Department of **Employment, Economic Development and Innovation**

Pasture management for the inland Burnett

Queensland Government

Pasture management for the inland Burnett

compiled by Damien O'Sullivan

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On 26 March 2009, the Department of Primary Industries and Fisheries was amalgamated with other government departments to form the Department of Employment, Economic Development and Innovation.

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Introduction

The beef industry is a major contributor to the wealth of the inland Burnett region and this valuable industry relies on productive pastures. This booklet aims to help graziers better understand the development and management of pastures suited to the region.

Selecting the best mix of grasses and legumes for each land type will ensure the best financial return on investment from improved pastures. This booklet is designed to help all grazing property managers from those on small grazing blocks to properties of 10 000 ha or more.

The inland Burnett lies within the southern black speargrass region of Queenland's pasture communities. On the surface it may seem simple to manage a paddock full of grass but the way graziers manage stock numbers under a variety of climatic conditions can dramatically improve or deteriorate the condition of the ecological system.

To establish and maintain healthy and sustainable pastures, graziers need to know:

- what plants are in the pasture and the condition of the pasture
- whether there are changes occurring in the numbers of broadleaf weeds, woody weeds or other unfavourable species
- how many stock to carry with the feed on hand (i.e. when is it time to sell stock or begin to feed supplements?)
- how changes in stock or pasture management will affect the pasture composition or condition
- how to maximise income without jeopardising pasture health
- how to demonstrate that the property management strategies are sustainable
- how to use a system like *Stocktake* to monitor changes in pasture condition over time.

Pasture basics

Pastures are complex ecosystems. A wide variety of natural phenomenon and management decisions affect the composition and productivity of a pasture over time.

Pasture composition

The composition of pastures varies considerably. It is important for graziers to have a clear idea of what they expect from their pastures and choose plant species that have the capacity to fulfil grazing requirements.

There are two very broad plant types found in most pastures:

- annuals and weak perennials—plants that live for one or a limited number of growing seasons
- perennials—plants with variable life spans, from a year to decades.

In the grazing situation the main plants of interest are:

- grasses—low-growing vegetative plants that can tolerate grazing. Stoloniferous grasses like couch and Rhodes grass spread by seed and underground roots called stolons. Tussock grasses grow in clumps as distinct individual plants
- forbs—non-woody broadleaf plants
- legumes—plants with a varying ability to fix nitrogen with the help of bacteria in root nodules (e.g. clovers)
- sedges—grass-like plants (e.g. nutgrass)
- woody weeds—woody plants with the ability to compete with pasture plants for sunlight, nutrients and moisture (e.g. wattles)
- other weeds—any undesirable plant in a pasture that affects carrying capacity of the pasture due to its unpalatability, competition with more favourable species or toxicity to livestock (e.g. lantana and African lovegrass).

Features of a healthy pasture

A healthy pasture has a:

- high percentage of palatable, productive, perennial grasses (3P grasses)
- small number of annual plants (e.g. small burrgrass)
- small number of weeds (e.g. verbenas)
- high frequency of desirable forbs (e.g. native legumes such as glycine)
- variety of other favourable species.

What affects pasture condition and quality?

Climate, soil type, plant type and grazing pressure all interact to determine the quality, productivity and sustainability of pastures.

Climate

Climate, and rainfall in particular, has a major effect on pastures. Given the wide variation in climatic conditions within and between years, it is unreasonable to expect pasture bulk and quality to remain constant.

The nutritive value of a plant varies with seasonal conditions and soil fertility. In years of high rainfall, plant yield is often high but protein content is low. The opposite is often the case in lower rainfall years. Frost, wind, humidity and heat can also affect pasture quantity and quality.

The effectiveness of rainfall is the major determining factor for pasture growth. A combination of the following factors will determine the amount of effective rainfall and subsequent pasture growth:

- ground cover—pasture condition, plant type and species (see Table 1)
- soil type and condition—aggregate structure, pore size and amount of organic matter and minerals
- rainfall intensity
- evaporation
- slope
- tree cover.

In this case the perennial tussock grasses grew more dry matter per mm of rainfall.

Soil type

Generally, the better the soil, the better the pasture. While we often look at a particular grass as being very good for stock feed, the protein level of that grass varies depending on soil fertility. Low soil phosphorus and nitrogen are generally the most common nutrient restrictions on pasture growth.

Organic matter is an important soil component, providing plant nutrients, binding soil aggregates, improving infiltration and feeding soil micro and macro organisms. Low organic matter levels inhibit plant growth.

Once pasture cover drops below 40–50% there is a serious risk of soil erosion due to increased run-off.

Much of the fertility in Burnett soils is carried in the top 1–3 cm of the profile so it is important to manage pastures in a way that will preserve and improve the quality of this soil zone. A paddock with pasture composed of annuals and large areas of bare soil loses significant quantities of fertile topsoil every year (see Figure 1).

Table 1 – The effect of pasture type on water infiltration and dry matter production

	Water infiltration %	kg dry matter/ mm rainfall
Perennial tussock grasses	76	4
Stoloniferous grasses	55	3
Annual grasses	40	2
Bare ground	25	0

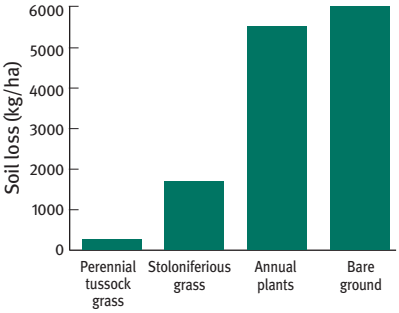

Figure 1 – Soil losses from pastures

Plant type

Each type of plant community has something different to offer graziers. The contributions of the three main pasture types in the inland Burnett are outlined below.

Native pastures

These pastures are often underused and undervalued. They are a cheap resource, costing 1–6c per kg of liveweight gain in cattle compared to around $1.60 per kg of liveweight gain in cattle on a grain diet.

Native pastures are still the main pastures supporting Queensland's grazing industry. They usually benefit from a careful burning regime and, with proper management, they can be productive and profitable.

Native pastures + legume

Oversowing legumes into native pastures is a cost-effective way of increasing production. Stylos and wynn cassia are commonly used in the inland Burnett. Clovers and medics will perform well in wet winters and are a worthy addition to any pasture.

Sown pastures

Pastures sown into a prepared seedbed are the most productive, and the most expensive. These pastures will usually run down after 5–8 years due to a lack of nitrogen. They can be maintained for longer with fertiliser applications and careful renovation. Legumes are an essential addition to pastures to reduce the effects of run-down.

Grazing

Stock will select the highest quality diet available to them. Increasing the stocking rate reduces each animal's ability to select and so reduces the quality of the diet. Forcing stock to eat more than leaf (e.g. stem) will reduce the weight gain per head.

About 25–40% of a pasture grass plant (above the ground) is leaf. To maintain strong pasture plants do not allow animals to use any more than a third of the grass growth over 12 months. Using about one-third of a grass plant gives stock the best quality diet and avoids overgrazing the pasture (see Figure 2).

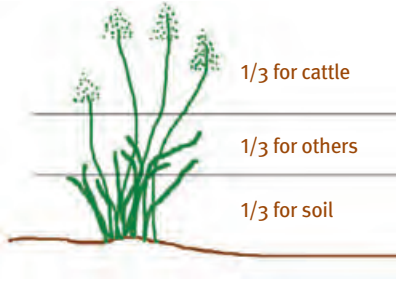

Figure 2 – Using one-third of the available pasture for stock helps maintain quality pastures.

If stock are allowed to continually eat green shoots as they emerge, the plant is unable to build up carbohydrate reserves in its roots. This causes root loss and a loss in plant productivity (see Figure 3).

As the number of stock grazing on a pasture increases, the potential liveweight gain decreases (see Figure 4). Increased stocking pressure results in the loss of more palatable pastures species and a decline in pasture quality.

As the number of stock grazing on a pasture increases the potential liveweight gain decreases (see Figure 4). Increased stocking pressure results in the loss of more palatable pastures species and eventual pasture quality decline.

Improving pasture palatability and productivity

Several factors influence pasture palatability and productivity. Use the following principles to help manage pastures to achieve long term productivity.

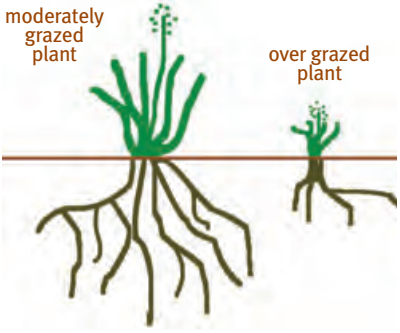

Figure 3 – An over-grazed plant compared to a moderately grazed plant. Note the difference in root mass.

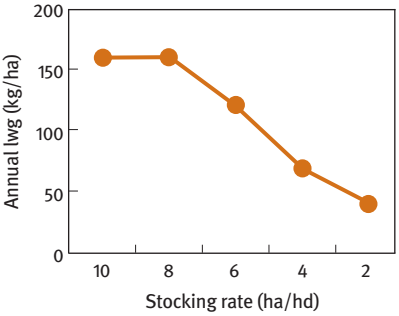

Figure 4 – Weight gain (annual liveweight gain in kg/head vs stocking rate head/ha)

Leafiness

Leafiness and the protein content of the leaves determines the palatablity and productivity of grasses. Nitrogen content (and so protein) varies between plant stem and leaf and the time of the year (see Table 2) and leafiness varies with pasture species (see Table 3).

