural drainage and so concentrate run-off. The best place is along ridgelines or along the contour; if the slope is gentle, tracks can go straight up the slope but you need to construct whoa-boys.

Making tracks

- on hard stony soils, grade lightly to remove logs, sticks and stones without disturbing too much soil and vegetation. On clay soils, you may need spur drains
- avoid windrows of soil, especially on the uphill side, or leave gaps every 20–40 m
- if you have to remove trees near gullies, leave the root systems by cutting them close to the ground with a chainsaw
- build 'whoa boys' across tracks on sloping ground, every 50 m on steep slopes, and at the top of the banks if the track crosses a gully
- change the location of wheel tracks frequently to prevent ruts developing.

▼ *Trees killed to boost grass growth*

▼ *The GRASSMAN computer program may help you to decide the best strategy for woodland management*

Should I clear trees?

For those of you who graze native pastures under eucalypt woodlands, tree clearing is the main avenue of development. Grass growth can be greatly increased where there is competition for soil moisture. But not all trees are weeds to be killed.

Trees can provide:

- shelter and shade for stock
- timber for farm and sale
- shelter and beauty around the homestead
- habitats for wildlife
- drought fodder

Questions to be answered before forest or scrub is cleared include 'Will I damage the land?' and 'Can I get a return on my investment?'.

Will I damage my land?

Clearing may result in erosion or increased salting lower in the catchment. QDPI Land Management officers will be able to tell you whether your soils and land type are at risk. On leasehold land, a tree management plan has to be prepared before a tree clearing permit can be issued.

Will I get a return on my investment?

Extra net income will be decided by:

- Will more grass be produced?
- Are there stock to use this extra grass?
- What is the cost of clearing?
- What are the costs of controlling regrowth?

Clearing may be highly beneficial in the subtropics but give extra grass only in dry summers in the north.

Extra stock have to come by retaining animals that could be sold or by buying in. Both cost money and will alter your short-term cash flow.

The real cost of clearing depends on how effectively the treatment kills the unwanted species and how long it is before more money has to be spent to control the regrowth.

The GRASSMAN decision support program can help you to compare tree and grazing management strategies for eucalypt woodlands.

Am I going to get regrowth?

Yes, on many types of woodland, you are—check the understorey for suppressed seedlings. Regrowth may cause a bigger problem than the original open forest. A good fire is needed in the first few years before this regrowth gets away.

There are many large blocks of forest pulled without any follow-up plan and virtually abandoned to seedlings and suckers.

Only clear an area that you can manage subsequently.

▼ *This regrowth is probably a worse problem than the original mature trees*

What are good guidelines for clearing trees?

- Mark out, on a farm plan, all areas that should never be cleared —
  - too steep
  - erodible soils
  - potential salting
  - useful timber
  - bad understorey regrowth
  - scenic value
  - wildlife haven.
- On the land to be cleared, keep at least 20% of the original tree population in 100 metre or more wide strips. These should connect the water courses and areas of retained timber on your, and neighbouring, land.
- Do not clear on slopes greater than 20%. (This varies considerably with land type and soil type)
- Keep any cattle camps at least 2 to 5 ha in area
- Do not clear within 50 to 100 metres of the banks of recognised water courses.
- Check any legislation before you start.

Where should I plant more trees?

Information on planting trees is available from the Queensland Forestry Service and from Greening Australia.

One good way, for some species, is to encourage them under the canopy of mature trees by cultivating lightly and protecting them from grazing. The corners of paddocks are easy to re-establish this way.

Shade and shelter plots can be located strategically to draw stock to unused parts of a paddock. A plot close to water may be an advantage for lambing ewes.

8 What will it cost?

Your immediate concern may well be the need of your family, with conservation measures getting attention once you have achieved an adequate life style.

Overgrazing is most likely on properties where debts per head of livestock are high. Contrary to popular belief, long-term credit arrangements, which need regular interest payments, generally reduce your management options and encourage overstocking.

Many graziers feel that more stock and a higher stocking rate mean extra income. This is not always true.

What if I permanently lighten my stocking?

Lightening off is likely to be profitable in the short and longer terms if your stocking rate is presently on the too-high side.

▼ *Which paddock gives you the most options?*

Benefits from lightening off can come from a number of directions.

