

## APPENDIX 3

### GRAZING MANAGEMENT REQUIREMENTS OF PASTURE SPECIES

The following strategies have been successfully used for particular pasture species. In mixtures, optimal management must take into account other species and interactions between them.

### INTRODUCED TEMPERATE SPECIES

#### Annual legumes

For species such as subterranean clover, medics, serradella, Persian clover, balansa clover and arrowleaf clover the following guidelines are provided.

Aim for 30–40% legume content (on a dry weight basis) in introduced mixed perennial grass/annual legume pastures and more than 50% in annual pastures in cropping rotations. If the percentage falls below 15%, in permanent pastures consider ways of increasing legume growth and controlling grass dominance (e.g. fertiliser use, grazing management, herbicides).

Most annual legumes (especially sub. clover) are well adapted to heavy grazing in winter. For the initial establishment year or where persistence is a problem in established annual legume based pastures, the following strategies can assist to build a larger seed bank:

- Graze in late summer/early autumn to ensure summer feed is kept reasonably short and excess litter removed. This enables better germination of annual legumes after the autumn break. Avoid grazing so short (exposing large areas of bare ground) that:
  - » erosion risk is increased;
  - » seed pods are grazed in significant quantities (e.g. large snail medic pods);
  - » weeds can invade.
- Reduce stock pressure following germination. When plants are well anchored pressure can then be increased to moderate levels.

- From flowering to seed set, stock pressure should be high enough to reduce shading by companion species (especially grasses) and seed set of undesirable weeds.
- Avoid heavy grazing of flowers and pods of species such as medics, serradella, rose clover etc. In well established balansa clover, grazing through flowering does not appear to reduce persistence. However, in the establishment year, removing stock at the commencement of flowering may maximise seed set.

#### Lucerne (*Medicago sativa*)

##### Year 1

During the establishment year it is best to allow lucerne to reach full flower, then to graze for a maximum of 2–3 weeks to a height of 7–10 cm.

##### Established pastures

Set stocking at moderate to high density can kill established lucerne quickly. High carrying capacity and good persistence are possible if you graze paddocks for 2–3 weeks, then rest until early flowering (usually about 5 weeks). The recovery period is more critical than the grazing time as it allows the plant sufficient time to replenish root reserves.

Sustainable grazing systems range from two paddocks on the Tablelands, to four to six paddocks on the Slopes. Strip grazing is used under irrigated intensive systems and is usually associated with the dairy industry.

**Rotations must be flexible** to allow for stock condition and climatic constraints. If dry conditions prevail it is preferable to graze lucerne rather than allow leaf fall to occur and waste valuable feed.

Higher quality feed can be obtained by reducing the rest period, so that grazing is carried out at the bud or pre bud stage, however this may reduce persistence of lucerne if done routinely.



If subdivision is inadequate for rotational grazing, accept that potential carrying capacities will be lower and stand persistence reduced. For best results under these conditions:

- Sow well adapted semi-dormant varieties, avoid highly winter active varieties.
- Use furrow sow establishment techniques where possible.
- Sow companion species with lucerne (e.g. sub. clover, white clover). These will replace lucerne plants as they die as well as improve the quality and continuity of feed supply.
- Avoid set stocking for long periods (greater than 5 weeks).
- Use conservative stocking rates.
- To replenish root reserves, allow lucerne to flower whenever possible, especially before and after stress periods (e.g. summer).
- Monitor insect pests and control them if they threaten survival of the stand.

### White clover (*Trifolium repens*)

#### Year 1

Where grass competition is a problem in the spring following an autumn sowing, frequent light grazing during this period will improve survival.

#### Established pastures

When actively growing and under good soil moisture, white clover can tolerate heavy continuous grazing pressure without serious damage.

Close grazing, to 1500 kg DM/ha of total pasture or 750 kg green DM/ha, in autumn, winter and spring will increase clover presence.



**Note:** Haifa white clover does not root well at nodes and is easily over-grazed by sheep compared to other cultivars that are more stoloniferous .

Avoid grazing less than 2000 kg DM/ha of total pasture if moisture is limiting, especially in summer. Maintain leaf area at this time and avoid grazing to bare stolons, especially in areas with drier summers where white clover acts more as an annual.

Clover density and vigour can be greatly influenced by the density and growth of companion grasses. Strong summer growing grasses, such as kikuyu, can suppress clover.

Strong growing temperate grasses, such as phalaris, can also suppress white clover if spelled in the spring months.

Native grasses generally are less competitive although some, such as microlaena, can be very competitive.

Vigorous clover growth can lead to clover dominance in native grass/clover pastures. Such pastures may become unstable, susceptible to erosion and weed invasion, and cause bloat. To prevent this, increase grazing pressure to remove excessive clover growth and, in future years, reduce fertiliser applications.

Careful manipulation of stocking pressure and soil fertility is the key to maintaining pasture stability. Under intensive irrigated production, grazing can commence when lower leaves start to yellow. Graze to 5–6 cm.

### Lotus

#### *Lotus pedunculatus* (e.g. Maku)

#### Year 1

If grazing is necessary to control grass in spring, graze to 5–7 cm high.

#### Established pastures

Maku lotus is remarkably robust and withstands either close grazing or rank presence of companion grasses. However, maintaining herbage mass between 2000 and 3500 kg DM/ha (no less than about 1500 kg green DM/ha) is desirable for recovery and regrowth following grazing. Reducing grazing pressure in autumn may assist rhizome density and contribute to a better spread.