Perennial grasses live for more than a year, providing bulk and cover year round if managed properly. If perennial grass cover declines, the result is inefficient energy capture, loss of nutrients to the plant, inefficient use of rainfall and a decline in soil condition. So with less pasture leaf produced per mm of rainfall there is a decrease in stock carrying capacity.

Age of pasture plants

Most pastures have maximum energy and protein for a period of 40–60 days. Unless there is continued

Table 2 – Nitrogen content % of black speargrass leaf and stem

	Early wet season %N/kg dry matter	Mid dry season %N/kg dry matter
Leaf	10.1	4.1
Stem	3.6	1.1

Table 3 – Leaf percentage of the above-ground portion of some grass species

Grass	% leaf
Green panic	30-45
Speargrass	30
Wiregrass	10
Golden beard grass	high leaf percent but low yield

pasture growth there is an inevitable decline in the value of the pasture. Figure 5 shows the decline in crude protein and digestibility of black speargrass over time following rainfall.

Legumes in the pasture

Legumes provide an extra source of protein for animals grazing the

Perennial stoloniferous grasses provide ground cover, protecting soil from erosion.

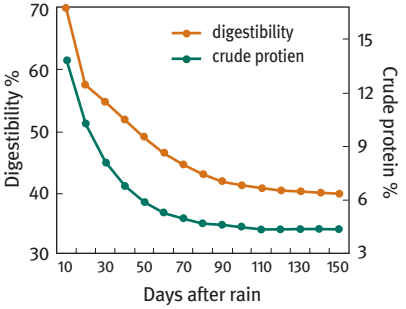

Figure 5 – Change in crude protein and digestibility over time

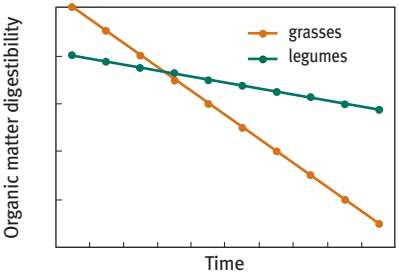

Figure 6 – Digestibility of legume vs grasses

pasture as well as contributing nitrogen to the soil for grasses in the pasture to utilise. Compared to grasses they also retain their digestibility for a longer period of time (see Figure 6).

Spelling pastures

Grasses need a period of rest (a spell) if they are to set seed and produce to their maximum potential, especially after burning or heavy grazing. Spell pastures over the grazing season for at least six weeks or until the grass goes to seed. This may need planning over a number of years to ensure every paddock receives a spell over time. Lack of rest for pasture over the

growing season is the main reason for loss of favourable pasture species.

Fire

Fire can be a useful tool for pastures if used correctly. In the speargrass region burning every 3–4 years is recommended. This however will depend on the season, stocking rates and the grazing intention for the pasture. Most of the vegetation in this region has developed under a regime of fire. Grasses like black speargrass are adapted to fire and can increase in density with correct and timely burning.

Carry out burning in spring when ground litter is damp and will not readily burn. Choosing the right time to burn can be difficult and dangerous. Remember a fire permit is required for any burning. Spell burnt pastures until they go to seed. The green pick after burning pasture is very palatable and nutritious to stock but grazing at this time will damage 3P grasses.

Timber and woody weeds

Woody weed density affects pasture growth. Generally, the less trees and woody weeds the more water is available for pasture growth (see Figure 7). However in the very long term a correct balance of trees and pastures is the best for maximum production and sustainability.

How to set carrying capacity

Step 1 – Determine the amount of feed available using pasture standards or pasture cuts.

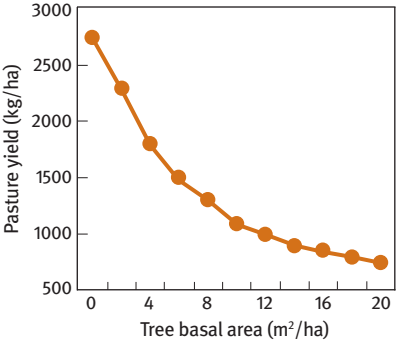

Figure 7 – Tree basal area vs pasture yield

A *Stocktake* workshop will show you how to do this (see page 59).

Step 2 – Aim to utilise between 25–40 percent of feed grown to give stock the best quality diet and allow grasses the opportunity to grow to their best potential (how much feed do the stock need? or what are the triggers for removing stock from a paddock?).

Step 3 – Budget to leave a proportion of the feed to provide for trampling by stock, ground cover, decomposition and for other fauna.

Fodder conservation can supplement animals during periods of standing feed shortage.

Enhancing native pastures

Legumes increase the quality of native pasture and so increase carrying capacity, breeder performance and animal growth rate.

Introducing legumes can benefit native pastures and run-down improved pastures, increasing carrying capacity and property income. Legumes supply some nitrogen to the soil and boost grass growth, but their main benefit is in offering a higher protein diet to the grazing animals. The protein level of summer growing grasses drops as plants mature and remains low during autumn and winter. Legumes, with their high protein content, are an excellent source of nutrition for stock and maintain their levels of protein much longer than grasses (Figure 6).

Most native pastures in the inland Burnett have one or more native legumes present. Rhizobia on the roots of the legume fix nitrogen and over time this is made available in the soil to be utilised by other plants. This helps to minimise the run-down in production that usually occurs in fertilised sown pastures after 5–6 years.

Many legumes have deep tap roots and are able to access moisture and nutrients deep down in the soil. The inland Burnett area is generally more suited to tropical and sub-tropical legumes such as wynn cassia and stylos. However in wet winters clovers and medics will grow well.

Grazing improved native pastures

South Burnett case studies show that, depending on soil type, graziers can rely on the following 'rules of thumb' when planning to add legumes to their pastures:

- Some legumes will persist. Lotononis has been established in some pastures for 18 years. At least 20 percent legume in the pasture sward is desirable.
- Under good summer conditions legumes in a pasture will give an extra 0.1 kg per head per day over the 0.7 kg for grass-only pastures.
- Animals usually lose weight during winter when grazing native or improved grass-only pastures. However in mild winters, legumes such as lotononis, white clover and lucerne in pastures can add an extra 0.5 kg per head per day over the 0.3 kg expected for grass-only pastures.

Manage pastures with legumes carefully as wynn cassia and some stylos have low palatability and can dominate pastures if grass is grazed out, causing an overall loss of production.

Clovers, medics and lucerne can also cause bloat in cattle when they make up a large proportion of an animal's diet.

Case studies have shown that introducing legumes can increase stocking rates by up to 20 percent. Of the extra income that legumes generate, 90 percent comes from the increased stocking rate and only 10 percent from the extra weight gain per beast. However, long term stability of the pasture should be considered. Many properties are already stocked to capacity even with some degree of pasture improvement.

Establishing legumes into existing pastures

Legumes can be introduced into existing native or sown pastures in a variety of ways as outlined below. Recommended planting rates vary considerably depending on the planting mix and composition of the existing pasture.

All legumes need to be inoculated at planting to ensure the correct species of rhizobia is available to fix nitrogen from the atmosphere through nodules that form on the roots. The inoculation process involves mixing the inoculant with a sticker and the seed within 24 hours of planting. The inoculant is a living material and requires careful treatment. Follow the recommendations that come with the inoculant and use it before the expiry date, after which time viability is lost.

Renovation

The grass pasture is very roughly cultivated and legume seed sown onto the surface. As the grass re-grows it competes with the legume seedlings and losses will be very high. This method is best where temperate legumes, such as clovers and medics, are sown into grass pastures in autumn. Frost will reduce the grass competition. Tropical legumes can be established this way but it is usually less successful.

Ploughed strips

Legume seed is sown on the surface of ploughed strips. The legume then spreads to the un-ploughed area by seed or runners. Usually the strips require two workings to reduce the grass competition. Strips should be ploughed on the contour and not across gully lines. Up to 20 percent of the area may be disturbed to introduce the legumes. Depending on the legume chosen, kangaroos, hares and rabbits can cause significant damage to the establishing legume plants.

Roller or drum seeders are necessary to sow uncoated, fluffy grass seeds such as buffel, Rhodes grass and creeping blue grass.

Bandseeding

A bandseeder plants, fertilises and sprays herbicide in strips in one pass. Bandseeding is better than preparing a cultivated seedbed because it is cheaper, there is less risk of soil erosion and the pasture is out of production for less time.

Only one third of the total area is sprayed. The herbicide reduces grass competition and so improves seedling survival and growth.

Another system used on various implements is a broad flat foot on a tyne. The foot cuts under the existing pasture, eliminating grass competition for the pasture seeds sown into the ploughed area.

Sod-seeding

Conventional sod-seeders do not handle rough country as well as a bandseeders do. They have difficulty in placing small seeds near the surface and do not remove grass competition without a separate spraying operation. Best results have been from sod-seeding temperate legumes (lucerne and medics) in autumn.

Crocodile seeder

This is an implement with a large cylindrical drum to which shovel-like tools are welded. Seed placed in the drum escapes through holes at each shovel as the implement is towed along. It is a cheap method of establishment and a large 4WD can tow the implement.

Surface sowing

Seed spread on the surface without preparing a seedbed is often wasted. It has to compete with the established pasture and removal by ants. The best chance of success is using medics and clovers in autumn when frosts kill off the competition and good rain is expected.

There are some good examples of lotononis sown by air at very low rates. These pastures have taken seven to ten years to become highly productive. Surface sowing is an option for seeding inaccessible areas. For example, seeds may be broadcast from the air or by hand into hilly country after a fire. Success depends on good rain after planting.

Animals

Seed fed to cattle can be spread in the manure. This is usually not economical given current seed prices and losses of highly digestible seeds, such as lotononis.

