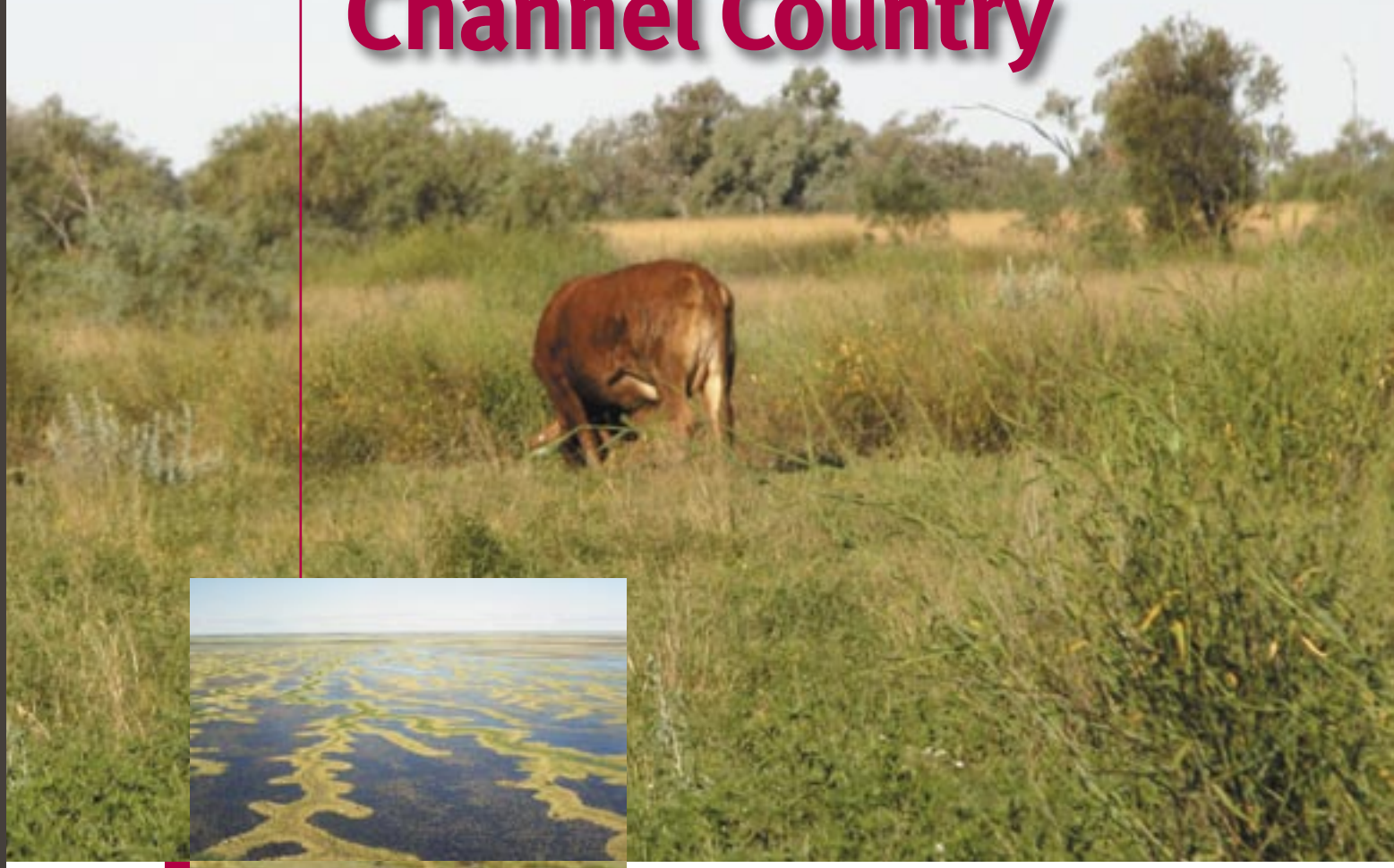
Forage value in the Channel Country



A photographic guide

mla
MEAT & LIVESTOCK AUSTRALIA

Queensland Government
Department of Primary Industries and Fisheries

Forage value in the Channel Country

A photographic guide

March 2007

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Contents

What is this guide?

One of the biggest challenges in the Channel Country is anticipating the extent of flooding, the forage response and therefore the appropriate number of cattle that could be carried through to target weight. The general summer flood pasture growth table in this publication gives an indication of the amount of feed which will grow on different land types following different sized floods. The DPI&F 'Flood Rules of Thumb' maps are designed to help you to anticipate the size of flood to expect.

This booklet presents photographic guides and written descriptions of the quality (feed value) and quantity (yield, as kg of dry matter/ha) of the major pasture types within the floodplains of the Channel Country. The average values for digestibility (%), protein content (%), energy value (MJ/kg) and phosphorus level (%) are provided for bluebush, native sorghum, Cooper clover, cow vine, Flinders grass, bogan flea, pea bush, nardoo and spiny flat sedge at peak yield compared with hayed-off pasture. An estimate of likely cattle liveweight gains from pastures is also provided as a guide to planning turn-off dates and weighing schedules. A table of nutrient levels for plants which occur less often, or comprise a smaller component of the pasture, is provided at the end of the booklet.

How to use this guide?

We are sure that you already assess the amount and quality of feed in front of you – now we provide some additional information to help you do this more accurately. We hope that your experience in setting cattle numbers can be enhanced by using pasture yields and amounts based on the information in this booklet. We also hope that your eye for cattle weights can be improved by the pasture quality data in this booklet.

This guide is intended to provide you with additional information for anticipating and planning the appropriate number of cattle that can be carried during any one period within the floodplains (based on pasture yield and feed value) and their growth rates and hence turn-off dates (based on feed value). As such, this guide complements your own experience in setting and adjusting cattle numbers and in estimating cattle liveweight gains either in the paddock or through regular weighing. This guide may help you plan a weighing schedule for your cattle. You may also find this guide useful in developing a supplementation program, as the pasture always starts to 'slip' before the cattle do.

Pastures quite obviously vary across a paddock, and assessing pasture yield and value is often not a simple task. The photographs in this booklet should be used as a guide to pasture yield and feed values as you drive through your paddocks. Do not rely on observations from only a few spots within a paddock.

For yield, or amount of pastures, we suggest you estimate the range present in a paddock, based on the photographs provided, so that you start to 'get a feel' for the average yield. This will assist you to get a reliable calculation of the appropriate number of cattle to carry using a feed budgeting approach.

For feed value, consider the greenness of the pasture, as well as the amount of high quality components (leaf and seed head, compared with coarse stem) and the accessibility of the feed to cattle as you drive through your paddocks. This will give you a 'feel' for the average diet quality available to cattle, and how well the estimated growth rates in this guide will match your own situation.

The guide is based on the main pasture types within the Channel Country floodplains and includes:

- common and scientific names;
- a photograph of the plant or the pasture it grows in;
- the most common areas where the plant grows;
- the plant's palatability;
- a guide to cattle performance;
- a guide to short term carrying capacity (a period of about 90 days) based on the pasture yield and quality; and
- a table of the plant's measured quality including digestibility.