Less personal pressure

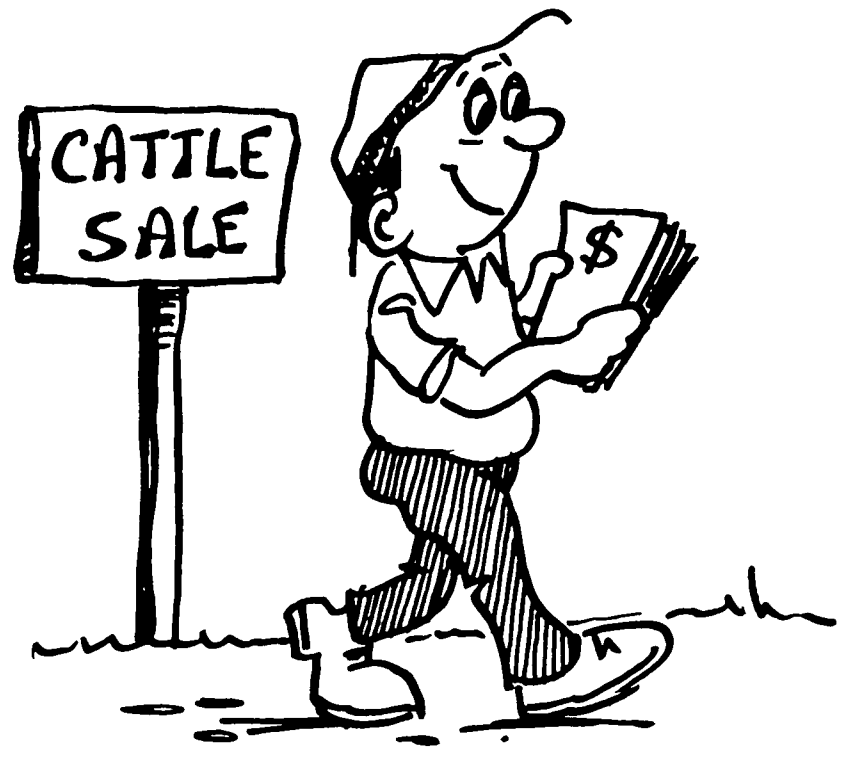
The income you receive from selling stock (at a favourable time) can be used to:

- reduce debts
- put up better fences or watering points
- improve grazing.

Sales fetch better prices

The remaining animals will grow faster and produce more, so:

- sale stock are turned off at a younger age and at heavier weights
- calving or lambing percentages and survival rates can rise
- lactating breeding stock remain in better condition
- wool clips increase
- mortality rates can decrease greatly
- *herd or flock quality improves with heavier culling.*



Lower costs

Livestock management is easier because:

- there are fewer individuals to handle or treat
- stock can ride out dry conditions with less attention
- supplementary feeding is less frequent
- drought management is simple

Fewer problems

Pasture management is easier because:

- there is more feed available
- pasture can be burnt periodically
- woody regrowth is kept under control.

A brighter future

Pasture condition improves in the medium term so:

- stock numbers could be increased safely later.

Trials in mulga country and elsewhere have shown that the whole property net income of a wool-producing operation can be improved by reducing stocking rates. Decision-support programs such as RANGEPACK HERD-ECON can help you work out the gains and losses from such a strategy to find the best compromise.

9 Can computers help?

Computer programs that can help you to make decisions are called 'decision support' packages. The reaction to computers of many graziers has been, *'No b..... computer is going to tell me what to do on my property!'*

A decision support package never tells you what to do but it can help you when you have to make difficult decisions. What you eventually do will depend on many other, often personal, factors—your family's needs and your attitude to risk; often on how much money you owe!

Could I use a decision support system?

You can always make a better decision if you have good information, whether it is from your own experiences, talking to a neighbour, from reading *Queensland Country Life* or contacting the QDPI.

Some seemingly simple decisions are actually highly complex because they involve a lot of factors interacting; change one and what is the effect on the others? It is here that computer programs can be useful; they can perform complex calculations almost instantaneously, allowing you to test dozens of 'what if?' questions quickly.

What sort of decision support programs would help a grazier?

There are three types available now and new programs are being developed.

- ***Property-economic management***

  RANGEPACK HERD-ECON - *A microcomputer-based Advisory System for Pastoral Land Management.* HERD-ECON is a dynamic herd and flock model that links the biology and the business of a property. You can compare management options in the context of climatic and marketing risks. It can help interpret the implications of decisions on your property into dollars, for example 'What's my most cost-effective development option?' or 'Should I destock during this drought?'.

  RANGEPACK HERD-ECON is being developed continually with new modules—Forage, Animal, Paddock, Fire, Pest—that can handle different aspects of the property.