Alternatively a small plot of pure legume can be grown, grazed when seed is mature then the animals released into a suitable paddock. Hundreds of dollars of seed can be 'harvested' in this way. This is a very effective way of spreading hard seeded tropical legumes such as the stylos (e.g. fine stem stylo).

The addition of legume to a productive native pasture will often provide a worthwhile boost to livestock and pasture alike.

Establishing sown pastures

Sown pastures have the potential to improve stock production in many areas of the Burnett. Introduced grasses and legumes can rejuvenate run-down native pastures and old cultivation country.

It is not recommended to replace productive native pastures of black speargrass, Queensland blue grass or forest blue grass unless they have been overtaken by unpalatable species such as wire grass. Careful management of native pasture provides the cheapest long-term fodder source for stock. The addition of a tropical legume may be all that is needed to give native pasture a worthwhile boost (see 'Enhancing native pastures' on page 8).

New sown pastures will be the most productive for the first 3–5 years. After this, there is usually a tie-up of nitrogen in the soil and production decreases. To maintain production levels fertiliser, scarifying and adding a legume will be required.

The rules of thumb for establishing sown improved pastures are:

- better seedbed: better establishment
- sow most grass and small legume seeds on the surface
- sow when there is good soil moisture at depth
- know the quality of the seed before planting.

Selecting pasture mix

The mix of grasses and legumes planted depends on the soil or land type and on the cost and availability of seed. The 'Legumes for the inland Burnett' and 'Grasses for the inland Burnett' sections (pages 35 and 46) provide detailed information to help select suitable species. Preparation time and planning is important, it is best to plan up to 12 months in advance for a pasture planting program.

Planting times

When to plant is the most difficult decision in establishing pastures. It is always hot and dry after you plant!

Plant summer pastures from August to March. Early or late is the best option. Early rain in September will be very useful for germination and establishment, while rain may fall more reliably in January–February. Hot, dry spells from October to December often kill young seedlings.

April–May is the preferred time for temperate species such as lucerne, medics, clovers and vetches.

Grass weeds, particularly in old cropping ground, can cause establishment failures. Sometimes the pasture will not be at its best until the second year. Weeds are generally worse in spring plantings. Delaying planting until January–February is often worthwhile but do not leave it so late that short new pasture is frosted.

Pasture seeds are usually planted dry and will be dormant until the next

rain. The seed zone needs to be moist for three to four days for germination to occur. Along with surface moisture, pasture establishment relies on deeper, subsoil moisture.

Cover crops

Cover crops have been widely used to establish pastures in the inland Burnett. Cover cropping involves planting crops such as maize, oats, grain sorghum, forage sorghum and millets at half their normal seeding rates.

There are four reasons given to justify the use cover crops:

- shading to protect young seedlings on sandy soils
- suppressing weeds
- providing grazing or some cash return if the pasture fails
- reducing erosion on steep country.

Of these reasons, only minimising erosion is valid. Planting in early spring or autumn will avoid seedlings being burnt in sandy soils. Planting a cover crop thick enough to suppress weeds also suppresses the pasture. A cover crop is often grazed before the pasture has fully established. Successful pasture establishment using cover crops occurs only in good seasons. Often the cover crop will compete for moisture with the pasture, inhibiting its growth and establishment.

Seedbed preparation

Seedlings need some soil disturbance to establish. Few legumes and almost no grasses will establish in undisturbed soils, especially those with hard-setting surfaces.

Failure of sown pastures is often due to poor seedbed preparation so allow ample time to prepare a suitable seedbed. If preparation is left too late the result is often a rough, cloddy seedbed, poor weed control and little subsoil moisture. Prepare a firm seedbed for small pasture seeds.

Avoid over-cultivation of soils that are prone to setting hard or crusting after rain. These soils include many inland Burnett forest soils and some old cultivation soils that are often poorly structured and have a tendency to surface seal.

Seedbed preparation does leave soils prone to erosion so try to follow these guidelines to reduce soil loss:

- do not cultivate in gullies and drainage lines
- divert run-off water away from the cultivated ground
- leave grass strips in ploughed areas
- avoid over-working soils to produce a very fine, powdery seedbed.

Planting rates

Planting rates for legumes and grasses are provided on pages 36 and 47 respectively.

Planting methods

The planting method chosen depends on the seed type and machinery available. Often a neighbour with good pastures has the best experience for your local area. Seed can be spread using a rolling drum

seeder, fertiliser spinner or combine drill with the seed hoses removed. Other options are full cultivation, sod seeding, bandseeding and crocodile seeder. Adding a legume during pasture cropping can also have some success (see 'Enhancing native pastures' on page 8).

Planting fluffy seeds

Fluffy seeds, such as Rhodes grass and creeping blue grass, are hard to spread with some planters. To make planting easier try mixing the seed with fertiliser, cracked grain or sawdust to act as a carrier.

Another option is to purchase coated seed. If mixing with fertiliser, do not leave seed and fertiliser mixed longer than necessary. If the planting mix includes inoculated legume seed, these seeds must be pelleted before mixing with fertiliser.

Mixing seed with sieved, dry sawdust is safer than using fertiliser as the carrier. Use twice the volume of sawdust to grass seed. Calibrate the seeder using only sawdust, before adjusting with seed and sawdust. If broadcasting, only fill the hopper with enough seed for 1–2 ha to prevent bridging. Use runs 1.25–1.5 m apart and check how far the seed has thrown. It may be better to plant across the wind.

Many seed companies now offer coated seed. Using coated seed will generally make planting easier and more accurate. The coatings are lime based and contain various fertilisers. Remember to increase the planting rate to compensate for the increased weight and volume of the coated seed. A kilogram of coated seed contains less seeds per kg. To determine the required rate of coated seed multiply the seed rate in kg per ha by three.

Coated seed is advantageous if ants are likely to remove or destroy fluffy seeds. The seed coating can have insecticide added to protect the seeds from ant damage.

In the case of legumes, the rhizobia inoculant can be added when the seed is coated and will remain viable for 28 days.

Planting depth

Seed is usually placed on the surface and lightly covered with soil. To achieve the best strike with most pasture grasses and legumes do not bury the seed more than 10 mm deep. However, lucerne, purple pigeon grass and silk sorghum can be planted as deep as 25 mm.

A small seeds box or a C-seeder mounted on a combine will allow planting at two depths.

Rolling and harrowing

Rolling and/or harrowing will improve emergence on most soils. However, many old cultivation soils are poorly structured and tend to surface seal. Using a roller after planting can make crusting worse.

Harrows on their back or chains and weldmesh will cover seed from 0 to 10 mm deep, depending how rough the seedbed is. Very loose soils, such as red snuffy soils, may need rolling

before and after planting. Rolling with dual tractor wheels has proven very successful on these red soils.

Fertiliser

Old cultivation soils often have low fertility. Before investing in pasture improvement it is worth getting a soil test to determine if there are any problems. A fertiliser program can then be implemented. Phosphorus, nitrogen and potassium are the main nutrients pastures need. Many red soils in the inland Burnett are very acidic. These soils will benefit from applications of lime before planting the improved pasture. Lack of nitrogen is a common cause of poor grass growth and low nutritive value, especially on some old cultivated forest soils.

Weeds

Weeds can be a major problem when establishing pastures. They are usually worse in old cultivation ground. Ways to reduce competition from weeds include:

- Delay planting until January–February to reduce the number of grass weeds.
- Slash to reduce weeds, this will limit their growth and reduce competition for moisture.
- Use herbicides to control grass weeds. Most herbicides will damage young legumes.
- If broadleaf weeds are a major problem, another option is to plant grasses and then when they are established oversow with legumes. This way broadleaf herbicides can be used in the establishment phase of the grass.

First year management

Grazing management in the first year is critical to the establishment and long-term viability of sown pastures. There are two general approaches:

1. no grazing until the pasture seeds or
2. lightly grazing once or twice during the first summer–autumn.

Light grazing is preferable and it will provide some feed, and encourage the grasses to spread out and reduces the build up of too much growth that can smother the young grasses and legumes. Heavy grazing will permanently damage the pasture.

Allowing the pasture to seed in the first year is important only for grasses that reproduce only via seed rather than runners. Rhodes grass and creeping blue grass will fill in the gaps without seeding.

Frosted pasture can be grazed. After spring rain, allow a build up of feed before grazing. Planning a forage sorghum crop for this time can give pastures a break.

More pastures are destroyed in the first year due to overgrazing than for most other reasons. Sown pastures are not indestructible.

Inland Burnett land types

There are 20 land types identified for the inland Burnett area. Land management recommendations are provided in this section.