For example:

Common name (*scientific name*)

Native sorghum (*Echinochloa turneriana*)

Land type guide

Grows on:

Frequently flooded plains	✓
Occasionally flooded plains	✖
Swamps and depressions	✓

Growth stage shown in the photograph

Yield

4500 – 5500 kg DM/ha

Carrying capacity

Acres per AE
Hectares per AE
AE per km²

Cattle performance

Gaining
0.8 – 1.2 kg/hd/d (short term average)
0.9 kg/hd/d (average over 12 months

Palatability/preference

High

Seeding

Guides to:

- Yield (in kg/ha, showing a range)
- Short-term carrying capacity
- Expected cattle performance (in kg/head/day)
- Plant palatability (high, medium or low)

An indication of the initial carrying capacity based on yield. This will vary according to pasture quality, the length of time the cattle need to be carried, as well as the target weight. This is provided for peak (seeding) yields only.

Assumes cattle numbers permit animals to select the best diet on offer.

Plant Part	Digestibility %	Protein %	Energy MJ/kg*	Phosphorus %
Leaf				
Seed				
Stem				
Whole plant				

Nutrient analysis table

*MJ/kg - mega joules of energy per kilogram of dry feed

Background to this guide

The project "Sustainable Grazing in the Channel Country Floodplains" has measured rate and amount of growth in floodplain pastures following several summer floods, as well as the rate at which amount and quality of pasture declines once peak yield has been reached. The five years of data collection could not cover every timing or extent of flooding and we have relied heavily on experienced land managers in the area to make our results generally applicable and useful for decision making.

Floodplain pastures are reliant on flood events, rather than rainfall, to initiate pasture growth. This is due to the very high clay content of the cracking soils of the floodplains – clay soils require a lot of wetting up before pastures will grow. Monitoring of summer floods in this project has highlighted the variable nature of pasture growth, and hence the ability to carry cattle, on the floodplains.

The plant nutrient values listed in this publication show the average value, as well as the *minimum* and *maximum* values, calculated from a number of samples. We acknowledge that many seasonal factors can affect the nutrient status of plants, and that sampling has not been able to cover all of these factors. We therefore offer these nutrient values as a guide to the value of plants and pastures presented.

Experienced Channel Country graziers, who have weighed livestock on a quarterly basis over many years, have examined the photographs in this publication and have provided the matching estimates of likely cattle weight gain or loss. Cattle growth rates can be as high as 1.5 to 1.75 kg/hd/day for a short period whilst on lush stands of Cooper clover following good winter flood events, while average daily gains over a 270 day period range from 0.5 to 0.7 kg/hd/day. Liveweight losses occur over the heat of summer or when cattle remain in the floodplains during extended dry periods, such as the 2001-02 drought.

Pasture quality and cattle performance

The nutritional value of plants is not the only factor affecting the quality of a pasture, or cattle performance from that pasture. Cattle dietary requirements, cattle health (e.g. plagues of sand-flies), climatic conditions (e.g. extreme heat or cold), distance to water, water quality and availability of good quality forage all play a role in cattle performance. An understanding of all these factors, and how to optimise each one, is the key to ensuring optimum cattle performance. This guide addresses the dietary quality aspect of these factors.

The dietary requirement of cattle varies according to their stage of growth and physiological state. The following table provides an approximate guide to the requirements of the main classes of cattle. This information is from 'Nutrient requirements of beef cattle', 7th rev. ed. 2000, Washington D.C., National Academy Press.

Cattle dietary requirements

Class of animal	Approx. feed intake (kg/hd/day)	Approx. water intake (litre/hd/day)	Digestibility (%)	Protein (g)	Energy (MJ)	Phosphorus (g)
Growing weaner (200 kg, gaining 0.5kg/day) 2% intake	4.0	30	>50%	275-415	35-53	12
Adult Equivalent (450 kg dry beast, maintaining weight) 2% intake	9.0	70-78	>50%	335-413	43-53	12
Pregnant cow (450 kg, maintaining) 2.2% intake	9.9	50-60	>50%	570	60	15
Lactating cow (450 kg, maintaining) 2% intake	9.9	60	>50%	911	80	21
Bull (750 kg, maintaining) 2.2% intake	15.0	78	>50%	942	100	25

Forage value, feed intake and initial cattle numbers

The appropriate number of cattle to run following flooding will vary according to pasture quantity and quality, the length of time the cattle need to be carried for, as well as the target weight or market.

The class of animal also needs to be considered. The amount that cattle eat (i.e. intake as dry matter per head per day) varies according to size and physiological state (e.g. dry versus wet). Intake also varies with forage quality. The table below provides a guide to the intake of the main classes of cattle and provides a means to compare different classes and sizes of animal.

Cattle intake

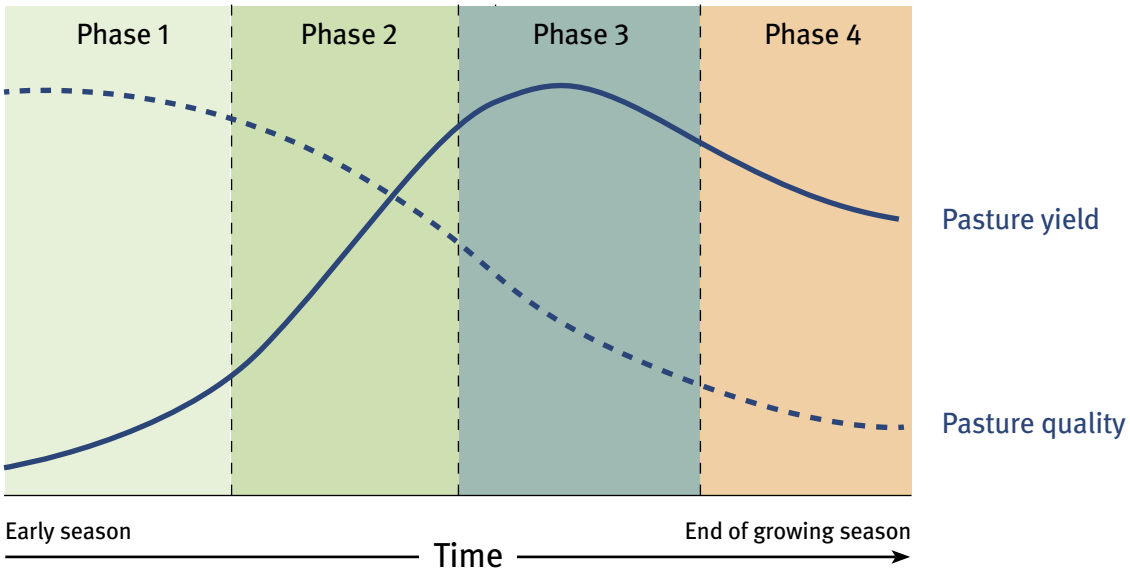
Class of animal	Approximate feed intake (DM kg/hd/d)			
	Early / Mid growth	Seeding	Senescing	'Trash'
Growing weaner (200 kg, gaining 0.5kg/day)	5.0	4.0	3.6	3.0
Adult Equivalent (450 kg dry beast)	11.3	9.0	8.1	6.8
Pregnant cow (450 kg)	12.2	9.9	9.0	7.7
Lactating cow (450 kg)	12.2	9.9	9.0	7.7
Bull (750 kg)	18.8	15.0	13.5	11.3

This information is from the MLA Nutrition EDGE training package. This and other training packages such as "Stocktake" and MLA's Grazing Land Management workshop help to optimise cattle performance in both the short and long-term.