## *Lotus corniculatus* (e.g. Goldie)

### *Year 1*

Seedlings are especially vulnerable to competition so follow-up grazing to control grass competition is essential for good establishment. Light frequent grazing through the following spring/summer should be maintained because germination events continue to occur for at least 12 months following sowing.

### *Established pasture*

Plants generally are relatively short-lived (2–4 years), so intensive flowering for natural re-seeding is essential for long-term persistence.

Like lucerne, it requires strategic grazing for persistence. Graze when tillers are fully developed (about 15–20 cm high). Cease grazing when plant height is reduced to 3–5 cm. Spell for 6–8 weeks in summer from first flowering to pod shatter to promote the development of the soil seed-bank and to promote subsequent seedling recruitment.

## TEMPERATE GRASSES

### *Year 1*

When establishing phalaris, cocksfoot, fescue or perennial ryegrass, appropriate grazing management strategies vary with sowing method, sowing time, soil fertility and anticipated soil moisture through the growing season.

Where grass is sown early into fertile soils and good soil moisture is likely through spring and summer (e.g. under irrigation and high rainfall tableland conditions), quick grazing, once plants are well anchored, to 800 kg green DM/ha (about 7 cm high in new pasture which is not very dense), will enhance tillering and plant development.

If late spring and summer soil moisture is unreliable, grazing should be limited to allow sufficient time for plants to flower in spring and summer.

Where possible, keep sheep off newly sown pastures for the first 12–18 months. Cattle are preferred for early grazing of well anchored plants.

Under less favourable conditions, perennial grasses should not be grazed until flowering has occurred and the root system well anchored. Even then, permit only a light quick grazing preferably with cattle. Such situations would be,

- surface sowing;
- late sowing (e.g. winter);
- low fertility;
- quick drying soils;
- areas with unreliable spring/summer soil moisture; and
- situations where plant development may be delayed.

## *Phalaris (Phalaris aquatica)*

### *Established pasture*

Once established, Australian phalaris is less sensitive to changes in grazing management than winter active types such as Siroso. Grazing management can however be used to manipulate phalaris-based pastures in many situations:

### *Young pasture – say less than two years old*

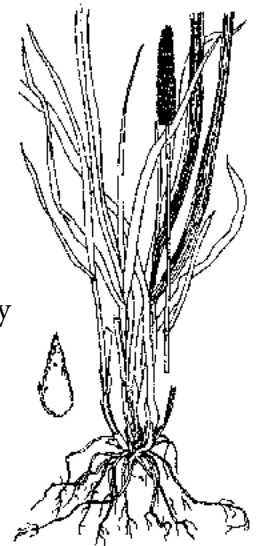
In autumn and winter, graze leniently to limit weed growth while encouraging sub. clover and phalaris tillering. Do not cut young pastures for hay. Leniently graze through summer months.

### *Degraded pasture*

Firstly, ensure nutrient deficiencies, especially phosphorus, sulphur and molybdenum, are corrected.

Encourage pastures to recover and increase phalaris density. Defer grazing until after the autumn break for about six weeks. This allows around 1500 kg/ha of green dry matter to accumulate. Development may be enhanced by spelling for 8 weeks after a 1–2 week graze.

If annual grasses are a major problem, use high stocking rates in rotation. Consider herbicides to reduce dominance of both annual grass and broad leaved weeds. Reduce stocking pressure in spring to allow seed set of both phalaris and subterranean clover.



During summer degraded phalaris pastures should not be heavily grazed.

#### *Mature pasture*

Following the autumn break, avoid heavy grazing for about six weeks, aiming at an availability of 1500 kg/ha green dry matter in late Autumn. This allows phalaris tillers to develop and clovers to establish following the autumn break. Then rotationally graze – within dry matter limits of 1000–1500 kg green DM/ha – through autumn and winter using rest periods of around 6 weeks. Where paddocks are set stocked through winter, maintain green dry matter levels above 1000–1200 kg DM/ha.

In spring graze to keep pasture at less than 3000 kg/ha dry matter. This will encourage white clover in high rainfall areas and sub clover to set seed. Where annual grasses are a problem, use short periods of grazing to keep feed between 1500–3000 kg/ha of green dry matter.

Delay any hay cutting until after stem elongation and heading of phalaris. Earlier cutting can be successful if the growing conditions following cutting are adequate for the grass to send up seed heads. In late summer to early autumn use moderate grazing pressure to minimise residues to about 1000–1500 kg.

In 'summer dry' environments, some carry-over stubble is considered useful. In elevated areas (tablelands) that receive reasonable summer rain, keep pastures short and leafy through summer.

However, in hotter areas with more erratic summer rainfall (e.g. Northern Slopes), more carry over feed with flowering stems has been associated with preventing regeneration buds from shooting. Lack of follow-up rain and hot weather can deplete root energy reserves where new growth occurs. This bulk then needs reducing at the end of summer.

Rotational grazing practices may increase the incidence of the 'sudden death' form of phalaris poisoning in stock.

## **Perennial ryegrass (*Lolium perenne*)**

### *Established pastures*

#### **Coastal**

Graze when three new leaves have expanded on each ryegrass tiller. On the North Coast this is equivalent to a grazing interval of 30–45 days in winter and 15–20 days in spring.

Graze to a height of 5–6 cm of stubble. Do not allow cows to graze after 48 hours when intensively rotating livestock on pasture.