Bastard scrub

Land resource area	Volcanic uplands, red tablelands
Landform	Ridge crests; broad ridges; some scarp areas; upper, mid and lower slopes of undulating rises and low hills. Commonly slopes 3-10%, occasionally steep10-25% slopes, and in minor areas as steep as 45%.
Woody vegetation	Open forest to closed scrubs of softwood species (vines, bottle trees, white cedar, crows ash, figs) and / or hoop pine and / or narrow-leaved ironbark open woodland. Other species may occur include Burdekin plum, Yarraman ironbark, gum-topped box, spotted gum, grey gum, brush box, swamp mahogany, Queensland blue gum.
Expected native pasture composition	
Preferred	Black speargrass, Queensland bluegrass, kangaroo grass, hooky grass, leafy panic
Non-indicator	Slender chloris, western rat's tail grass
Non-preferred	Wiregrasses (e.g. dark), purple lovegrass, reed grass
Legumes	Woolly glycine, glycine pea
Suitable sown pastures	Rhodes grass, creeping bluegrass, green panic

Blue gum on cracking clays

Land resource area	Floodplains
Landform	Broad, low sloping floodplains on valley floors
Woody vegetation	Tall open forest of Queensland blue gum and Moreton Bay ash with occasional broad-leaved apple, silver-leaved ironbark, rough-barked apple and broad-leaved ironbark. Understorey usually absent.
Expected native pasture composition	Southern black speargrass pastures
Preferred	Black speargrass, forest bluegrass, Queensland bluegrass, scentedtop, hairy panic
Non-indicator	Spring grass, liverseed (urochloa) grass, bamboo speargrass, umbrella grass
Non-preferred	Wiregrasses (e.g. dark), small burrgrass (annual), slender chloris
Legumes	Woolly glycine, rhynchosia, glycine pea, creeping tick trefoil
Suitable sown pastures	Creeping bluegrass, Rhodes grass

Blue gums on granite

Land resource area	Granite hills
Landform	Undulating rises to rolling hills
Woody vegetation	Open forest to woodland of Queensland blue gum, silver-leaved ironbark and narrow-leaved ironbark. Understorey of wattle and minor beefwood.
Expected native pasture composition	Southern black speargrass pastures
Preferred	Black speargrass, red natal grass, silky umbrella grass, native millet
Non-indicator	Pitted bluegrass grass, bottlewashers, slender chloris, barbwire grass
Non-preferred	Golden beard grass, comet grass
Legumes	Emu foot, glycine pea
Suitable sown pastures	Creeping bluegrass

Blue gum on loams and duplexes

Land resource area	Floodplains, terraces
Landform	Levees and levee backslopes along major streams and rivers, and the upper slopes of gently undulating relict alluvial plains and high terraces.
Woody vegetation	Tall open forest to woodland of Queensland blue gum and Moreton Bay ash or Queensland blue gum and rough-barked apple with occasional silver-leaved ironbark and narrow-leaved ironbark. Understorey usually absent.
Expected native pasture composition	Southern black speargrass pastures
Preferred	Black speargrass, Queensland bluegrass, kangaroo grass, hooky grass, leafy panic
Non-indicator	Slender chloris, western rat's tail grass
Non-preferred	Wiregrasses (e.g. dark), purple lovegrass, reed grass
Legumes	Woolly glycine, glycine pea
Suitable sown pastures	Rhodes, creeping bluegrass, green panic

Box on clay

Land resource area	Floodplains
Landform	Backplains and levee backslopes of alluvial plains and creek flats.
Woody vegetation	Tall open woodland to open forest of poplar box gum-topped box, broad-leaved apple. Understorey often absent.
Expected native pasture composition	Southern black speargrass pastures
Preferred	Black speargrass, forest bluegrass, Queensland bluegrass, scentedtop, paspalum
Non-indicator	Pitted bluegrass, barbwire grass
Non-preferred	Wiregrasses (e.g. dark), small burrgrass
Legumes	Woolly glycine, rhynchosia, glycine pea
Suitable sown pastures	Creeping bluegrass, Rhodes grass

Box on erosive soils

Land resource area	Terraces
Landform	Broad low sloping, higher lying relict alluvial plains.
Woody vegetation	Open forest or woodland of poplar box, narrow-leaved ironbark, gum-topped box and occasionally rusty gum. Understorey usually absent, occasionally wilga and wattles.
Expected native pasture composition	Wiregrass – pitted bluegrass pastures
Preferred	Black speargrass, forest bluegrass, Queensland bluegrass, scentedtop
Non-indicator	Spider grass, bottlewashers, silky umbrella grass
Non-preferred	Wiregrasses (e.g. dark), small burr grass, slender chloris
Legumes	Woolly glycine, rhynchosia, emu foot, creeping tick trefoil
Suitable sown pastures	Creeping bluegrass, Rhodes grass

Brigalow and brigalow belah

Land resource area	Undulating plains, relict alluvial plains
Landform	Gently undulating relict alluvial plains and higher lying level plains, and most slope positions on undulating low rises (slopes 1% to 4%).
Woody vegetation	Brigalow and brigalow belah open forest in association with wattles, wilga and softwood scrub.
Expected native pasture composition	Brigalow pastures
Preferred	Brigalow grass, Queensland bluegrass, hooky grass, leafy panic
Non-indicator	Slender chloris, western rats' tail grass
Non-preferred	Dark wiregrass, purple lovegrass
Legumes	Woolly glycine, glycine pea
Suitable sown pastures	Green panic, Rhodes grass, buffel, stylos, siratro, leucaena

Brigalow melonhole

Land resource area	Relict alluvial plains
Landform	Higher lying level plains, and mid slopes and crests of broad low rises.
Woody vegetation	Brigalow, black tea tree belah open forest.
Expected native pasture composition	Brigalow pastures
Preferred	Brigalow grass, Queensland bluegrass, silky browntop
Non-indicator	Native millet, spring grass, umbrella canegrass, slender chloris
Non-preferred	Wiregrasses (e.g. dark), tall chloris
Legumes	Woolly glycine, rhynchosia
Suitable sown pastures	Creeping blue grass, Rhodes grass, green panic, buffel grass

Gum-topped box

Land resource area	Terraces and relict alluvial plains
Landform	Slightly elevated level to gently undulating relict floodplains, backplains and slightly higher terraces of major streams.
Woody vegetation	Open forest to woodland of gum-topped box, narrow-leaved ironbark and poplar box, with scattered rusty gum and Queensland blue gum. Occasional understorey of wattles, myrtle and beefwood.
Expected native pasture composition	Wiregrass – pitted bluegrass pastures
Preferred	Black speargrass, forest bluegrass, barbwire grass, kangaroo grass, pitted bluegrass grass
Non-indicator	Spider grass (native couch), bottlewashers, umbrella grass
Non-preferred	Wiregrasses (e.g. dark), small burrgrass, slender chloris
Legumes	Woolly glycine, emu foot, creeping tick trefoil
Suitable sown pastures	None suitable

Ironbark & bloodwood on non-cracking clays

Land resource area	Volcanic uplands
Landform	Undulating rises and mid to lower slopes of low hills and ranges.
Woody vegetation	Woodlands of silver-leaved and narrow-leaved ironbarks and variable–barked bloodwood with occasional Queensland blue gum and areas of softwood scrub. Understorey usually absent.
Expected native pasture composition	Southern black speargrass pastures
Preferred	Black speargrass, forest bluegrass, Queensland bluegrass, scentedtop, paspalum
Non-indicator	Pitted bluegrass, Indian couch, barbwire grass, silkyheads
Non-preferred	Wiregrasses (dark, kerosene), slender chloris, woodland lovegrass
Legumes	Woolly glycine, rhynchosia, emu foot, creeping tick trefoil
Suitable sown pastures	Creeping bluegrass, Rhodes grass

Ironbark & spotted gum on duplex and loams

Land resource area	Uplands sediments
Landform	Gently to moderately inclined, undulating plains to slopes and rises of low hills (slopes 3-12%), with areas of steep hills (up to 40%).
Woody vegetation	Woodland to open forest of narrow-leaved ironbark and spotted gum, occasionally bloodwood, with an understorey of wattle and whitewood.
Expected native pasture composition	Southern black speargrass pastures
Preferred	Black speargrass, forest bluegrass, Queensland bluegrass, scentedtop, paspalum
Non-indicator	Pitted bluegrass, Indian couch, barbwire grass, silkyheads
Non-preferred	Wiregrasses (e.g. dark, kerosene), woodland lovegrass, slender chloris
Legumes	Woolly glycine, emu foot, creeping tick trefoil, rhynchosia
Suitable sown pastures	Rhodes grass, creeping bluegrass

Ironbark on basalt upper slopes and benches

Land resource area	Basalt rises
Landform	Upper slopes and crests, including those on ridges, of undulating to low rises to steep hilly terrain and stony knolls.
Woody vegetation	Woodland or open forest of silver-leaved and/or narrow-leaved ironbarks in association with Queensland blue gum, variable-barked bloodwood, mountain coolibah and Moreton Bay ash. Understorey is usually absent.
Expected native pasture composition	Southern black speargrass pastures
Preferred	Black speargrass, forest bluegrass, Queensland bluegrass, scentedtop, hairy panic
Non-indicator	Spring grass, liverseed (urochloa) grass, bamboo speargrass, umbrella grass
Non-preferred	Wiregrasses (e.g. dark), small burrgrass (annual), slender chloris
Legumes	Rhynchosia, creeping tick trefoil, glycine pea, woolly glycine
Suitable sown pastures	Rhodes, panic (green), creeping bluegrass, buffel, purple pigeon grass

Mixed open forest on duplexes and loams

Land resource area	Basalt rises, volcanic uplands, terraces, relict alluvial plains, red tablelands
Landform	Widespread occurrence on mid, lower and upper slopes and crests of low basalt rises and stony knolls; upper slope positions on relict alluvial plains; mid and lower slopes of undulating plains and low hills, and mid to upper slopes of broad rises.
Woody vegetation	Open forest or woodland of gum-topped box, silver-leaved ironbark, narrow-leaved ironbark, with occasional Queensland blue gum, broad-leaved apple, pink bloodwood and spotted gum. Scattered occurrences of rusty gum, and wattle and dogwood.
Expected native pasture composition	Southern black speargrass pastures
Preferred	Black speargrass, Queensland bluegrass, kangaroo grass, hooky grass, leafy panic
Non-indicator	Slender chloris, western rat's tail grass
Non-preferred	Wiregrasses (e.g. dark), purple lovegrass, reed grass
Legumes	Woolly glycine, glycine pea
Suitable sown pastures	Rhodes grass, creeping bluegrass, green panic