The quality of forage changes according to the phase of growth. In general, plants are most nutritious during early growth, when there is more leaf than stem. There are exceptions to this rule – for instance native sorghum is best if it has gone to seed when it still short (phase 3). This guide presents information on pasture quality from samples collected mostly during seeding (phase 3) and hayed off (phase 4). Information is lacking from the early growth phases due to difficulties in accessing floodplains immediately after flooding. Pasture plants have four phases of

early growth (phase 1)
mid-growth (phase 2)
seeding (phase 3)
hayed off (phase 4)

Pasture growth phases



This publication presents estimates of cattle numbers (in adult equivalents or AE) assuming that initial stocking occurs during late Phase 2 or early Phase 3, and that adjustments in cattle numbers are made subsequently. An AE is defined as a dry (non-lactating) adult beast of 450 kg liveweight. It is useful to have a standard measure that the cattle you are carrying can be benchmarked to. This allows you to:

- compare carrying capacity across land types;
- calculate short-term carrying capacity for any class of animal;
- compare carrying capacity with other locations.

To convert these AE values to other classes of cattle we have provided the following table. The adult equivalent (AE) conversion table is based on an average intake of 2% of bodyweight over the period cattle are grazing.

Converting adult equivalents

Category	Average liveweight (kg)	Average forage demand (kg/head/day)	Adult equivalent rating
Pregnancy/calves (<6 months)		3.15	0.35
Females			
Weaners (6–12 months)	250	5	0.64
Heifers (1–2 years)	350	7	0.83
Heifers (2–3 years)	400	8	0.92
Cows (3 years +)	**450**	**9**	**1**
Males			
Weaners (6–12 months)	250	5	0.64
Steers (1–2 years)	400	8	0.92
Steers (2–3 years)	550	11	1.16
Bullocks (3–4 years)	650	13	1.32
Bullocks (4–5 years)	700	14	1.39
Bulls (and bullocks >5 yr)	750	15	1.47
Camels	650+		1.5
Horses			1.2
Kangaroos			0.07

Forage availability

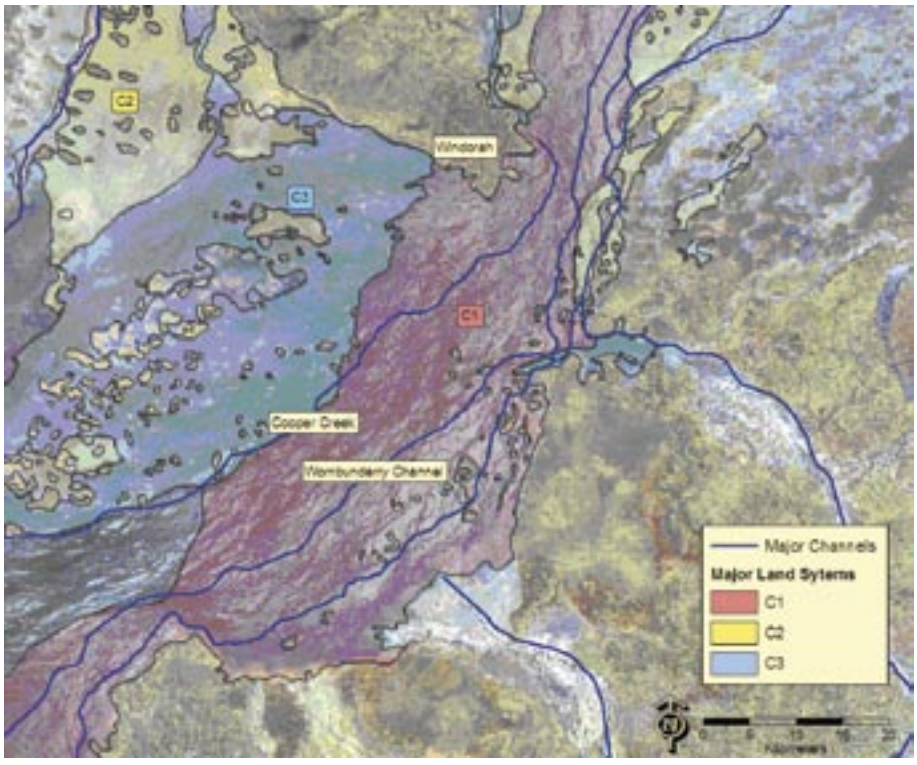
In general, the more green leaf that is available within a pasture, the better the cattle performance will be. Conversely, the greater the proportion of stem – especially old dry stem – the poorer the quality of the pasture and hence the worse the cattle performance. The longer the feed remains green, the longer that cattle numbers and performance can be maintained.

If cattle have to walk long distances (e.g. further than 2 km) to find patches of good quality feed, their performance may be affected. Similarly, cattle performance is reduced if they have to spend a large proportion of the day (and night!) foraging for better quality plants within a generally poor quality pasture. However the presence of browse or high protein or high energy feed sources (such as seed heads, seed on the soil surface or isolated areas of green feed) can help maintain cattle performance above expected levels at times when the bulk of the feed is hayed off (or worse). This is especially true for the Channel Country, where there are a large variety of land types and hence types of feed.

Floodplain land types

The different types of floodplain within the channel country have been mapped into three broad categories of land systems. Each has differing flood characteristics and the potential to grow different types and amounts of feed. This photoguide has information for most of the main past types within each floodplain land system. The three land systems are:

1. 'C1': Frequently flooded alluvial plains with braided channels, often with deep and fast moving water in major channels. Often referred to as 'current swept' because of the closeness to main channels, these frequently flooded areas grow nearly everything including: bogan flea, cow vine, native sorghum and Cooper clover.
2. 'C2': Occasionally flooded, flat alluvial plains, generally with shallow and slow moving water. This land type is the least frequently flooded as it includes the areas furthest from the major channels and higher areas within the floodplains. It grows annual pastures such as Flinders grass and peabush.
3. 'C3': Poorly drained swamps and depressions on alluvial plains of intermittent flooding frequency, with variable water speed and depth, generally associated with the outer lying channels. C3 areas grow much the same types of feed as C1 but are generally more productive because water is held for longer in swamps and depressions. Queensland bluebush, rat's tail couch, nardoo, native sorghum and Cooper clover are the most dominant pasture plants.



WARLUS land systems are shown overlaying a satellite image (Landsat ETM+) from 2001.

An example of the three mapped land systems (land types) relative to major river channels, in this case Cooper Creek south of Windorah.

Flood categories and pasture response

Floods have been categorised into channel, gutter, handy (or useful) and good, based on industry experience and definitions. The flood categories relate to the country types, as each of the three land systems have different flooding frequencies.

Flood type	Description	Land Systems Flooded
Channel	The main channels run but water does not escape to the surrounding floodplain	C1, limited to channel margins
Gutter	Gutter floods occur when the water escapes from the main channels and spills over to the many small waterways (gutters) that flow from the main channels covering 5 - 15% of the floodplains. These floods promote growth of a good body of herbage and grasses along the gutters	C1
Handy (or useful)	Handy floods occur when the water escapes from the gutters, connecting up to form the large sheets of water for which the area is famous. It can cover up to 50 - 60% of the floodplain with water at varying depths. There is a large pasture response from these floods, but the extent to which the feed lasts is determined by the time of year (heat) and how long the pastures remain covered (determining the moisture penetration in the soil)	C1, C3
Good	Good floods are similar to handy floods, but cover a much higher proportion of the floodplain (80 - 100%)	C1, C3, C2

General summer flood pasture growth table

Initial cattle numbers can be based on the estimates of the amount of useful forage on offer post-flooding. Not all pasture provides useful forage; for instance peabush has very high yields, but the coarse stems that comprise the bulk of the feed are unpalatable to cattle. The leaf, whilst high in protein, is also rarely eaten. Hence in pastures dominated by peabush the peabush component should be excluded from the feed budget calculations. Similarly, other unpalatable plants should also be excluded when calculating cattle numbers.