In summer, maintain ground cover to reduce invasion by summer grasses. In summer, graze infrequently (e.g. monthly) as required, but follow-up with a slashing if weeds are present, otherwise they may smother the ryegrass. Maintain soil moisture by irrigating every 4–5 days in summer if necessary, depending on soil type, depth, evaporation etc.

Grazing periods should be timed as far as practical to avoid soil pugging in wet conditions.

#### **Inland**

Strategies to maintain or upgrade the content of perennial ryegrass and sub. clover in a pasture include the following methods:

*Late summer/autumn* – reduce stubble before the autumn break to about 1000 kg DM/ha. If grazing with sheep-only, defer grazing until 1200 kg/ha green dry matter is present.

*Winter* – graze to maintain the green dry matter level between 1200–2000 kg DM/ha and increase pressure if weeds are shading the ryegrass and sub. clover.

*Spring* – graze to maintain green dry matter between 1000–2500 kg DM/ha. Control excessive spring growth to encourage sub. clover, reduce weeds and increase incidence of late tillers, providing more feed into summer.

When cutting for hay in spring, cut before tillers containing potential seed heads appear. This strategy will allow fresh regrowth to continue into the early summer period when moisture and temperatures are favourable. Grazing before leaf decay occurs encourages survival of spring tillers over summer.



*Hotter areas* – refrain from grazing paddocks during summer and early autumn where mean maximum temperatures exceed 30°C. The overall aim is to maximise tiller production following the autumn break. Graze before leaf decay occurs.

Allowing pastures to seed can increase plant numbers. Reduce stubble following seeding.

#### *Endophytes*

The endophyte fungus, which may be present in perennial ryegrass (and tall fescue) pastures, is responsible for a number of livestock health disorders, including ryegrass stagger. If present it is found in the leaf sheaths at the base of the plant and in seed heads. Where endophyte are known to exist and associated health disorders are of concern, grazing strategies need to avoid high intake of these plant parts, especially in summer and autumn when concentrations of toxin tends to be greater.

#### **Annual ryegrasses such as Tetila (*Lolium multiflorum*)**

If growing under high fertility conditions and good soil moisture, grazing when plants are well anchored (approximately 6 or 7 weeks) will assist tillering and allow light penetration.

Then graze when three fully expanded leaves appear on each ryegrass tiller.

Graze to a height of 5–6 cm. More frequent grazing may be necessary in spring if rust is a problem or if you wish to delay stem development.

#### **Prairie grass (*Bromus willdenowii*)**

From sowing, graze when plants reach 3–4 new leaves/tiller, which will be 30–35 days in mid-winter to 20–22 days in spring. However, this may be compromised by soil moisture as it seems critical not to graze prairie grass when the soil is waterlogged.

The intervals between grazing in spring, as indicated above, are essential for sward survival. They allow increased growth and senescence of the lower leaves of the canopy to form a mat. The mat is believed to have at least two important functions:

- Reducing soil surface temperature in summer

- Preventing weeds (summer grass) establishing.

This mat breaks down towards the end of summer and allows new prairie grass seedlings to germinate and establish.

There appears to be no advantage in deferring grazing in early autumn to allow the new prairie grass seedlings to establish. In fact, if there are weeds present, the effect of deferment from grazing is negative on prairie grass production.

If invasion by summer grasses becomes significant, spray out the pasture with herbicide (rate and herbicide type depends on weeds present) any time after mid-February and at the time the prairie grass seed begins to germinate. This practice may need to be repeated every two years but this depends on the weed seed bank. Such a practice has the potential to lead to a permanent grass pasture.

#### **Cocksfoot (*Dactylis glomerata*)**

Some varieties are more tolerant to grazing than others with low crowned varieties tending to be more tolerant (especially with sheep).

Important aspects of cocksfoot management are; to maintain a balance of legume and grass, and to keep growth under control in summer and autumn to avoid loss of feed quality and shading of other species, particularly clovers.

When grazing young cocksfoot pastures aim to leave at least 1200 kg of green dry matter per hectare (about 4 cm in height in a thick pasture) after grazing.

Once established, graze to reduce excess growth through summer and before the autumn break (1000 to 1500 kg DM/ha). After the break, defer grazing as far as practical to allow clover to develop and allow herbage mass to reach around 1500 kg DM/ha. Then stock through winter grazing between 1200 to 1500 kg/ha of green dry matter (cocksfoot will tolerate set stocking) until subterranean clover has flowered. If



cocksfoot is too dominant in winter, increase the stocking rate to reduce dominance and to encourage the subterranean clover to flower and set seed. Grazing to less than 800–1000 kg DM/ha of green dry matter may jeopardise persistence. If seeding down of cocksfoot is required, reduce the stocking density once the clover has flowered.

Set stocking by sheep through summer may reduce the density of cocksfoot. Should new shoots be grazed following summer rainfall, plant energy reserves may be depleted and this can cause plant deaths especially if followed by hot dry conditions.

High crowned varieties, growing in summer rainfall districts tend to form large tussocks that lose digestibility, smother legumes and render a pasture relatively less productive. Aim to keep pastures grazed to less than 1800 kg DM/ha (about 7 cm high in a dense pasture) through summer to reduce this problem. This management will also reduce the risk of *Oncopora* (Corbie grub) damage, favour autumn clover establishment and minimise the incidence of leaf rust.

### Tall fescue (*Festuca arundinacea*)

Once established, fescue is relatively tolerant of grazing. For established stands, the main concerns are to keep growth vegetative for as long as possible in spring, and to encourage the legume component of the pasture.