Narrow-leaved ironbark on granite

Land resource area	Granite hills
Landform	Undulating rises to rolling hills.
Woody vegetation	Open forest to woodland of narrow-leaved ironbark, silver-leaved ironbark and Queensland blue gum and wattles.
Expected native pasture composition	Southern black speargrass pastures
Preferred	Black speargrass, red natal grass, barbwire grass, silky umbrella grass, hairy panic
Non-indicator	Pitted bluegrass grass, niggarheads, bottlewashers, woodland lovegrass
Non-preferred	Wiregrasses (e.g. dark, erect kerosene), reed grass, golden beard grass
Legumes	Woolly glycine, emu foot, glycine pea
Suitable sown pastures	None suitable

Narrow-leaved ironbark and wattles

Land resource area	Ranges
Landform	Crests and slopes of steep hills and mountains.
Woody vegetation	Woodland to open forest of narrow-leaved ironbark, silver-leaved, bloodwood, and spotted gum. If understorey present often wattles, rosewood, whitewood or beefwood.
Expected native pasture composition	Southern black speargrass pastures
Preferred	Black speargrass, barbwire grass, pitted bluegrass, native oatgrass, kangaroo grass
Non-indicator	Many-headed grass, kerosene grass, bottlewashers
Non-preferred	White speargrass
Legumes	Narrow-leaved indigo, glycine pea
Suitable sown pastures	None suitable

Silver-leaved ironbark on cracking clays

Land resource area	Basalt rises
Landform	Undulating plains to rolling hills.
Woody vegetation	Open forest or woodland of silver-leaved ironbark and Queensland blue gum with occasional narrow-leaved ironbark, variable-barked bloodwood. Understorey is usually absent.
Expected native pasture composition	Southern black speargrass pastures
Preferred	Black speargrass, forest bluegrass, Queensland bluegrass, scentedtop, paspalum
Non-indicator	Native millet, hairy panic, barbwire grass, slender chloris
Non-preferred	Wiregrasses (e.g. dark), small burr grass (annual)
Legumes	Woolly glycine, rhynchosia, glycine pea
Suitable sown pastures	Creeping bluegrass, Rhodes grass

Silver-leaved ironbark on granite

Land resource area	Granite hills
Landform	Undulating rises with broad hill crests on granite.
Woody vegetation	Open forest to woodland of silver-leaved ironbark, narrow-leaved ironbark and Queensland blue gum. Understorey of wattles and minor beefwood.
Expected native pasture composition	Southern black speargrass pastures
Preferred	Black speargrass, red natal grass, barbwire grass
Non-indicator	Pitted bluegrass grass, many-headed wiregrass, silky umbrella grass, feathertop Rhodes grass
Non-preferred	Dark wiregrass, reed grass, golden beard grass
Legumes	Rattlepods, Birdsville indigo, glycine pea
Suitable sown pastures	Creeping bluegrass

Softwood scrub

Land resource area	Undulating plains, red tablelands
Landform	Mid to upper slopes and crests of gently sloping remnant plateaus and near scarp margins; slopes below scarps; and low hills adjacent to plateau remnants.
Woody vegetation	Softwood scrub (vines, bottle trees, white cedar, crows ash, figs) and open forest to open woodland of narrow-leaved ironbark in association with blue gum, blackbutt, spotted gum, Gympie messmate, grey gum, tallowwood or Yarraman ironbark depending on landscape position. Occasional bloodwoods, rusty gums, she-oaks and silver-leaved ironbarks with an understorey of wattles, red ash and dogwood.
Expected native pasture composition	
Preferred	Green panic
Non-indicator	
Non-preferred	Wiregrasses
Legumes	Woolly glycine, glycine pea
Suitable sown pastures	Green panic, Rhodes grass, buffel, stylos, siratro, leucaena

Spotted gum ridges

Land resource area	Ranges
Landform	Crests and hillslopes of undulating rises to low hills to mountains.
Woody vegetation	Spotted gum open forest or woodland frequently associated with narrow-leaved ironbark. Other species that may occur include bloodwoods, rusty gum, and gum-topped box. An understorey may include red ash, currant bush, grevilleas and wattles.
Expected native pasture composition	Wiregrass – pitted bluegrass pastures
Preferred	Black speargrass, barbwire grass, pitted bluegrass, native oatgrass, kangaroo grass
Non-indicator	Erect kerosene grass, kerosene grass, silkyheads
Non-preferred	Dark wiregrass, five minute grass, comet grass
Legumes	Rattlepods, glycine pea
Suitable sown pastures	None suitable

Tall open forest of snuffy soils

Land resource area	Red tablelands
Landform	Upper slopes and crests of plateau remnants and some low rises.
Woody vegetation	Closed softwood scrub associated with open forest of narrow-leaved ironbark, grey gum, tallowwood, Gympie messmate and Yarraman ironbark with occasional bloodwoods, spotted gums and understorey of wattles and red ash.
Expected native pasture composition	Southern black speargrass pastures
Preferred	Black speargrass, Queensland bluegrass, kangaroo grass, hooky grass, leafy panic
Non-indicator	Slender chloris, western rat's tail grass
Non-preferred	Wiregrasses (e.g. dark), purple lovegrass, reed grass
Legumes	Woolly glycine, glycine pea
Suitable sown pastures	Rhodes grass, creeping bluegrass, green panic

Legumes for inland Burnett pastures

Select legumes based on their suitability for the soil type and their suitability for the production system. Table 4 lists the legumes recommended for the inland Burnett district. Ask for advice on the species or planting mix most likely to provide good quality feed during peak production periods. Descriptions are provided outlining the characteristics of each species.

Recommended planting rates and inoculant

Recommended planting rates vary considerably. If a legume is used in a mix of other legumes the lower rate would be used whereas the higher rate would be planted if the legume is being used as a single species planting. Adjust the planting rate if using coated seed (see Table 5).

Many tropical legumes are hardseeded. This characteristic enables the seed to remain in the soil for long periods and to germinate when conditions are favourable. Most hardseeded legumes are resistant to fire. To encourage germination of these seeds in a sown pasture it is often beneficial to 'scarify' or 'scar' the seed coat. Seed companies generally do this if necessary.

Table 4 – Legumes for inland Burnett soils

Soil	Suitable legumes
Scrub	Wynn cassia, leucaena, white clover (Haifa), lotononis, fine stem stylo, serradella, vetch, lucerne
Red forest	Wynn cassia, lucerne, leucaena, white clover, lotononis, fine stem stylo, serradella, vetch
Brown forest	Lucerne, white clover, lotononis, wynn cassia, vetch, medics, seca stylo
Black forest (ironbark)	Lucerne, medics, desmanthus, white clover, leucaena, vetch, siratro, seca stylo
Black alluvial (blue gum)	Lucerne, medics, white clover, desmanthus, vetch, maku lotus, strawberry clover, siratro
Hardsetting (box trees)	Lotononis, seca stylo
Sandy surface (ironbark)	Seca stylo, lotononis, wynn cassia, fine stem stylo, siratro, serradella, vetch
Stony ridges (spotted gum)	Seca stylo, lotononis, wynn cassia, fine stem stylo

Table 5 – Recommended planting rates for legumes

Species	Planting rate	Rhizobium inoculant
Annual medics	0.3–2 kg/ha in pastures. Up to 8 kg/ha for snail medic forage cropping.	Group AM
Burgundy bean	3–5 kg/ha. Seed coat needs scarifying.	CB1717
Butterfly pea	3–4 kg/ha	Tropical group M
Clover	0.3–1 kg/ha	Group B, TA1
Desmanthus	2 kg/ha. Seed coat needs scarifying.	CB3126
Forage peanuts	Main variety is Pinto which can be planted by seed or runners. Prine needs to be planted from runners.	CIAT 3101
Lab lab	12–20 kg/ha for single sowing with grass; 5–8 kg/ha if sown with other legumes.	Group J
Leucaena	2–2.5 kg/ha	Leucaena, CB81
Lotononis	0.1–0.25 kg/ha. Also established via runners or cattle dung.	Group L, CB376
Lucerne	1–6 kg/ha	Group A, CC169
Maku lotus	2–3 kg/ha	Group D, CC829
Siratro	0.5–2 kg/ha. Seed coat needs scarifying.	Group M
Serradella	8 kg/ha of podded seed.	Group G, WU425
Stylo, fine stem	2–5 kg/ha. Seed coat needs scarifying.	CB82, CB1650, CB1552
Stylo, shrubby	1–2 kg/ha. Seed coat needs scarifying.	Group S but will readily combine with native rhizobia
Vetch	2–4 kg/ha	Group E, SU391
Wynn cassia	0.3–1 kg/ha	Group M

photo: David Gramshaw

Annual medics

Medicago spps

Many types of medics have been trialled in the inland Burnett including barrel medic (*M. trunculata*), common burr medic (*M. polymorpha*) and snail medic (*M. scutella*). These are winter/spring annuals and grow well with early spring rainfall.

They are suited to clay or loam soils with a neutral to high pH. The snail medics such as Sava and Kelson can be used in crop-pasture rotations while the barrel medics such as Jemalong, Cyperus and Paraggio perform best in pastures. Autumn, after the threat of hot weather has passed, is the best time for planting.

Generally, snail medics have not persisted well in the inland Burnett, but burr medics are common.

Medics will do best in wet winters. Bloat can be a problem if there is a large bulk of these legumes. Barrel medics are a worthwhile addition to wheat crops to improve productivity and grazing on harvested stubble. Seed is generally not expensive and they have been found to be very beneficial for stock.

Burgundy bean

Macroptilium bracteatum

Burgundy bean is a summer-growing, twining perennial with dark red to burgundy flowers.