Pasture growth has been measured in the field and then modelled through computer software to define the range of yields expected to occur after a channel, gutter, handy or good flood within each of the three Land Systems. The general pasture growth table can be used to anticipate the amount of feed likely to grow. This table provides a predictive tool for likely carrying capacity based on anticipated flood levels. Your own experience and the 'Flooding rules of Thumb' maps used in conjunction with the photographs in this publication and the following table can assist in forward planning of the number of cattle required following a flood.

	Forage peak yield: kilograms of dry matter per hectare		
Flood type	**Frequently flooded plains (C1)**	**Occasionally flooded plains (C2)**	**Swamps and depressions (C3)**
Channel	250-750	Doesn't occur	1200-2500
Gutter	400-1200	Doesn't occur	2000-4500
Handy	750-1500	100-250	3500-6500
Good	1200-2500	1500-3500	4500-8000

Post flood conditions, such as heat waves or insect plagues, can quickly reduce forage value, thereby reducing the number of cattle that can be carried. Experienced channel country managers continually reassess forage value and cattle condition. These managers are able to revise cattle numbers based on such post flood events ensuring both high cattle performance and sustainable management of their pastures.

Winter floods generally produce pastures of higher quality but lower yields. These pastures are commonly dominated by Cooper clover and other winter herbages that tend to maintain useful forage (quantity and quality) for longer because of the lower temperatures and evaporation rates.

Implications of over-grazing

There are no known current examples of over-grazing within the Channel Country floodplains. There are, however, historical stories of cattle perishing when feed ran short because of over-stocking, and country taking considerable time to rebound.

The floodplains of the Channel Country are unique in that pasture production and landscape processes are based primarily on annual pasture plants. In most other areas of Australia, productive pastures are based on perennial grasses and hence recommendations for sustainable production are based on conserving and encouraging the desirable perennial grass species.

Annual plants, however, rely on seed production for their survival – by definition annual plants last for only a single growing season. New populations are established from the seed in the soil following favourable conditions – such as flooding in summer (for native sorghum) or flooding in winter (for Cooper clover).

In theory, as long as sufficient seed of annual plants is allowed to fall to the ground then the next crop of that plant is assured. In practice, light grazing pressure allows for this to occur – unless the seed of a plant is highly sought after by cattle. In this instance, thought may need to be given to spelling some country on a rotational basis to allow the next big crop of seed to be produced. For the floodplains, spelling occurs naturally under low cattle numbers as grazing is patchy, with no one area grazed repeatedly after subsequent floods.

Research in the floodplains suggests that should repeated over-grazing occur, the amount of mulch (i.e. the left-over annual pasture) is reduced. In theory at least, this could reduce the amount of nutrient loaded sediment being captured during flooding as well as reducing the amount of organic matter going back into the soil, and lead to reduced pasture yields in the very long-term. Reduced mulch could also lead to higher evaporation rates and hence reduce the length of time that moisture is held in soil. In this case, pastures may not respond as well to rains following flooding, or may not grow for as long following flooding. In each case, pasture yields and quality could be reduced. There is a low risk of soil deterioration under light grazing pressure.

The main perennial plants within the floodplains are bluebush, lignum, rat's tail couch and sedges, which are limited to the frequently flooded alluvial plains (C1) and poorly drained swamps and depressions (C3) land systems. Swamp cane grass is a perennial which occurs in flooded areas between sand dunes. There are no perennial pasture plants within the occasionally flooded, flat alluvial plains (C2) land system, due to the low frequency of flooding.

These perennials appear to filter nutrient loaded sediment from flood waters, and hence help to maintain the high soil fertility in a similar manner to mulch. In theory, a reduction in any of the perennial plants would lead to slow run-down in the fertility of the soil.

It is important, then, to match cattle numbers with the feed on offer to allow the return of mulch to the soil, and to prevent damage to these few perennial plant species in the floodplains. This guide aims to help land managers accomplish this by providing additional tools and advice on how to objectively achieve this.

Pasture photographs

The photographs in the following pages are representative of the nutrient values presented, but individual values are not necessarily from the actual site depicted.

Cooper clover dominated pastures

Cooper clover (*Trigonella suavissima*)

Grows on:

Frequently flooded plains	✓
Occasionally flooded plains	×
Swamps and depressions	✓

Early growth

Yield

1800 kg DM/ha
Early July 2006

Cattle performance

Gaining
1.5 – 1.75 kg/hd/d

Palatability/preference

High

Plant Part	Digestibility %	Protein %	Energy MJ/kg	Phosphorus %
Whole plant	70.7 (64.7-73.7)	21.2 (18.9-23.3)	9.0 (8.3-9.6)	0.3

Note that this pasture has clumps and lower patches in between.

This harvested vegetation had a moisture content of 82%.

Description of forage value:

Cooper clover maintains peak quality from when it is short and leafy through to seed set, making it excellent cattle feed. Cooper clover is winter growing and grows best in areas where water lays for 3-5 days. There can be a range of other forage on offer at the same time (generally others forbs such as wild flowers), but cattle graze clover in preference to most other plant species. Low temperatures and hence low evaporation rates over winter generally lead to a longer growing season following winter floods than summer floods, and Cooper clover pastures can remain green and high quality for many weeks.

This same location several weeks after the first picture shows that the patches in between the clumps have now been filled in and total useful forage yield has increased. More grass and some herbage have come up.

This vegetation had a moisture content of 78%.

Yield

2800 kg DM/ha
Mid-July 2006

Cattle performance

Gaining
1.5 – 1.75 kg/hd/d

Palatability/preference

High

Cooper clover dominated pastures

Seeding

Yield

3500 kg DM/ha
Mid-August 2006

Carrying capacity

18.5 acres/AE
7.5 ha/AE
13.3 AE/km^2

Cattle performance

Gaining
1.0 – 1.5 kg/hd/d

Palatability/preference

High

The Cooper clover has reached its peak yield and is now starting to hay off. Seed is fully developed and ripe but has not dropped.

This vegetation had a moisture content of 58%.

Hayed off

Area between 4 pegs = 0.01 ha. Rear pegs 14.8 m from front pegs

Once past its peak, Cooper clover disintegrates. However, nutritional value remains high until the plant is unavailable. Nutrient analyses of Cooper clover from the Channel Country have only been for near peak yield; this site has not yet been analysed.

In these pastures, Cooper clover was the fastest growing species with grass and other forbs reaching peak levels after Cooper clover. Our measurement site near Longreach peaked at 3500 kg DM/ha in the month of August after a Bureau of Meteorology 'Minor' (greater than 2.0 m at Longreach) flood in mid-March and a BoM 'Moderate' (greater than 3.0 m at Longreach) flood in mid-April. Some follow up rains occurred with 11 mm in May, 15 mm in June and 22 mm in July.

Hayed off vegetation at this site had a moisture content of 22%.