Following the autumn break, spell to allow leaf area to develop, then set stock or use a system of alternate resting and grazing through the remainder of autumn and winter. Avoid grazing to below 1000–1200 kg green DM/ha.

Under good growing conditions in the early to mid spring, use heavy grazing pressure as far as possible to keep growth in the vegetative phase, but graze no shorter than 1000–1200 kg green DM/ha. At this stage, limit rest periods, where practical, to no more than 10 days.

Later in the spring, the rest periods can be lengthened (15 days or greater) to allow for adequate recovery, especially if hot dry weather is expected, in which case rest periods may have to be increased, or grazing stopped altogether. If the summer remains moist, the spelling interval can be kept short.

Tall rank fescue growth will inhibit subterranean clover germination in late summer/autumn. If increasing the subterranean clover component of pasture is the objective, graze to remove excess fescue by late summer. Ensure the retention of adequate ground cover.

See under perennial ryegrass for comments on endophytes.



### Annual grasses

Temperate grasses in this group include barley grass, brome, sterile brome, *Wimmera* ryegrass and *vulpia*. These grasses tend to be early maturing and hence are vegetative for a very short period.

They need to be utilised while they are vegetative (green). Once they mature, feed value and attractiveness to stock decline sharply (especially with *vulpia*). Ensure control (keep pastures to 10 cm) over spring, as a dense mat of these pastures will shade flowering legumes. Spray topping has a role in controlling barley grass, ryegrass and *vulpia*.

## HERBS

### Chicory (*Chicorium intybus*)

#### Year 1

Chicory is ready to graze when it reaches 15–20 cm and the taproot is well established. Grazing should be quick and light to avoid crown damage and encourage new shoots.

#### Established pastures

Management of chicory will depend on the primary objective of the feed source.

When chicory is sown as a high quality specialist forage for say finishing stock, rotational grazing based on a four-paddock system will probably be the most appropriate. Aim to maintain plant height between 5 cm and 40 cm with a high proportion of leaf. In summer, maintain grazing pressure so as to prevent stem elongation. This is likely to require an increase in stocking density when chicory growth rates are high. Applying post-grazing nitrogen in conjunction with rainfall or irrigation over the warmer months will ensure quick regrowth and maximise production.

When part of a conventional perennial pasture mix, it is important the pasture is managed for the benefit of the chicory component. If perennial grasses and clovers are part of the mix there is the temptation to set stock for long periods, particularly during winter. The likely outcome of this approach is a decline in the chicory component.

Across both management situations, during periods of fast growth (Spring/Summer), chicory should be grazed for about a week and spelled for about three weeks. Through periods of slow growth (Autumn/Winter), grazing periods can extend to about two weeks with spell periods to about six weeks. This ideally suits a four-paddock system.

## NATIVE AND NATURALISED GRASSES\*

In general:

- Learn to recognise beneficial and undesirable plants. Note when they flower and when they establish.
- By resting paddocks periodically when flowering and seeding down, and during seedling establishment, the density and persistence of some desirable plants may be increased.
- Some undesirable plants that are less grazing tolerant can be discouraged by grazing hard at establishment and flowering. Where mixed pastures are involved, the effects of a grazing strategy on one species have to be balanced against any injurious effects on other species in the mixture.
- Avoid continued heavy stocking pressure, as far as practical, especially when pastures have been or are under stress, such as drought.

*Wallaby grass (Austrodanthonia)* and *Weeping grass (Microlaena)*. Wallaby grass seeds down in autumn and spring, while *Microlaena* seeds from November to March. Both grasses respond to fertiliser and tolerate grazing. In spring, shading by strong sub clover growth can retard them.

To maintain a good presence of these grasses use moderate to heavy stocking rates to reduce residues in late summer and autumn to allow sub clover to establish. Avoid heavy grazing after the autumn break to allow grass seedlings to establish. If broad leaved weeds are a problem maintain ground cover in autumn to reduce establishment of these weeds.

Through winter, reduce grazing pressure to help establishing grasses. If annual grasses are a problem, defer grazing until late winter to spring when heavy stocking rates may be used to control them.

Grazing at low to moderate stocking rates until perennial grasses have set seed favours the grass component while controlling sub. clover growth. Shading of grasses by sub. clover and broad leaf weeds can be a problem in good seasons. Graze heavily in spring to reduce competition from sub. clover or broad leaf weeds. Favourable changes in species composition may occur faster under high fertility conditions.

With a low density of desirable species, use strategies that encourage seedling recruitment and seeding down, while discouraging undesirable competitive species. For example, see the section on wiregrass below.



*Redgrass (Bothriochloa)*. Grows over summer and is frost susceptible. Grazing over summer increases redgrass density and oversowing with fertiliser and legumes increases winter feed availability.

Be careful of legume dominance in spring as it can reduce redgrass density over time. This can be manipulated by judicious use of fertiliser. High rates of phosphorus and sulphur can encourage clover dominance at the expense of redgrass. Sub optimal rates of phosphorus and sulphur may be preferable to losing the perennial grass component of the pasture.

\* See note at the end of this section.



Diagram: N. Burbidge

**Kangaroo grass (*Themeda australis*).** Grows well with summer rain and is frost sensitive. It is threatened by grazing and clover dominance if pasture is improved with the oversowing of legume with appropriate fertiliser.

This grass is regarded as intolerant of heavy continuous grazing at heavy stocking rates but will survive at lower stocking rates. It appears to be

encouraged by intermittent grazing.

Spelling in late summer to provide bulk going into autumn will reduce the presence of annual clover and strengthen the perennial grass.