It was selected for use on clay soils. It is drought tolerant and has survived for up to three years on shallow clay soils.

It has the ability to germinate and grow earlier in the season than other tropical legumes. It is susceptible to frost.

It is very palatable to stock and needs spelling to allow it to go to seed and persist in pastures. Burgundy bean is well suited to sandy loams and clay loams. Tolerates slightly acid to alkaline soils.

Seeds are large and can germinate in less-than-ideal conditions. It can be hard seeded and the seed coat may require scarifying to ensure adequate germination. There are two varieties of burgundy bean that are marketed together: Cardarga is an upright growing plant; Juaninta has 19% protein.

Butterfly pea

Clitoria ternata

Butterfly pea is a tropical summer-growing, twining perennial with mauve to blue flowers. It can vary in appearance depending on the growing conditions. Commonly used as an ornamental garden creeper.

Butterfly pea grows well on a variety of soil types but performs best on heavy alkaline black clay soils.

This tropical plant will not persist in cold areas subject to heavy frosts. In the inland Burnett it needs to be planted high in the landscape and be well established to survive winter frosts.

It is a very palatable, excellent quality fodder that is also suitable for hay.

Milgarra is the main variety. This variety has some tolerance to flooding and waterlogging.

Clover

Trifolium spps

There are a number of clovers available but generally white clover has been the most successful in the inland Burnett.

Clovers are temperate legumes suited to high moisture situations, but are worth planting because they are productive in wet winters and early in spring. Clovers are the most persistent legume in kikuyu pastures.

The main variety is Haifa. There are many other varieties but availability varies. Choose a variety suited to the sub-tropics.

Desmanthus

Desmanthus virgatus

Desmanthus is a summer-growing, woody perennial shrub. It usually grows to around 70 cm in height but can grow as tall as 1.5 m. Its taproot grows to a depth of 0.5 m. Desmanthus grows on a wide variety of soils but is best suited to alkaline duplex and cracking clay soils. Frost will defoliate the shrubs but it will re-grow from established crowns after frosting provided there is sufficient soil moisture.

The seed coat is very hard and established stands should be allowed to set seed for two years to build up seed reserves. Once established it will tolerate heavy grazing. Desmanthus is palatable to cattle but not as favoured as leucaena.

The three cultivars, Marc, Bayamo and Uman varieties, have short, mid season and late season flowering respectively. They are marketed as one under the name Jabiru.

Desmanthus has an average crude protein of 21%.

Forage peanuts

Arachis spps

Forage peanuts have not been used widely in inland Burnett pastures because they are sensitive to cooler conditions. They may do well in protected situations.

There are two main varieties. Pinto is grown from seed and is used in coastal areas as a horticultural ground cover. Prine is grown from cuttings and has been trialled in the dairy industry in Central Queensland.

Lab lab

Lablab purpureus

Lab lab is a summer growing annual that occasionally persists as a short-lived perennial It is a vigorous robust trailing and twining plant. Stems grow to 3–6 m in length.

It is an ideal plant for grazing and cropping rotations or as an addition to forage crops. It performs well as a green manure crop and has very good forage quality for grazing or as hay.

Lab lab does not tolerate frost but will grow in a wide range of soils from deep sands to heavy clays, provided drainage is good and the pH is 4.5–7.5. Lab lab has an average crude protein of 26%.

There are two varieties. Rongai has white flowers and is a late-flowering, with high dry matter production. Highworth is an earlier-flowering variety originally intended for grain production. It has purple flowers and black seeds.

Lab lab is an excellent addition to summer fodder crops

Leucaena

Leucaena leucocephala

Leucaena is a tree legume needing deep, fertile, well drained soil. Mature trees grows to 18 m high but should be kept lower in a grazing situation. It does best in areas with minimal frost. Leucaena is slow to establish and needs careful weed management in the early stages.

Leucaena is costly to establish but very productive. Well managed stands in the Burnett have remained productive for over 30 years. Leucaena can be toxic to cattle. Inoculate cattle grazing leucaena with a rumen bacteria to ensure digestibility of the plant.

There are three main varieties. Peru is one of the original varieties introduced by CSIRO. Cunningham is more highly branched and 30% higher yielding than Peru. Tarramba establishes more rapidly, and is marginally more psyllid-resistant and cool-tolerant than Peru and Cunningham.

Leucaena has potential to be an invasive weed if not managed correctly. The Leaucaena Network has a Code of Practice for members to follow to avoid weed problems.

For more information on leucaena it is recommended to read the Meat & Livestock Australia publication *Leucaena - A guide to establishment and management.* The Leucaena Network also provides valuable information about establishing and managing plantations (www.leucaena.net).

Lotononis

Lotononis bainesii

Lotononis is an early summer-growing perennial with moderate frost tolerance. It prefers lighter well drained soils but is found on a variety of soil types; gravelly, sandy and loamy soils, but not generally on clays.

It has yellow flowers and is a low growing, very palatable species, common on roadsides in the inland Burnett. It tolerates low fertility soils and heavy grazing. It is slow, and often difficult, to establish due to hard seeds, but persists once established.

Lotononis spreads by both runners and seed. It does not do well if it is shaded out by taller grasses particularly those with runners. It performs well under rotational grazing regimes. Lotononis has an average crude protein range of 9–25%.

Lucerne

Medicago sativa

Lucerne is the king of fodder crops. It is a perennial suited to fertile, deep, well drained soils. It does not persist well on shallow or acidic soils.

All lucerne cultivars are summer-growing, but some cultivars are more winter-active than others. As a result, cultivars can be described as winter-dormant, semi winter-dormant, winter-active, and highly winter-active.

Growth in semi-dormant and dormant cultivars slows down during the colder months. Generally these types have lower crowns and are more persistent in dryland grazing systems.

Highly winter-active cultivars will provide year-round feed with only a slightly reduced production in winter, especially if they are irrigated. Winter-active cultivars fall between these extremes. They have moderate winter growth and are moderately persistent under grazing.

Bloat can be a problem in pastures containing a high proportion of lucerne. Rotational grazing is essential to maintain plant population.

Choose a lucerne variety that suits your situation, there are many cultivars available bearing in mind the semi-dormant and dormant cultivars are best and most persistent for dry land pastures.

Maku lotus

Lotus pedunculatus

This is a perennial that is suited to waterlogged areas. It has a variable growth habit depending on the environment, growing up to 60 cm high.

This legume needs very good moisture levels but is tolerant of frost, heavy grazing and low fertility acid soils. It has poor drought tolerance but does not cause bloat.

photo: David Gramshaw

Serradella

Ornithopus compressus

Serradella is a winter/spring annual for deep, light well-drained soils and acidic sandy soils. It is a non-bloating legume. Seradella has not been planted widely in the inland Burnett but does have some potential in southern areas.

The Maderia and Santorini varieties of yellow serradella are recommended for southern Queensland.

Slender serradella, the Jebala variety, flowers mid-season and is hardseeded. It can tolerate poorly drained soils (shallow, stony soils that can become very wet) better than yellow serradella, and can produce a good bulk of forage in late spring.

Siratro

Macroptilium atropurpurem

Siratro is a perennial vine with a deep, swollen taproot and trailing, climbing and twining stems.

It grows on a wide range of soils from dark cracking clays to sands and gravels, but does best on more fertile soils. It is sensitive to frost and rust but is drought resistant.

Siratro persists best under rotational grazing and requires spelling to set seed to ensure persistence. Siratro seed requires scarification before planting. It has an average crude protein of 25%. The Aztec variety is rust resistant.

Stylo, fine stem

Stylosanthes guianensis var. intermedia

Fine stem stylo is a low growing (up to 30 cm high) perennial with fine hairs visible on the stems. It is tolerant of cold, fire and heavy grazing. It needs deep, free draining sandy soils to perform best.

Fine stem stylo is palatable to stock and responds well to regular grazing. It may be lost from a pasture if it is shaded out by tall grasses. Its resistance to fire makes fine stem stylo a useful addition to native pastures. Cattle will spread the seed in their dung once it is established.

It is hard seeded so seed requires scarification before planting. Establishment is usually slow. Fine stem stylo has an average crude protein of 16%.

Stylo, shrubby

Stylosanthes scabra

Shrubby stylo is a perennial shrub legume that grows to 2 m tall with a long taproot. It is tolerant of heavy grazing and drought. Plants are slow to grow in the first year and can become very woody with age.

Shrubby stylo is sensitive to heavy frosts and waterlogging. It has hard seeds so establishment is slow if the seed is not scarified. Seed will spread over time in manure of stock and in pods attached to hair.

The two varieties, Seca and Siran, are suited to a wide range of soils except for heavy clays. Caatinga stylo is more suited to heavier clay soils.

Vetch

Vicia villosa ssp dasycarpa

Vetch is a spring growing annual suited to most soils except those susceptible to waterlogging and those that set very hard. It is a good pioneer species but needs to be spelled to allow seed to set. There is a local native spurred vetch that is common in inland Burnett pastures.

The main varieties are Namoi, Woolly pod and Poppany.

Wynn cassia

Chamaecrista rotundifolia

Wynn cassia is a tropical legume that is quick to establish and seeds well. It often dies in winter and returns from seed. It is susceptible to frost and drops leaves under drought conditions.

It prefers lighter soils and can withstand heavy grazing. Palatability is a problem in some areas and pastures must be managed carefully to ensure grass is not overgrazed. Wynn cassia has the potential to form a pure sward leaving no grasses if the pasture is overgrazed. It has been used to make hay in some coastal areas.

Grasses for inland Burnett pastures

Select grasses based on their suitability for the soil type and their suitability for the production system. Table 6 lists the grasses recommended for the Inland Burnett district. Ask for advice on the species or planting mix most likely to provide good quality feed during peak production periods. Descriptions are provided outlining the characteristics of each species.