Yield

2000 kg DM/ha
Early September 2006

Cattle performance

Gaining
1.0 – 1.5 kg/hd/d

Palatability/preference

Moderate to high

Native sorghum (or channel millet)

Native sorghum (also known as channel millet) (*Echinochloa turneriana*)

Grows on:

Frequently flooded plains	✓
Occasionally flooded plains	×
Swamps and depressions	✓

Yield

4500 – 5500 kg DM/ha

Carrying capacity

12.4 acres/AE
5 ha/AE
20 AE/km^2

Cattle performance

Gaining
0.8 – 1.2 kg/hd/d or
0.9 kg/hd/d for 12 months

Palatability/preference

High

Plant Part	Digestibility %	Protein %	Energy MJ/kg	Phosphorus %
Leaf	58.6 (54.6-61.3)	8.0 (4.9-11.9)	7.3 (6.7-7.7)	0.2 (0.2-0.4)
Seed	54.4 (50.0-57.5)	9.6 (7.9-12.2)	7.3 (6.7-7.6)	0.3 (0.2-0.4)
Stem	61.0 (57.1-65.7)	6.3 (1.9-10.1)	7.3 (6.9-7.8)	0.3 (0.1-0.5)
Whole plant	57.8 (55.0-62.9)	6.5 (2.7-13.2)	7.3 (6.7-7.8)	0.3 (0.1-0.7)

Description of forage value:

Native sorghum is at its peak quality when short and leafy. This is generally in the early stages of growth (phase 1 or 2) but short sorghum (30-40 cm high) which has gone to seed early is also of high quality. Sorghum is summer growing and grows best in areas where water lays for 3-5 days. There can be a range of other forages on offer at the same time, but cattle graze sorghum in preference to most other plant species. Coarse weathered stem is rarely eaten and once sorghum has fallen over it is little more than trash and is avoided.

Plant Part	Digestibility %	Protein %	Energy MJ/kg	Phosphorus %
Leaf	50.2 (40.9-56.3)	4.3 (2.3-7.9)	6.6 (5.5-7.7)	0.2 (0.1-0.3)
Seed	50.4 (43.5-59.3)	7.2 (3.6-9.4)	6.7 (5.5-7.8)	0.3 (0.2-0.4)
Stem	51.5 (41.9-63.4)	3.6 (5.7-7.6)	6.4 (5.7-7.6)	0.2 (0.1-0.3)
Whole plant	51.1 (44.5-61.7)	5.0 (5.9-8.0)	6.6 (5.9-7.6)	0.2 (0.1-0.4)
'Trash'	47.1	3.7	6.6	0.1

Yield

2500 – 3000 kg DM/ha

Cattle performance

Gaining
0.5 – 0.7 kg/hd/d with seed
0.2 – 0.3 kg/hd/d without seed

Palatability/preference

Moderate to high

Rat's tail couch dominated pastures

Rat's tail couch (*Sporobolus mitchellii*)

Grows on:

Frequently flooded plains	✓
Occasionally flooded plains	×
Swamps and depressions	✓

Seeding

Yield

2500 – 3000 kg DM/ha

Carrying capacity

24.7 acres/AE
10 ha/AE
10 AE/km^2

Cattle performance

Gaining
0.5 kg/hd/d

Palatability/preference

Moderate

Plant Part	Digestibility %	Protein %	Energy MJ/kg	Phosphorus %
Whole plant	43.5 (37.9-59.9)	8.4 (5.0-17.8)	5.8 (4.8-8.0)	0.2 (0.1-0.3)

Description of forage value:

Rat's tail couch provides good quality forage but is not generally the first preference. Cattle will graze the tops, returning later to graze the rest when pastures have hayed off. Rat's tail couch is a summer growing perennial grass, which means that it can respond to any falls of rain; it may be the only source of green feed at those times. It also provide carry over dry feed, although digestibility is very low in hayed off (phase 4) couch.

Plant Part	Digestibility %	Protein %	Energy MJ/kg	Phosphorus %
Whole plant	39.2 (33.2-44.8)	4.1 (3.2-5.1)	5.3 (4.5-6.0)	0.2 (0.1-0.3)

Yield

1200 – 1800 kg DM/ha

Cattle performance

Maintaining to gaining 0.0 –0.2 kg/hd/d

Palatability/preference

Low

Spiny flat sedge swampy areas

Spiny flat sedge (*Cyperus gymnocaulos*)

Grows on:

Frequently flooded plains	✓
Occasionally flooded plains	×
Swamps and depressions	✓

Yield

2500 – 3000 kg DM/ha

Carrying capacity

49.4 acres/AE
20 ha/AE
5 AE/km^2

Cattle performance

Maintaining
+/- 0.1 kg/hd/d

Palatability/preference

Moderate

Plant Part	Digestibility %	Protein %	Energy MJ/kg	Phosphorus %
Whole plant	57.7 (44.0-74.2)	16.3 (5.8-26.4)	7.1 (5.6-8.9)	0.3 (0.2-0.5)

Description of forage value:

Spiny flat sedge is grazed by cattle in areas of heavy use, such as close to handling yards. At other times, it is thought to be avoided, but it can provide useful forage when other green feed is sparse. Like rat's tail couch and bluebush, spiny flat sedge is a perennial, meaning it can respond to rain, or quickly to small floods. Spiny flat sedge will grow most times of the year, but grows best in summer in areas where water lays for extended periods of time.

Plant Part	Digestibility %	Protein %	Energy MJ/kg	Phosphorus %
Whole plant	47.2 (44.7-49.6)	6.9 (5.2-8.7)	6.4 (6.2-6.5)	0.1

Yield

3000 – 4500 kg DM/ha

Cattle performance

Maintaining
+/- 0.1 kg/hd/d

Palatability/preference

Low

Nardoo dominated wet areas

Nardoo (*Marsilea drummondii*)

Grows on:

Frequently flooded plains	✓
Occasionally flooded plains	×
Swamps and depressions	✓

Yield

2500 – 3000 kg DM/ha

Carrying capacity

250 acres/AE
100 ha/AE
1 AE's/km^2

Cattle performance

Maintaining
+/- 0.1 kg/hd/d

Palatability/preference

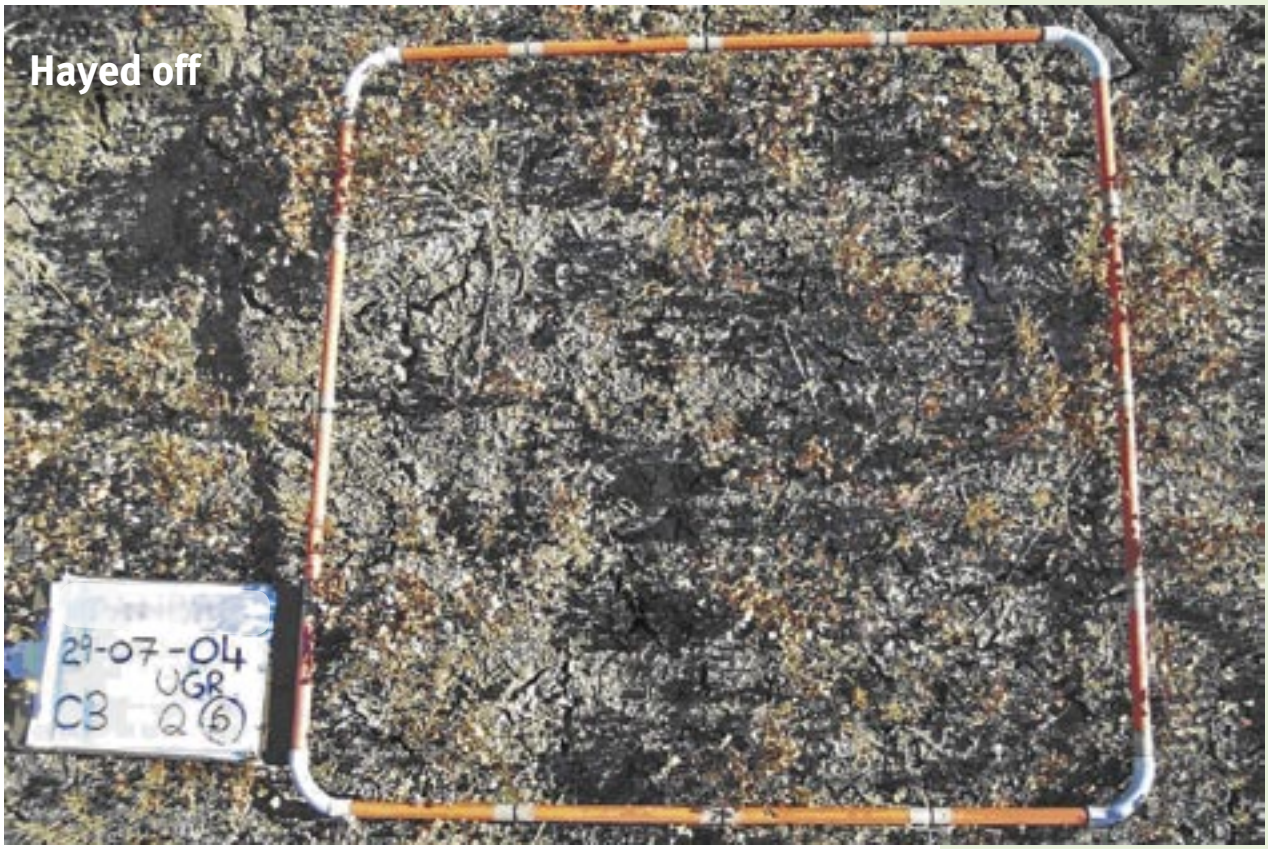
Low [NOTE]