**Mitchell grass (*Astrebla* sp.)** Stocking rates must be adjusted according to rainfall patterns.

In general, Mitchell grass pastures should not be grazed in the first summer, but left to set seed. However, if the pasture establishes well and has sufficient growth, a quick light grazing may encourage tillering and help control weeds.

The pasture is safe to graze from the following spring. If the stand is thick (a maximum spacing of one metre between plants, with medic or herbage in between) the best stocking rate is about one DSE per hectare.

Each winter, dry tussocks should be grazed down hard. Then remove the stock to allow spring growth and restock the area in summer.

**Wiregrass dominant pastures.** Research in northern NSW has shown that wiregrass dominant pastures can be manipulated with grazing management to promote more beneficial year-long green perennial native grasses.

Inspect pastures in spring for seed heads of winter green desirable native grasses – such as Wallaby grass (*Austrodanthonia*) or Weeping grass (*Microlaena*) and select a pasture to be grazed in the following year.

In summer, select the best paddock for burning the following August. Ensure sufficient fuel builds up by not overgrazing in autumn. Aim to keep dry matter above 1000 kg/ha. Pasture can be grazed heavily in mid to late winter to reduce its green component. Keep green material below 200 kg/ha dry matter.

Burn the pasture in late winter to remove dead material or, graze heavily through to summer and supplement stock. Mob stock at 15 DSE/ha before wiregrass seed heads appear.

In summer, grazing needs to be heavy to keep grass under control while maintaining adequate ground cover during the most likely heavy rainfall intensity period. Then use 'put and take' stocking – 15 DSE/ha – to keep the pasture below 200 kg/ha of green dry matter, depending on rainfall and growth. This can be continued until the first frost.

Reduce the stocking rate in winter to allow the desirable native year-long perennials to grow.

In the next spring, the treated paddock should be rested to allow plants to regrow. In subsequent years, rest paddocks in favourable spring conditions to allow the desirable winter growing native grasses to flower.

This procedure can be repeated for a second year if needed to reduce wiregrass and encourage beneficial species. Production will be further enhanced by oversowing the modified pasture with sub clover and applying fertiliser.

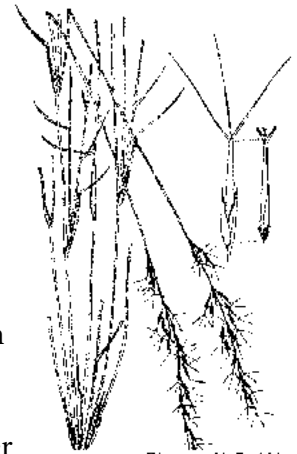


Diagram: N. Burbidge

Note: In respect to issues raised relating to native pastures, before implementing a change to management check with the Department of Land and Water Conservation, that the proposed change does not contravene the *Native Vegetation Conservation Act 1997*.

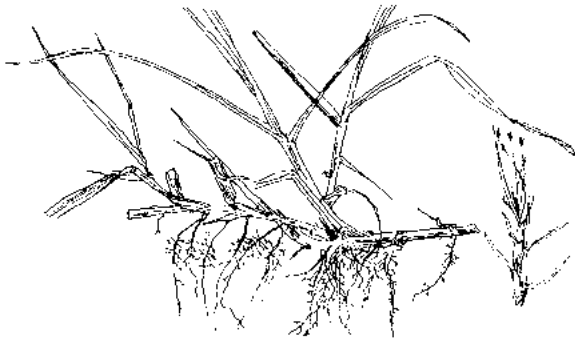


## INTRODUCED SUB TROPICAL SPECIES

### Kikuyu (*Pennisetum clandestinum*)

Recent research has provided the following guidelines for high return, irrigated or high rainfall situations:

- If pasture height exceeds 15 cm, and if soil moisture is good, mulch (preferred) or slash to 5 cm to allow light into sward to initiate new growth.
- Apply adequate nitrogen fertiliser (under high utilisation/good moisture/high return systems – 46 kg N/ha) after every second grazing.
- Graze at adequate intervals (Phase II). Research at Wollongbar has found that optimal quality coincides with the four and a half leaf stage of regrowth. After this the proportion of stem increases rapidly as does the number of dead leaves.
- Provide a new 'strip' of feed after each grazing.



# SUBTROPICAL NORTH COAST SUPPLEMENT

This supplement should be used in conjunction with Segment 6, *Pastures and Grazing* and Appendix 3, *Grazing Management Requirements of Pasture Species* of this Manual.

The role and principles of grazing management for subtropical pastures are similar to temperate pastures. As with temperate pastures, grazing management of subtropical pastures can be a powerful, cost effective tool, but there are important differences between these pasture types in the temperate and subtropical environments of NSW.

## CLIMATE

The north coast is a high rainfall environment ranging from 950 mm to over 2000 mm per annum in some locations. Rainfall is summer/autumn dominant with dry late winter and spring. Normally 30% or less of the annual rainfall falls in this period. Locations to the south of the region (lower Hunter/Manning) have a greater winter rainfall incidence than the far north coast.

Despite the high annual rainfall, the distribution is variable, with heavy rainfall events for short periods and often, long periods of low or no rainfall.

This variability in rainfall has a major influence on pasture growth and grazing management options.

## LANDSCAPE, SOIL AND MICROCLIMATE DIVERSITY

As the north coast of NSW has a wide range of landscapes, has soils varying from fertile to infertile and has many microclimates, a range of pasture species is needed to meet these demands. Many of these species require specific grazing management practices for their persistence and productivity.