The best mix of pasture will depend on cost and availability of seed. The planting rates given vary, with the higher rates for single species planting and lower rates for mixes of species. Rates are for uncoated seed.

Table 6 – Introduced grasses for the inland Burnett

Soil	Tree type	Pasture grass
Scrub	Scrub	Rhodes grass, creeping blue grass, kikuyu, digit grass, panic, paspalum, purple pigeon grass
Red forest	Narrow leaf ironbark	Rhodes grass, creeping blue grass, digit grass, kikuyu, silk sorghum, paspalum, purple pigeon grass, pangola
Brown forest	Narrow leaf ironbark	Rhodes grass, creeping blue grass, digit grass, purple pigeon grass, silk sorghum, paspalum, pangola
Black forest	Broad leaf ironbark	Rhodes grass, creeping blue grass, purple pigeon grass, silk sorghum, bambatsi, paspalum, Swann blue grass
Black alluvial	Blue gum	Rhodes grass, kikuyu, bambatsi, purple pigeon grass, silk sorghum, paspalum, Floren blue grass, Sabi grass
Hardsetting duplex	Gum top box	Rhodes grass, creeping blue grass
Sandy surface	Ironbark	Creeping blue grass, Rhodes grass, digit grass, pangola, Indian blue grass
Stony ridge	Spotted gum, wattles	Rhodes, creeping blue, digit grass, Indian blue grass

Recommended planting rates

Table 7 – Recommended planting rates for grasses

Grass	Planting rate	Comments
Bambatsi	2–4 kg/ha	seeds have long dormancy
Buffel grass	1–4 kg/ha	fluffy seed
Blue grass (creeping)	1–4 kg/ha	fluffy seed
Blue grass (Floren)	2–4 kg/ha	suited to alkaline soils
Blue grass (Indian)	3–4 kg/ha	suited to low fertility soils
Blue grass (Swann forest)	2 kg/ha	fluffy seed
Digit grass	2–4 kg/ha	can spread by stolons
Kikuyu	0.5–1 kg/ha	spreads by runners
Panic	3–5 kg/ha	shade tolerant
Pangola	n/a	propagate via runners only
Paspalum	2–4 kg/ha	sticky seeds spread by animals
Purple pigeon grass	2–4 kg/ha	seeds have long dormancy
Rhodes grass	2–4 kg/ha	fluffy seed, most spread by runners
Sabi grass	1–4 kg/ha	seed readily available
Silk sorghum	2–4 kg/ha	responds to warmer soil temperature

Bambatsi

Panicum coloratum var. makarikariense

Bambatsi is also known as makarikari grass. It has distinctive bluish leaves with a white mid-rib. The foliage grows to a height of 70 cm. Bambatsi spreads by seeds and stolons.

It is slow to establish, but tolerates light frosts and is very persistent once established. It is well adapted to heavy, self-mulching black clay soils, black soil creek flats and melon hole country, it is tolerant of temporary waterlogging, flooding, drought and moderate soil salinity.

Bambatsi is cold tolerant and has high forage quality. It has a lower nitrogen requirement than green panic. Seeds can have a long dormancy period. Photosensitization has occurred in sheep, goats, cattle and horses grazing Bambatsi but it is rare. Bambatsi is very palatable with crude protein ranging from 5–19%.

Buffel grass

Cenchrus ciliarus

Buffel grass is very widely planted in central and western Queensland. It requires fertile soils and responds quickly to rain with excellent production. Plants will grow to 2 m high depending upon cultivar.

It is drought tolerant but can be slow to establish. Fresh seed has a period of dormancy. The seed is fluffy and difficult to sow in conventional seeding equipment unless pelleted. Buffel grass is not generally adapted to southern areas of the inland Burnett but will grow more widely in the northern areas. It is often worthwhile planting buffel grass on elevated red soils in the South Burnett. Buffel grass has an average crude protein of 6–16%. If it is their sole diet, buffel grass can cause a disease called 'bighead' in horses.

There are many varieties but the main ones grown in the inland Burnett are Biloela (the main tall variety now available), Gayndah (more prostrate and dense tillered) and American/USA (similar to Gayndah but has a longer flowering season).

Blue grass (creeping)

Bothriochloa insculpta

Creeping blue grass is a perennial, stoloniferous tussock grass that grows to 0.9 m tall. The seed and leaves have a strong scent when crushed. It grows well on low fertility soils, but not on waterlogged soils or very heavy clays.

When growing on black soil creek flats creeping bluegrass can be unpalatable. Its main growth occurs in summer/autumn. It is tolerant of heavy grazing on most soils and has been cut for hay in the inland Burnett. There is slow regrowth in spring.

Seed is fluffy and difficult to spread unless coated. It generally takes more than one season to establish. Average crude protein levels range from 10% at the beginning of the growing season to 5% at the end of the season. Creeping blue grass is useful for erosion control.

The varieties suited to the inland Burnett are Hatch, Bisset and Alpha. Hatch is long stemmed and more robust than the other varieties, runners do not root down. Bisset sends roots down from runners, is finer stemmed and flowers later than the other varieties. It is more palatable than Hatch. Alpha flowers earlier than other varieties but continues to flower throughout the season. It spreads well from runners.

Blue grass (Floren)

Dicanthium aristatum

Floren blue grass is a selected line of the introduced species angleton grass which is common in Queensland. Floren blue grass is not widely planted in the inland Burnett at present.

It is a late maturing, palatable perennial growing to a height of 1.8 m with a vigorous, spreading growth habit. Floren blue grass is suited to alkaline, cracking clay soils.

On the Darling Downs it is used extensively to compete with the weed lippia. Floren blue grass will tolerate flooding and saline conditions. It is palatable after frosting and persists well under heavy grazing.

Blue grass (Swann forest)

Bothriochloa bladhii subsp. *glabra*

Swann forest blue grass is a perennial tussock grass growing to 80 cm, generally with unbranched stems. The seedhead is green to purplish that, along with the leaf, has a distinctive odour when crushed. Swann forest blue grass makes good hay if it is cut before flowering but loses quality after that point. The main flowering is late in the season.

This sub species of blue grass has its origins in India and is different to Burnett blue grass, or native forest blue grass, *Bothriochloa bladhii*.

Swann forest blue grass grows well on both fertile and infertile soils but not on soils with high aluminium levels such as the red acid soils. The seed is fluffy and therefore difficult to sow. Maximum germination is reached 6–7 months after maturation. It has an average crude protein level range of 7–14%. It is susceptible to leaf rust and not as palatable as some other summer grasses.

Swann forest blue grass is more widely adapted than the native forest blue grass. It is palatable, tolerates heavy grazing and survives seasonal frosting.

Blue grass (Indian)

Bothriochloa pertusa

Indian blue grass is a creeping stoloniferous and/or tufted perennial, commonly with pink to red stolons and upright stems. It grows to 50 cm before flowering and is 90 cm at maturity.

The leaf blades are greyish green and aromatic when crushed. The seedhead is purplish.

This grass is not widely planted in the inland Burnett at present however it is very common in northern Queensland where it has replaced speargrass. It is less palatable than many native grasses. It is generally unpalatable after flowering but is eaten readily when young and green.

Indian blue grass tolerates a wide range of soil types but should only be considered for poorer soils where options for other sown grasses are limited. It is a very successful coloniser due to its tolerance of low fertility soil and heavy grazing. This grass can produce significant quantities of seed.

In some areas it is considered a weed of pastures, although its presence is usually a symptom of declining fertility and excessive grazing. When young this grass can have a crude protein level up to 12% but when averaged with flowering plants the average crude protein drops to around 3–4%.

There are three varieties of Indian blue grass. Medway was selected for leaf and length of flowering. It is a more robust type, best adapted to lower rainfall areas. Keppel is late flowering with leafy runners and fine stems. Dawson is low growing and used as a turf grass.

Digit grass

Digitaria milanjiana

Digit grass grows to 1.5 m. It is suited to low fertility soils but may need phosphorus and potassium on less fertile soils. It is very palatable, has early growth in spring and is drought hardy. It can spread by stolons. It may not establish well on heavy soils. Average crude protein ranges from 8 to 12%. There are four varieties available. Jarra grows to 1.8 m with broad dark green to purple leaves. Jarra does better in higher rainfall areas. Strickland grows to 1.5 m and has grey green leaves. It is more drought tolerant than Jarra.

Premier Digitaria has performed well with legumes and nitrogen on infertile soils, but it looses productivity when nitrogen declines.

Apollo is a more recent release of Digitaria and gives more spring feed in frost free conditions.

Kikuyu

Pennisetum clandestinum

Kikuyu is a productive and useful grass that spreads by runners. It can be established from seed but is expensive and slow. Kikuyu usually grows 30–40 cm high and will form a tight mat if heavily grazed. It requires highly fertile red and black soils with adequate moisture and will tolerate low pH (acid) soils. It will respond well to high levels of nitrogen and phosphorous.

Kikuyu performs best if grazed to maintain a height no lower than about 5 cm and no higher than 15 cm. Kikuyu can become stemmy resulting in reduced leaf production if allowed to grow too tall. Rest kikuyu pastures after grazing down to 5 cm. Kikuyu can dominate and exclude other pasture grasses and legumes.

In high rainfall areas a soil borne parasite can cause ‘kikuyu yellows’. Rust and various insects can also cause damage and production losses to kikuyu stands.