Plant Part	Digestibility %	Protein %	Energy MJ/kg	Phosphorus %
Whole plant	49.0 (41.4-56.9)	10.8 (9.1-14.8)	6.3 (5.4-7.6)	0.3 (0.2-0.4)

[NOTE] Cattle would generally graze on other species growing in this area

Description of forage value:

Nardoo is generally avoided by cattle but may be lightly grazed when dry. It does not provide good quality forage, despite relatively high protein levels. Nardoo will grow most times of the year, but grows best in summer in areas where water lays for extended periods of time. Nardoo is a fern.



Plant Part	Digestibility %	Protein %	Energy MJ/kg	Phosphorus %
Whole plant	46.3	11.6	6.0	0.1

Yield

1200 – 1800 kg DM/ha

Cattle performance

Losing
0.2 – 0.5 kg/hd/d

Palatability/preference

Low

Nardoo is poisonous, affecting the production of thiamine in the body and leading to reduced absorption of protein. If eaten in sufficient quantities, blindness and/or death may occur.

Queensland bluebush dominated pastures

Queensland bluebush (*Chenopodium auricomum*)

Grows on:

Frequently flooded plains	✓
Occasionally flooded plains	×
Swamps and depressions	✓

Browse

350 – 500 kg DM/ha NOTE (750 g/bush)

Carrying capacity

Bluebush supplements other pasture components

Cattle performance

Gaining
0.5 – 0.75 kg/hd/d

Palatability/preference

Moderate to high

Plant Part	Digestibility %	Protein %	Energy MJ/kg	Phosphorus %
Leaf	79.3 (72.4-84.1)	22.1 (15.8-27.6)	8.4 (7.8-9.3)	0.3 (0.2-0.4)
Seed	68.3	16.5	7.9	0.3
Stem	35.9 (30.8-41.4)	8.0 (5.7-10.5)	4.1 (3.5-4.9)	0.1 (0.1-0.2)
Whole plant	43.4 (29.9-73.7)	9.4 (4.1-21.4)	3.4 (0.1-7.7)	0.1 (0.1-0.3)

NOTE There cold be at least as much again of unpalatable woody stem.

Description of forage value:

Queensland bluebush is at peak quality while it has a good bulk of leaf present, through to when it is just starting to set seed. There can be a range of other forage on offer at the same time, and cattle often don't start to browse bluebush until after it has seeded and started to drop leaf. Coarse stem (>20 mm diameter) is rarely eaten, although cattle will break stems to gain access to fresh leaf in the centre of the bush. Bluebush can grow new leaf following rain throughout the year, making it a valuable source of browse when little feed is otherwise available. However, leaf can drop within 4 weeks of rain, leading to a limited period of useful browse.

Plant Part	Digestibility %	Protein %	Energy MJ/kg	Phosphorus %
Leaf	81.1 (78.7-83.4)	10.5 (14.2-17.2)	8.7 (8.6-8.7)	0.2
Stem	35.4	7.6	4.5	0.1
Whole plant	37.8 (21.1-56.6)	8.0 (4.3-16.9)	3.1 (0.1-6.1)	0.1 (01.-0.2)

Browse

20 g DM/bush

Carrying capacity

At this stage, bluebush offers only sparse browse to supplement pasture

Cattle performance

Maintaining
+/- 0.1 kg/hd/d

Palatability/preference

Moderate to high

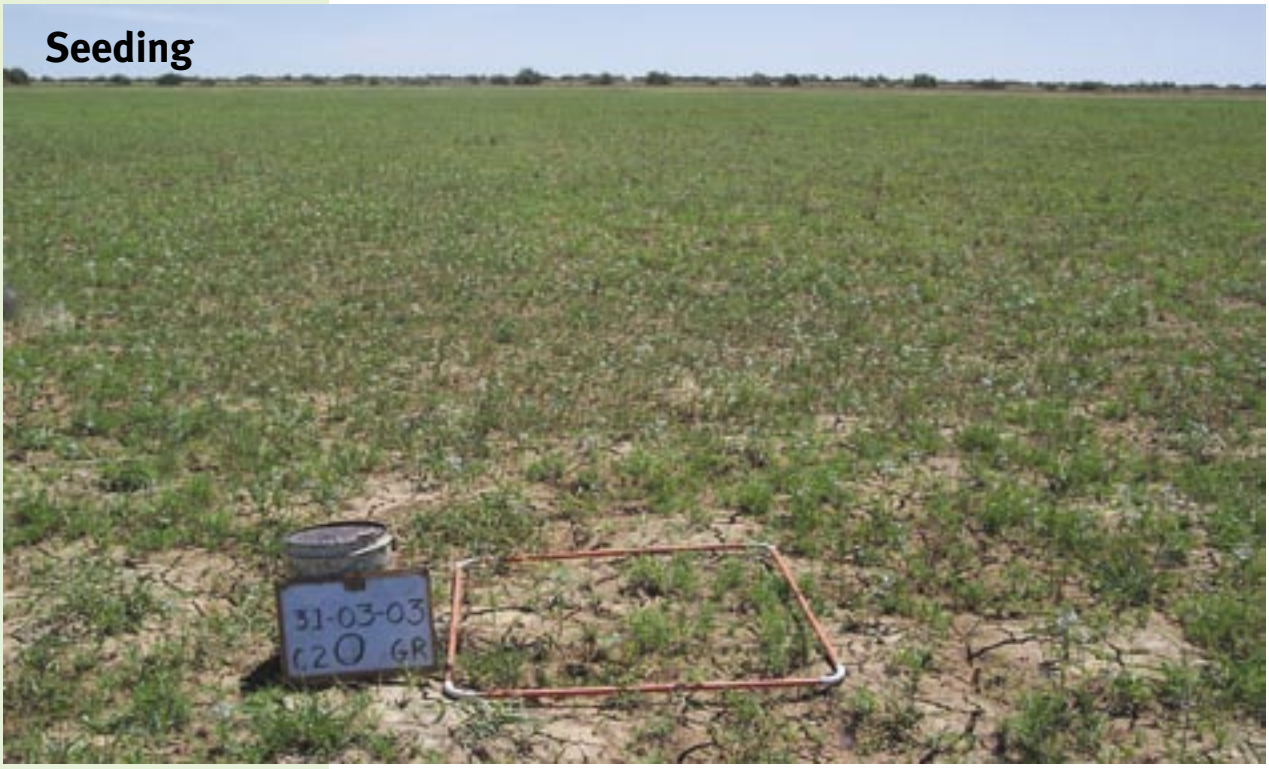
Cow vine dominated pastures

Cow vine (*Ipomoea diamantinensis* and *Ipomoea lonchophyla*)