## PASTURES

### Perennial grasses

Most north coast pastures are dominated by perennial summer-growing and winter-dormant introduced naturalised grasses e.g. carpet grass, common paspalum

and kikuyu. Although native grass pasture species are widespread, cattle production on the far north coast is mainly from grazing of the introduced naturalised perennial grasses.

Temperate perennial grasses such as perennial ryegrass and fescue do not persist well on the north coast. This is because the rainfall pattern (i.e. summer rainfall) does not coincide with the growing season of most temperate perennial grasses. High summer temperatures and humidity advantage the summer growing grasses resulting in strong competition to alternative species.

Selective grazing of temperate species, when mixed with summer growing grasses, also leads to poor persistence.

Annual temperate grasses, especially Italian ryegrass and oats, are often sown on the better land, e.g. alluvial soils, for high quality winter forage. Most reliable production from these grasses is with irrigation, but dryland sowings can also provide valuable specialised winter grazing.

### Legumes

Maintaining a pasture legume is difficult in the subtropical environment. Temperate legumes such as white clover do not persist well, even with adequate soil fertility, because of strong grass competition in summer/autumn. Variable rainfall during dry hot springs, hot humid summers and disease and parasite problems such as root knot nematodes all impact on their persistence.

Also viny tropical legumes e.g. siratro, are not well adapted to growing with the mat forming grasses. Winters in much of the subtropical zone are too cold or rainfall is insufficient for survival of many of the tropical legumes.

As the environment is neither temperate nor tropical the legume species in particular tend to be a mixture from the two environments. However, because neither type of legume is well adapted over much of the north coast it is difficult to achieve the ideal pasture composition of 30% legume content on a dry matter basis. Most of the time the percentage of legume in the pasture is well below this figure. This is another major limitation to feed quality of subtropical pastures for the grazing animal.

## Pasture quality

The summer growing subtropical and tropical pasture plants that dominate, are lower in digestibility and quality than temperate pasture plants at the same growth stage. This has major implications for animal production (see Segment 2, Pasture benchmarks) and for the management of the pasture to maintain the best quality of the subtropical pastures.

## Ground cover

Maintaining total ground cover is essential for sustainable pasture production but this is usually not an issue on the north coast since most of the pasture species are perennial mat forming grasses. Even in the dry periods total ground cover is normally maintained.

The exception is when fire in spring (August/September) is used to remove rank and dry pasture residue and to promote new green growth. Burning off pasture in these circumstances will reduce ground cover and expose soil to erosion and invasion of less desirable species. It is essential to maintain total ground cover on steep land due to high intensity rainfall. This is especially so with spring storms increasing erosion risk.

## Animals

Cattle dominate animal production systems on the north coast. Few sheep, goats or deer are grazed. This dominance limits some of the pasture and grazing management options that have proven beneficial in mixed sheep/cattle grazing enterprises.

## GRASS PRODUCTION

Unlike the majority of temperate pasture grasses that become larger through the production of tillers, most of the well adapted summer growing perennial pasture grasses on the north coast are mat forming giving generally a more even ground cover. *Setaria* cultivars are exceptions since they enlarge by tiller initiation.

Most perennial summer growing pasture grasses in this environment reproduce and spread vegetatively by the production of stolons or above ground runners e.g. kikuyu (see kikuyu diagram in Appendix 3) or rhizomes or underground stems or runners e.g. some of the *Paspalum* family. These grasses can also reproduce and spread by seed.

As a general rule the mat forming summer growing grasses are very tolerant of heavy grazing.

Grazing management using high-density stocking, followed by periods of rest, can be used to keep these pastures in a leafy, higher quality state. Lenient grazing leads to a high proportion of stem material, poor in quality and unable to support high levels of animal production.

## LEGUME PRODUCTION

Although it is difficult to keep a high proportion of legume in north coast pastures, even a small legume content can have a large impact on the pastures quality and animal production.

It is therefore important to maintain as much legume in the pasture as possible through adequate fertiliser, especially those supplying phosphorus and to a lesser extent sulphur and molybdenum. Grazing management is the other important factor in maintaining legume content in pastures.

## Temperate Legumes

Annual temperate legumes, such as subterranean clover, are not well adapted to, nor regenerate in the summer dominant rainfall environments of the north coast. However, some cultivars of subterranean clover (e.g. Clare) and other annual temperate clovers such as Persian and berseem clover can be useful winter legume forage, hay/silage or rotation crops.

### *White Clover*

Of the temperate perennial legumes white clover is the most widely used and widely naturalised on the north coast. Naturalised strains and better-adapted cultivars such as Haifa have two survival mechanisms.

- Under adequate moisture and good grazing management to reduce heavy grass competition, it can survive as stolons i.e. living plants.
- Naturalised types are early flowering, heavy seeders and set a high proportion of hard seed ensuring a residual soil seed bank. A large soil seed bank is an important survival mechanism where conditions mitigate against survival as living plants.

Periods of heavy grazing are required to reduce strong grass competition to assist survival of stolons. Heavy grazing especially is necessary in late summer and autumn to reduce grass overburden to assist regeneration of white clover from the soil seed bank. Germination of white clover from seed banks is most common in May/June if late autumn early winter rainfall occurs.

Managing grazing by strategic spelling in spring, to promote seeding of cultivars such as Haifa, is especially important in newly sown white clover based pasture. Spring grazing those pastures containing a high proportion of mature white clover seed heads and then shifting cattle to pastures with little or no white clover is an important means of spreading seed.