RANGEPACK
A Microcomputer-based Advisory System for Pastoral Land Management

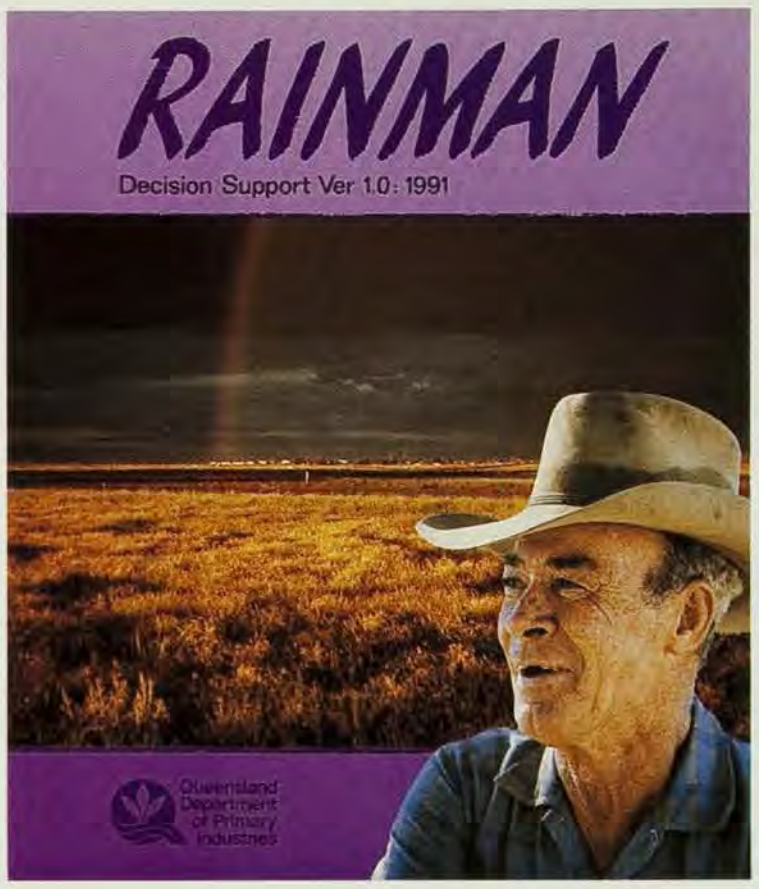
It is being developed by CSIRO's National Rangelands Program at Alice Springs.

BREEDCOW and **DYNAMA** are less complex programs than RANGEPACK and are available from the QDPI. They allow you to see the effect of altering the structure of your herd or flock on its turn-off, gross margin and capital value.

- ***Climatic risk and analysis***

  RAINMAN - *Rainfall information for better management.* RAINMAN analyses long-term rainfall records at 453 locations in Queensland to give probabilities of daily, monthly and seasonal rainfall. It shows whether the Southern Oscillation Index influences the rain in the coming season. RAINMAN can help you to decide whether to buy or sell stock or carry out improvements. Transfer the answers to Herdecon or BREEDCOW to see the dollar effect.

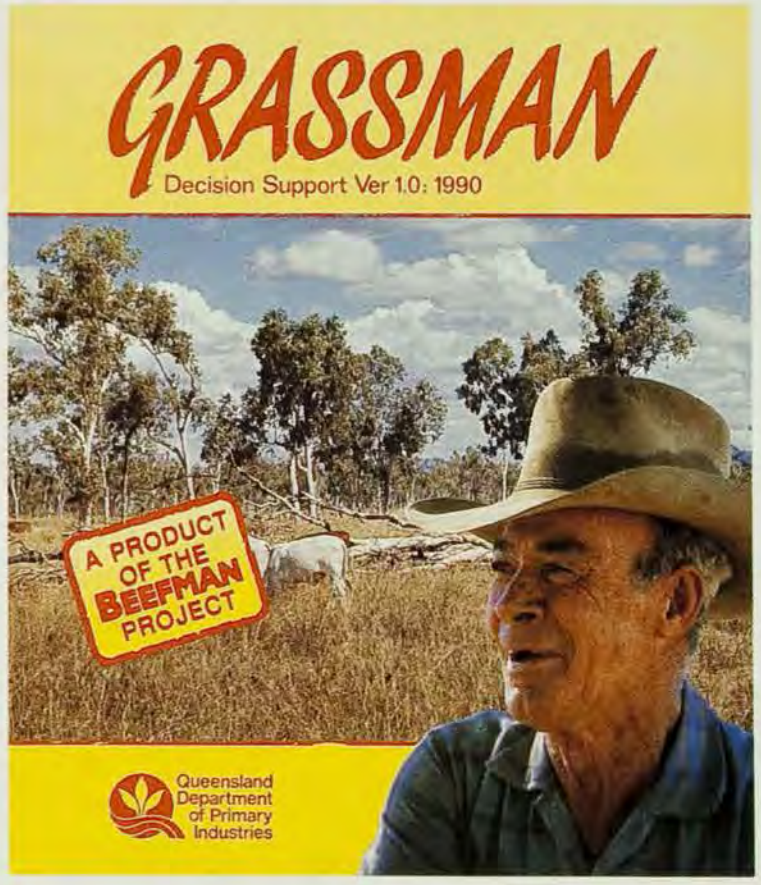
  RAINMAN is available from the QDPI.