Grows on:

Frequently flooded plains	✓
Occasionally flooded plains	✓
Swamps and depressions	✓

Low yield C2 land system



Yield

750 – 1200 kg DM/ha

Carrying capacity

54.9 acres/AE
22.2 ha/AE
4.5 AE/km^2

Cattle performance

Gaining
0.8 – 1.2 kg/hd/d

Palatability/preference

High

Even though yield is less than half that of spiny flat sedge (page 20), the carrying capacity remains approximately the same because of the higher palatability of cow vine dominated pastures.

Description of forage value:

Cow vine is at its peak quality when fresh and leafy, before drying out or being eaten by caterpillars. This is generally in the early stages of growth (phase 1 or 2) but dry cow vine with seed seems to offer some value as forage. Cow vine is summer growing and grows best in areas where water lays for 5-10 days. There can be a range of other forage on offer at the same time, but cattle graze cow vine in preference to many other plant species. The entire cow vine plant is eaten – even when dried out (phase 4) - with the vine often seen hanging from cattle's mouths. Even when hayed off, liveweight gains of 0.5 kg/hd/day are possible.

High yield C1 and C3 land systems

Plant Part	Digestibility %	Protein %	Energy MJ/kg	Phosphorus %
Leaf	76.2	28.6	9.2	0.5
Seed	66.3	13.3	8.6	0.7
Stem	75.2	8.3	8.8	0.5
Whole plant	77.4 (71.7-81.4)	16.3 (9.3-20.8)	9.3 (7.8-10.0)	0.7 (0.6-0.8)

Yield

1200 – 2000 kg DM/ha

Carrying capacity

35.3 acres/AE
14.3 ha/AE
7 AE/km^2

Cattle performance

Gaining
0.8 – 1.2 kg/hd/d

Palatability/preference

High

Bogan flea mixed pasture

Bogan flea (also known as daisy burr and marthaguy) (*Calotis* spp.)

Grows on:

Frequently flooded plains	✓
Occasionally flooded plains	✓
Swamps and depressions	✓

Seeding

Plant Part	Digestibility %	Protein %	Energy MJ/kg	Phosphorus %
Whole plant	56.5	6.9	7.3	0.4

Yield

300 – 400 kg DM/ha

Carrying capacity

247.1 acres/AE
100 ha/AE
1 AE/km^2

Cattle performance

Maintaining
+/- 0.1 kg/hd/d

Palatability/preference

Moderate

Description of forage value:

Bogan flea is short growing and quickly sets seed. Seeds are very spiny burrs, but high in protein and are licked up by cattle during dry periods. Bogan flea is at its peak quality when in the early stages of growth but it is generally inaccessible to cattle at this stage. Bogan flea can grow in summer and during cooler periods and grows best in current swept areas where water does not lay for long. Some cattle will actively seek bogan flea.

Hayed off

Plant Part	Digestibility %	Protein %	Energy MJ/kg	Phosphorus %
Whole plant	30.3 (22.2-38.4)	5.6 (5.4-5.8)	4.0 (3.0-4.9)	no data

Yield

Less than 150 kg DM/ha

Cattle performance

Losing
+/- 0.1 kg/hd/d NOTE

Palatability/preference

Moderate

NOTE Where browse/other feed is available. High losses can occur where other feed is not available.

Peabush dominated pastures

Peabush (*Sesbania* spp.)

Grows on:

Frequently flooded plains	✓
Occasionally flooded plains	✓
Swamps and depressions	✓

Low yield C2 land system

Seeding

Yield

750 – 1500 kg DM/ha

Browse

50 – 100 kg/ha

Carrying capacity

247.1 acres/AE
100 ha/AE
1 AE/km^2

Cattle performance

Maintaining
+/- 0.1 kg/hd/d

Palatability/preference

Moderate to none

Description of picture:

Peabush (*Sesbania* spp.) shown at peak yield within a C2 land system. Peabush can grow taller following longer periods of inundation

Description of forage value:

Peabush can dominate pastures, limiting cattle access and suppressing pasture growth underneath. There are some reports of peabush being grazed when it is very short with thin stems, or occasionally browsing the leaf. It does not provide good quality forage, i.e. low to none, and cattle generally avoid grazing it. Leaf falls from peabush within 3-6 weeks of flooding, as soon as seeding commences, and thus offers little in the way of browse. Peabush is a summer growing legume, which does return nitrogen to the soil. It has very hard seeds, allowing the seeds to survive drought and germinate rapidly under flooding.

High yield C1 and C3 land systems

Plant Part	Digestibility %	Protein %	Energy MJ/kg	Phosphorus %
Leaf	79.1	34.1	10.1	0.5
Seed	57.2	22.4	7.5	0.4
Stem	42.8	9.4	5.3	0.3
Whole plant	73.8 (69.2-78.4)	24.8 (21.1-28.5)	9.9 (9.0-10.8)	0.3

Yield

>8000 kg DM/ha

Browse

1000 kg/ha

Carrying capacity

49.4 acres/AE
20 ha/AE
5 AE/km^2

Cattle performance

Maintaining
+/- 0.1 kg/hd/d

Palatability/preference

Low to none

Peabush dominated pastures

High yield C1 and C3 land systems

Hayed off

Yield

6000 – 7000 kg DM/ha

Browse

0 kg/ha [NOTE]

Cattle performance

Maintaining to gaining +/- 0.1 kg/hd/d [NOTE]

Palatability/preference

None

Plant Part	Digestibility %	Protein %	Energy MJ/kg	Phosphorus %
Whole plant	54.9	15.4	7.3	0.3