#### *Maku lotus*

The other important temperate perennial legume on the north coast is Maku lotus. Maku is best adapted to seasonally wet or damp acidic soil situations or southerly-facing aspects in higher rainfall microclimates.

Maku lotus is a strong spring (if moisture adequate) summer and autumn grower, producing more dry matter than white clover under low fertility conditions. Its quality is not as good as white clover but it is palatable and of low bloat risk.

Frequent close grazing in autumn can retard rhizome development, which is the main mechanism of Maku lotus spread on the far north coast (Maku lotus sets more seed to the south). Therefore strategic spelling from grazing in autumn can assist the spread and regrowth of Maku lotus.

#### **Tropical Legumes**

Tropical legumes e.g. glycine, greenleaf desmodium, are generally only suited to the higher rainfall areas of the far north coast, north of the Richmond River or isolated frost free sites to the south.

The critical aspect in viny legume persistence is for strategic spelling from grazing. This is especially during their active growth period from mid summer to mid autumn. This is necessary for the plant to build up vine and leaf for rapid recovery from grazing.

Continuous stocking at any time at rates, which remove new growth, can quickly deplete the plant and result in their rapid decline in the pasture.

An exception to this general rule is Shaw creeping vigna that is a highly stoloniferous prostrate growing tropical legume. Once established Shaw will tolerate prolonged heavy set stocking, in fact, this grazing strategy is desirable as bulky, leniently grazed stands can develop severe leaf disease in autumn.

Other tropical legumes that will tolerate heavy grazing during their active growth stage are lotononis and Wynn round-leafed cassia.

Heavy grazing of pasture containing lotononis keeps down competing grasses and helps prevent a sudden collapse of a bulky stand due to disease when warm moist weather occurs. On the other hand, heavy continuous grazing of Wynn cassia may result in selective grazing of more palatable grasses and pasture plants. This can lead to a Wynn cassia dominant pasture, which can be unpalatable during good summer growth periods. Wynn cassia is best suited to hard short duration rotational grazing.

#### **GROWTH CURVE OF PLANT PRODUCTION — SUBTROPICAL PASTURES**

**The following should be read in conjunction with Figure 6.3, Segment 6 of the PROGRAZE Manual.**

Phase I. (Phase I is characterised as having below about 1000 kg of green DM per ha.).

Due to hot dry weather, most subtropical pastures can be in Phase I for extended periods from August to December (compared to winter/early spring for temperate species).

However, they often differ from temperate pastures in Phase I in that subtropical pastures can carry a large proportion of dead stem and leaf. The extent to which this occurs depends on season, grazing management and stocking rate.

So compared to a temperate pasture in Phase I, which may have little dead stem and leaf, subtropical pastures can be about 1000 kg or less/ha green DM leaf but up to 3000 kg/ha of dead material.

Because this is early in the growth phase of the pasture, this green leaf is of high quality. Where livestock can selectively graze the leaf and it is readily available, high levels of animal performance may be anticipated.

As this leaf is often combined with a high proportion of dead material in subtropical grass dominant pastures, overall pasture quality is often low, but yield is high. This is similar to Phase III in temperate pastures.

When, through grazing management, the dead material can be removed then the yield and quality characteristics are similar to Phase I temperate pastures. However, it should be kept in mind that subtropical pasture grasses are 10% to 15% lower in digestibility than temperate species at the same growth stage.

The grazing management of subtropical pastures should aim for high utilisation, of at least some of the farm's pastures, to reduce the carry over of dead material and maintain a leafy sward into Phase II.

Prolonged grazing in Phase I is unlikely to suppress mat forming grass dominant subtropical pastures, nor is it likely to reduce ground cover. Prolonged continuous grazing is not suited for some viny tropical legumes. (See earlier comments under *Tropical Legumes*).

Phase II. (Phase II is characterised as having between 1000–3000 kg of green DM per ha.).

The big challenge of grazing management of subtropical grass dominant pastures is to keep them in this phase for as long as possible. Depending on seasonal conditions subtropical pastures make their most active growth in late spring/early summer to early autumn. (See Appendix 4, North Coast pasture growth rates).

However, with the carrying capacity, often based on the late winter/spring carrying capacity, stocking rates are often too low in this active growth period to keep the pastures in Phase II over much of a property. Often it is observed that in a slightly drier summer season when there is a lower pasture growth rate (provided the growth rates are sufficient so as not to restrict intake), animal performance is better as the pastures can be maintained in Phase II for a longer period.

Grazing management is important when aiming to maintain a high proportion of a property's pasture in Phase II during this active growth period. It will involve more intensive grazing on sections of the property and allowing some other paddocks to grow through to Phase III. The most likely grazing management strategy would be to increase stocking intensity through using rotational and/or set stocking grazing management systems. Other management options include fodder conservation such as silage, pasture slashing or topping to maintain pastures in Phase II.

Whatever grazing system is used, the aim should be to match pasture growth rate with pasture removal by stock. The strategy reduces or delays the onset of stem growth and flowering, keeping the pasture with a high proportion of green leaf and so the highest possible quality for that pasture type.

Because subtropical pasture quality will rapidly decline as it moves into Phase III, to get better pasture utilisation, reduce selective and patch grazing and to improve animal performance, it is important to maintain as much of a property's pasture as possible in Phase II.

Phase III. (Phase III is characterised as having above 3000 kg of green DM per ha and mature).