Crude protein levels can reach 25% in well fertilised stands. New growth is very palatable for stock and stock

will often eat out small patches of kikuyu in a mixed pasture. Lactating dairy cows eating a high percentage of kikuyu in their diet may need calcium and sodium supplements. Nitrate poisoning, bloat and oxalate poisoning can also occur. Despite this kikuyu can provide valuable green feed in winter.

The two varieties of kikuyu are Whittet and Noonan. Whittet is a taller variety with broad leaves. It persists well on low fertility soils. Noonan seed is available but this variety is more suited to turf. It is resistant to kikuyu yellows.

photo: David Gramshaw

Panics

Megathyrsus maximus
(was *Panicum maximum)*

The panics are a large group of grasses that are very variable in appearance. Green panic and Gatton panic are the most common cultivars with Hamil grass being one of the tall types grown more in the tropics.

Panic is a bright green tussock grass with a wide leaf and stout stems growing to 1.5 m tall. Green and Gatton panic can flower throughout the season. They are shade tolerant and respond quickly to spring rain often being the first grass to appear after long dry periods.

Panics are able to grow in a wide range of soil types but generally only persist on more fertile scrub soils. Being very palatable to stock it is easily grazed out of pastures that are not rested. They respond well to fertilising, and will be replaced by other grasses as nitrogen becomes locked up in older pastures. Panic spreads well particularly in areas where it is not under grazing pressure.

Green panic is a fine stemmed Guinea grass (*Megathyrsus maximum var. trichoglume*) with soft leaves. It grows to 1.5 metres tall and is shade tolerant. It has hairy stems in comparison to Gatton panic which has smooth stem nodes. Gatton panic is more vigorous than green panic with longer and wider leaves. It often has red to puple colouration on the stems and is easier to establish and manage.

Pangola grass

Digitaria eriantha

Pangola grass is extremely variable in form. It is a perennial that spreads from runners. Only a very limited number of seeds are viable. Runners need to be harvested and planted into prepared soil during damp weather to propagate this grass.

Pangola grass is very productive on lighter soils but will grow on a large range of soil types. This grass competes well with African lovegrass and other weeds. It has a moderate tolerance to salinity, it is palatable and tolerates heavy grazing. Pangola grass responds well to fertiliser and is cut for hay in tropical areas. The average crude protein of pangola grass is 9–20%.

Paspalum

Paspalum dilatatum

Paspalum is a leafy, tufted, sod-forming perennial, arising from short rhizomes 4–8 mm in diameter. Paspalum has a thick fibrous root system growing to more than 1 m deep. It is found throughout the inland Burnett on a wide range of moderately fertile soils but it does best on more fertile soils.

Paspalum responds well to fertiliser and provides stable ground cover to reduce the risk of water erosion. It is palatable, persistent and tolerates waterlogging.

The sticky seeds spread by attachment to animals and vehicles. An ergot (fungus) on seedheads can be a problem but paspalum rarely forms a high proportion of pastures in the inland Burnett and so there is insufficient ergot to cause ill-effects in cattle. The average crude protein ranges from 4–23%.

The Hi-Gane variety is suitable for wetter areas.

Purple pigeon grass

Setaria incrassata

Purple pigeon grass forms a tussock growing to 2 m high. The seedhead is a distinctive spike. It is adapted to high fertility black and red clay soils where it establishes more reliably than Rhodes or panic grasses. Purple pigeon grass mixes well with lucerne and medics.

Purple pigeon grass is affected by frosts but recovers to give good spring and summer growth. It is best planted as a pure stand as it can be unpalatable and will not be grazed when there is other pasture available. It is most palatable when it is short and is useful for hay. Purple pigeon grass establishes quickly and could be suited to short term pasture leys on black soils. It is not recommended for horses due to potential oxalate poisoning. The seed can lay dormant for up to a year.

Rhodes grass

Chloris gayana

Rhodes grasses are very common and widely planted in the inland Burnett area. Most varieties spread by runners but are also easily established from seed although the seed is fluffy and if uncoated, is difficult to sow using conventional planting equipment. It grows to 2 m tall and has roots to 4 m depth. Rhodes grass does best on fertile soils but will survive on lighter soils. It will respond well to fertiliser.

Rhodes grass has good tolerance to saline conditions and provides good ground cover. It has a crude protein range from 17% when green to 3% when dry. Palatability reduces markedly after drying out or frosting.

There are several varieties of Rhodes grass. Katambora has a fine leaf, is early flowering and is less vigorous and palatable than other varieties. It is more persistent, forms a denser sward and shoots earlier in spring.

Callide is late flowering and takes a long time to respond in the spring. It

does best in fertile soils, is tall and late maturing. It has long awns and a long tuft of hairs at the awn base. Callide is more frost tender than Katambora and a smaller plant.

Pioneer is the original variety. It has a high proportion of stem and less leaf that the other varieties. It does not continue grow into autumn and is less likely to respond to warmer winter weather. Topcut is derived from Pioneer Rhodes with a finer leaf and stem. It has an erect, uniform growth habit and is ideal for hay production. Finecut is a leafy Katambora type for better grazing and hay production. It forms a dense mat over the ground. Nemkat is resistant to nematodes.

Sabi grass

Urochloa mosambicensis

Sabi grass is a perennial creeping grass that grows to 60 cm however it has variable size and habit depending on soil type and growing conditions.

There are four main types, three of which provide useful and palatable feed. Sabi grass tolerates hot and dry conditions but after frosting in winter it does not provide stand-over feed.

The favoured soil types for this grass depends on the variety but it will grow on many soil types from sands to light clays. Crude protein ranges from 10–20% in young growth.

This grass should not be confused with the annual grass *Urochloa panicoides* commonly found on cultivations during spring in the inland Burnett.

The Saraji variety is suited to sandy soils through to clay loams and areas of heavier rainfall. Nixon has good seedling survival, shorter growth habit and can persist in lower rainfall areas. Seed is readily available.

Temperate grasses

There are a number of temperate climate grasses that do well in the inland Burnett during winter if there is sufficient rainfall or irrigation. Ryegrass, fescue, cocksfoot and phalaris are worth investigating, particularly if irrigation is available.

Silk sorghum

Sorghum arundinaceum

Silk sorghum is an erect, robust, tussocky perennial with numerous tillers and thick short rhizomes that curve upwards to produce new shoots near the parental stool. Stems are solid and pithy, about 1 cm thick, sometimes reaching a height of 3–3.6 m. Leaves are 2.5–4 cm wide.

The seedhead has multiple branches that droop down as the seed ripens. Silk sorghum is suited to heavy, fertile soils and combines well with lucerne. It is easy to establish and will persist for one to five years, depending on soil management and rainfall.

Silk sorghum requires nitrogen fertiliser to grow and persist well. It is drought tolerant but does not handle flooding. It responds well to the onset of spring and soil temperatures above 15°C provide conditions for ideal growth. After long dry spells silk sorghum can be toxic due to high levels of prussic acid.

Silk is a hybrid between 'Krish' (a hybrid of Johnson grass (*S. halepense*) and *S. roxburghii*) and *S. arundinaceum*.

Further information

AFTRS

website www.dpi.qld.gov.au

Business Centre open from 8 am to 6 pm Monday to Friday (telephone 13 25 23 for the cost of a local call within Queensland; interstate callers 07 3404 6999) or email callweb@dpi.qld.gov.au

Pastures Australia

Pastures Australia is an incorporated joint venture for investment in the genetic improvement, management and adoption of pasture plants across Australia. The partners are Australian Wool Innovation, the Grains Research & Development Corporation, Meat & Livestock Australia, Dairy Australia, and the Rural Research & Development Corporation.

The Pastures Australia 'Pasture Picker' decision tool for farmers and advisors provides specific pasture recommendations for regions across Australia. Species selection can be refined to specific local conditions including climatic and soil variables.

Contact Pastures Australia Coordinator, Mr Rory Coffey to be directed to the location of this new internet tool.

Phone 0417 926 263 or email rorycoffey@woolinnovation.com

Tropical forages

http://www.tropicalforages.info

Tropical Forages is a powerful tool for selecting forage species suitable for local conditions in the tropics and subtropics. It is invaluable for agricultural researchers and extension officers involved in improving animal production.

Tropical forages allows you to speedily:

- identify forage species suitable for your climate, soils, production system and man-agement via a selection tool built on LUCID™
- access comprehensive information on these species with details of adaptation, uses and management of forage species, cultivars and elite accessions
- view images of the plants and their use
- search a comprehensive database of scientific references with abstracts.

Pasture photo-standards

Pasture photo-standards are an essential tool in good grazing land management. This pasture photo-standard CD will assist in developing pasture budgets and dry season business management plans. The CD contains photo-standards and corresponding pasture yields for many of Queensland's common pasture communities. You will be able to search for standards according to region or by pasture type. Also included is an order form to obtain durable, full colour, laminated copies of each of the pasture photo-standards for use in the field.

Creator: Department of Primary Industries and Fisheries
Publication year: 2003
Format: CD-ROM
Price: $17 (incl GST)

Phone 13 23 25 to order a copy.

Stocktake:balancing supply and demand

Stocktake is a paddock-scale land condition monitoring and management package. It has been developed to provide grazing land managers with a practical, systematic way to:

- assess land condition and long-term carrying capacity
- calculate short-term forage budgets.

Grazing Land Management

Grazing Land Management (GLM) workshops provide land managers with a practical and planned approach to improving productivity and sustainability. The workshops start by looking at grazing lands as ecosystems and how they function.

Held over three days, GLM workshops provide information that includes long-term stocking rate calculations, forage budgeting, land condition assessment and information on sown pastures, fire and weeds specific to the land types, climate and production systems of specific regions.

Phone 13 23 25 for workshop details and dates or email beef@dpi.qld.gov.au

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