- ***Animal-vegetation management***

  GRASSMAN - *to compare strategies for the management of native pastures in eucalypt woodland.* GRASSMAN is more specific than the first two packages, being concerned only with beef production in certain types of country. While the other packages are basically 'number-crunchers' using known basic data, GRASSMAN uses biological models of the growth of trees, grass and cattle under different rainfall conditions to determine suitable management strategies. Trees can be killed and regrowth controlled in a variety of ways, and stocking rates adjusted to determine the beef produced, and hence profitability over a 15 year time-span.

  GRASSMAN is available from the QDPI.



10 How are your pastures?

Monitoring is a fundamental part of native pasture management.

Serious changes in the botanical composition of grassland are often gradual although shorter-term changes between seasons can be much more dramatic. Unless you are able to pick up the serious changes, you will not be able to see whether your management needs to be changed.

Memory is short-lived and often selective; do not rely on it for long-term changes. Keep records.

What sort of records can I keep?

The simplest record is the photograph. Take a colour photo of the same part of the paddock each year at a set time, making sure that it represents the whole of the paddock. Stand in the back of a utility and point down to a spot about 15 m away.

More detailed is the record sheet on which are kept the numbers of times each species is encountered as you step along a fixed line. Researchers may record every species of grass and herb but you may only want to look for the important—**indicator**—species. These are the 'increasers', the 'decreasers' and the 'invaders'.

Is monitoring difficult?

You may think that identifying and counting different species sounds too difficult, but nearly all the co-operators with a QDPI monitoring-site have been so fascinated by this little-noticed part of grazing that they have joined the researchers to learn how to do their own monitoring.

How can I learn a good system of recording?

Notes on the different methods of monitoring pastures are available in a small QDPI publication called QGRAZ.

The important indicator species for each native pasture community have been identified and are illustrated in the Grazier Guide supplements. They are listed on a sample recording sheet at the back of each supplement.

Further reading

Native pastures in Queensland: the resources and their management.
Edited by W.H. Burrows, J.C. Scanlan and M.T. Rutherford (1988).
Queensland Department of Primary Industries, Brisbane.

Management of Australia's Rangelands.
Edited by G.N. Harrington, A.D. Wilson and M.D. Young (1984).
CSIRO, Melbourne.

The future of Australia's rangelands
by B.D. Foran, M.H. Friedel, N.D. MacLeod, D.M. Stafford Smith and A.D. Wilson (1990). CSIRO, Canberra.

Western grasses: a grazier's guide to the grasses of south-west Queensland
by B.R. Roberts and R.G. Silcock (1982).
Darling Downs Institute Press, Toowoomba.

The Grasses of Southern Queensland
by J.C. Tothill and J.B. Hacker (1983).
University of Queensland Press, St Lucia, Queensland.

Sown pastures for the seasonally dry tropics.
Edited by I.J. Partridge and C.P. Miller (1991).
Queensland Department of Primary, Brisbane.

Will it rain? El Niño and the Southern Oscillation.
Edited by I.J. Partridge (1991)
Queensland Department of Primary Industries, Brisbane.

Planning your property: how to get started in grazing lands (1990).
QDPI Leaflet QL90016.

Planning your property: locating property improvements
QDPI Land Conservation Branch

Conservation management of grazing lands.
Queensland Agricultural Journal (1987) Special Issue, Volume 113, No. 1.

Computer packages

RANGEPACK HerdEcon: a microcomputer-based Advisory System for Pastoral Land Management.
CSIRO National Rangelands Program, PO Box 2111, Alice Springs NT 0871.

The following are available from QDPI Publications, GPO Box 46, Brisbane 4001:

GRASSMAN: a computer program for Managing Native Pastures in Eucalypt Woodlands.

RAINMAN: Rainfall Information for Better Management.

BREEDCOW and DYNAMA: Herd Budgeting Spreadsheet Models.

Native pastures cover more than 90% of the grazing land in Queensland; they are the basis of our efficient and low-cost pastoral industries. Managing native pastures is a guide to maintaining or improving the condition and productivity of native pastures.

Written in a readable question and answer style, and illustrated with colour photographs or line drawings, the book describes

* the effects of grazing on plants
* the effects of stocking on animals and pastures
* the signs and causes of poor pasture condition
* the principles of good grazing management
* integrating other feed supplies
* drought management to protect pastures and stock
* property planning for fencing, water and access
* the costs of lowering stocking rates
* decision help from computer programs
* monitoring the condition of native pastures

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