With the poor rainfall distribution on the north coast and the need for a safety margin in stocking rates a high proportion of north coast pastures will move into Phase III in late summer and autumn. Also, high stocking intensity to keep some of a property's pasture as long as possible in Phase II will mean the remaining pasture will be in Phase III during late summer (see notes on Phase II above).

A high proportion of these pastures leaf and stem will die with the onset of winter resulting in large quantities of dry poor quality pasture.

Although this standing dry pasture will be of poor quality, it does offer an opportunity to be used for maintenance feeding certain classes of stock. For example, supplementary feeding breeding cows in winter and spring with suitable protein meals or access to a high quality temperate species fodder crop e.g. oats or ryegrass, can make good use of this dry pasture.

## SEASONAL MANAGEMENT

The following seasonal recommendations and options are for the pasture and grazing management of grass dominant subtropical pastures.

### Summer/early autumn

This is the wet and active pasture growth season on the north coast NSW. Keeping summer growing pastures at their highest quality during summer is a big challenge and on most properties matching stock requirements to pasture growth over all the property is most difficult (see earlier comments on Pasture Phases).

- As pasture growth accelerates increase stocking rates on those pastures that contain the largest amount of higher quality species e.g. kikuyu, setaria, paspalum. Rotational grazing or set stocking to keep pasture in the leaf stage (Phase II) for as long as possible is the aim. Grazing from about 15 cm high down to 5 cm is best for the mat forming pastures such as kikuyu. With tall tussocky grasses, such as setaria, graze to maintain pastures between 30 cm to 15 cm to ensure highest quality.
- Rotational graze for a short duration with high stocking intensity is best. This results in faster pasture recovery, lessening intervals between grazing and reducing patch or selective grazing. This also gives better feed utilisation. Strategic slashing or mulching to top seedheads in late summer/early autumn may help retain pasture quality.
- Pastures which contain better quality species, and are surplus to summer requirements, can be conserved as silage and possibly hay. When conserving tropical grasses pasture management to ensure high quality conserved fodder is needed. This will include paddock preparation, adequate fertiliser and harvesting at the correct pasture growth stage (Phase II).
- Surplus pasture can also remain as low quality dry feed for late autumn winter or spring feed combined with protein supplementation.

- Grazing of newly sown subtropical pasture should be very limited in the first year to assist establishment and allow seeding. Grazing is most likely required in a favourable season as a means of controlling/ utilising vigorous growth from sown species, self-sown annual grasses or weeds. Control of unpalatable weeds such as fireweed, may be necessary.
- Strategic grazing/spelling of viny tropical legume pastures is required. Continuous heavy grazing will eliminate these legumes. These pastures are well suited to summer/ autumn saving for grazing in late autumn to spring.
- Heavy late summer early autumn grazing to keep pasture short and reduce grass overburden is necessary where white clover is an important component, where pastures are being prepared for surface sowing or direct drilling of annual winter species such as Italian ryegrass.

### Late autumn/early winter

Late autumn can be a very wet period, but generally rainfall declines from March to May. However, with the onset of cooler temperatures the lower rainfall is generally quite effective at this time of the year.

- Continue high grazing intensity on pastures to be direct drilled or surface sown with annual winter pasture or forage crop species. Remove stock prior to preparations for sowing. Several preparation options or combinations are available including herbicide spray off, mulching and light cultivation to reduce competition and create a better environment for establishing the winter growing species.
- Rotationally graze winter pasture or fodder crop. Irrigation (if available), grazing management and the strategic use of nitrogen fertiliser are important tools for high winter pasture production. Details of the advantages and disadvantage of the different establishment techniques, grazing and management options for winter pastures and crops are available from your local District Agronomist or farm advisor.
- Depending on seasonal conditions, pasture growth, cattle classes and condition, protein supplementation either through access to high quality winter pasture, crop or protein meals can commence in early winter.

- Heavily graze late summer early autumn carry over feed of viny tropical legume based pastures prior to onset of frosts and cooler temperatures. This is to utilise green legume leaf prior to the quality decline that will occur in tropical viny legumes under the colder weather conditions.

### Late winter/spring

This is the driest period of the year and with rising temperatures by late spring, subtropical pastures can be under severe moisture stress. Usually in late spring (late Sept./Oct.) early storm activity can result in some pasture growth but often these storms are patchy and unreliable.

- Subtropical pasture species are dormant or growing at low rates, but still have a high ground cover even when grazed continuously and at high grazing pressure.
- Strategic burning of dry pasture carryover may be acceptable in some situations such as timbered areas where there is a need to reduce 'fuel' thereby avoiding severe damage due to bushfires.

Burning reduces ground cover and litter exposing soil to erosion risk during high intensity spring storms. Other situations where one-off burning of dry carryover pasture is acceptable is in preparation for cropping or sowing improved pastures.

Annual burning of dry carryover material from subtropical pastures is not recommended because it favours fire tolerant species such as blady grass and weeds such as giant Parramatta grass. It is far better to use the carryover feed or slash or mulch it to increase soil organic matter and promote green leaf when the season breaks.

- Protein supplementation will improve digestion and intake of dry feed by cattle where dry feed is low in protein. In this way, pasture utilisation improves as does cattle production.
- When ever possible, allow white clover to seed especially in any new areas. Grazing white clover pastures, when seed heads are mature, in rotation with paddocks of lower white clover content, is a good way to spread white clover.

This option is usually only available in those years of 'good clover springs'. As the adapted strains of white clover set large quantities of seed, of which a high proportion is hard, one good seeding year can build a soil seed bank for many years. (See earlier comments under *Temperate Legumes*).