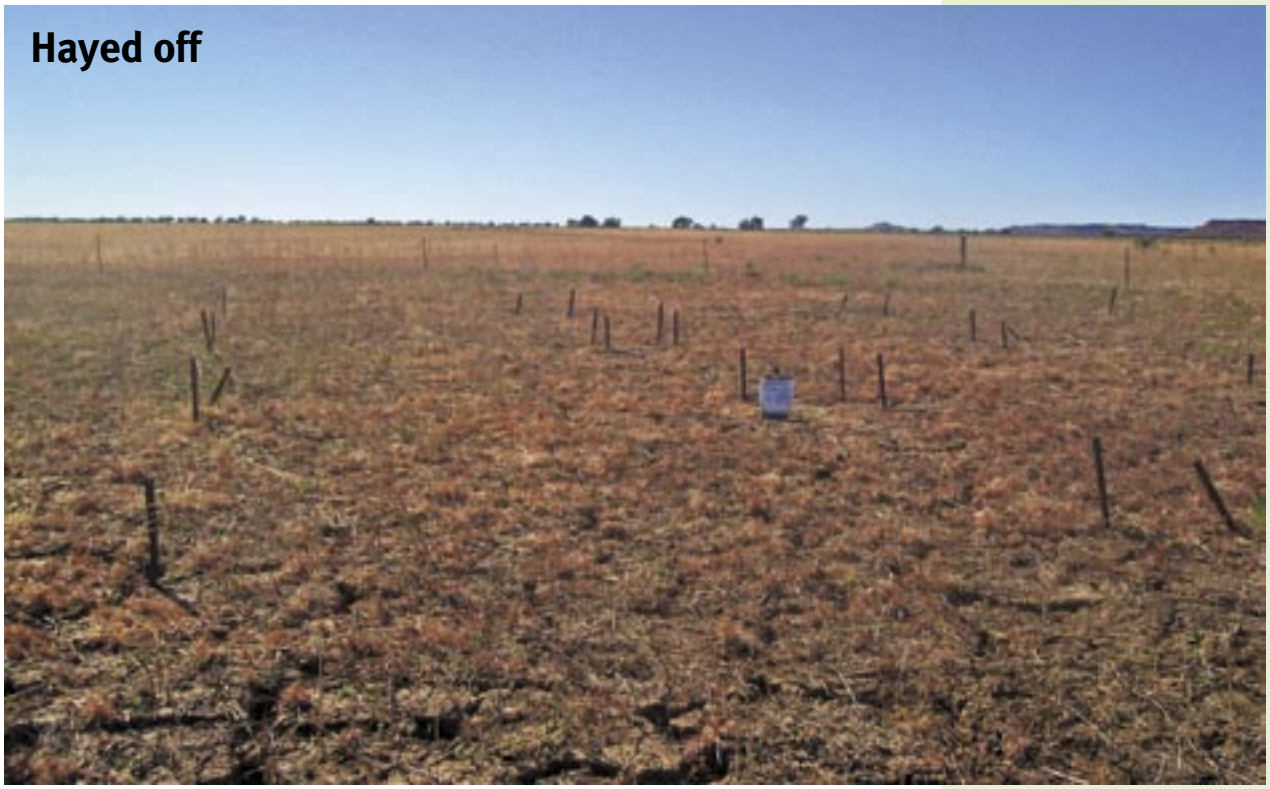
[NOTE] Once peabush has hayed-off, all leaf has dropped leaving just unpalatable stem with zero browse value. There will usually be valuable pasture plants growing amongst the peabush which cattle can graze and maintain or gain liveweight on. In this instance, pasture yield should be estimated as if the peabush were not present, as it offers no useful feed.

Flinders grass dominated pastures

Flinders grass (*Iseilema* spp.)

Grows on:

Frequently flooded plains	✓
Occasionally flooded plains	✓
Swamps and depressions	×



Plant Part	Digestibility %	Protein %	Energy MJ/kg	Phosphorus %
Whole plant	47.6 (43.8-51.3)	5.1 (4.9-5.3)	6.7 (6.3-7.0)	0.3

Yield

600 – 700 kg DM/ha

Cattle performance

Maintaining to gaining 0.0 – 0.2 kg/hd/d [NOTE]

Palatability/preference

Low

[NOTE] Flinders grass can grow on big flats with Potato vine; in this case cattle can gain 0.5 kg/hd/d

Table of average nutrient levels for all plants harvested

Seeding (phase 3)

Plant species	Plant part	Digestibility %	Protein %	Energy MJ/kg	Phosphorus %
Annual grass	whole plant	47.0	5.7	5.7	0.2
Blue grass	whole plant	57.5	7.3	7.7	0.4
Bluebush	leaf	79.3	22.1	8.4	0.3
	leaf+seed	77.3	17.2	8.3	0.2
	seed	68.3	16.5	7.9	0.3
	stem	35.9	8.0	4.1	0.1
	whole plant	43.4	9.4	3.4	0.1
Bogan flea	whole plant	65.5	6.9	7.3	0.4
Boggabri	whole plant	74.9	21.5	9.0	0.3
Budda pea	leaf	73.8	27.3	9.9	0.3
	stem	39.4	12.3	5.1	0.3
	whole plant	54.9	16.8	7.1	0.4
Burr	whole plant	56.5	6.9	7.3	0.4
Caustic bush	whole plant	79.9	8.6	9.5	0.9
Cooper clover	whole plant	70.7	21.2	9.0	0.3
Cowvine	leaf	76.2	28.6	9.2	0.5
	seed	66.3	13.3	8.6	0.7
	stem	75.2	8.3	8.8	0.5
	whole plant	77.4	16.3	9.3	0.7
Cudweed	whole plant	66.2	15.8	8.2	0.3
Daisy	whole plant	62.0	8.9	7.9	0.3
Delicate love grass	seed	52.6	11.7	7.7	0.4
	whole plant	56.4	7.4	7.8	0.3
Flinders grass	whole plant	51.9	7.4	6.9	0.3
Forbs	whole plant	52.0	9.7	5.0	0.4
Goodenia	whole plant				
Jerry jerry	whole plant	43.0	10.0	5.4	0.4
Joyweed	whole plant	65.2	15.0	8.1	0.3
Litter	whole plant	15.1	3.4	1.3	0.1
Mint bush	whole plant	64.8	11.2	7.2	0.3
Mueller's saltbush	whole plant	75.5	20.4	8.6	0.2
Nardoo	whole plant	49.0	10.8	6.3	0.3
Native cucumber	whole plant	74.5	7.6	8.6	0.5
Native lilly	whole plant	77.8	9.6	10.7	0.3
Native sorghum	leaf	58.6	8.0	7.3	0.2
	seed	54.4	9.6	7.3	0.3
	stem	61.0	6.3	7.3	0.3
	trash				
	whole plant	66.3	15.2	8.3	0.4
Nut grass	whole plant	39.2	9.1	4.5	0.3
Nutheads	whole plant	71.1	13.7	8.3	0.4

Hayed off (phase 4)

Plant species	Plant part	Digestibility %	Protein %	Energy MJ/kg	Phosphorus %
Annual grass	whole plant	42.6	4.5	5.1	0.2
Blue grass	whole plant				
Bluebush	leaf	81.1	15.7	8.7	0.2
	leaf+seed				
	seed				
	stem	35.4	7.6	4.5	0.1
	whole plant	37.8	8.0	3.1	0.1
Bogan flea	whole plant	30.3	5.6	4.0	n/a
Boggabri	whole plant				
Budda pea	leaf				
	stem				
	whole plant	43.5	12.3	5.6	0.2
Burr	whole plant				
Caustic bush	whole plant				
Cooper clover	whole plant				
Cowvine	leaf				
	seed				
	stem				
	whole plant	63.4	15.6	8.1	0.8
Cudweed	whole plant	33.1	5.1	4.3	0.2
Daisy	whole plant				
Delicate love grass	seed				
	whole plant	49.2	4.0	7.0	0.2
Flinders grass	whole plant	47.6	5.1	6.7	0.3
Forbs	whole plant	43.2	7.1	4.5	0.2
Goodenia	whole plant	71.0	8.7	9.5	0.6
Jerry Jerry	whole plant				
Joyweed	whole plant				
Litter	whole plant				
Mint bush	whole plant				
Mueller's saltbush	whole plant				
Nardoo	whole plant	46.3	11.6	6.0	0.1
Native cucumber	whole plant				
Native lilly	whole plant				
Native sorghum	leaf	50.2	4.3	6.6	0.2
	seed	50.4	7.2	6.7	0.3
	stem	51.5	3.6	6.4	0.2
	trash	47.1	3.7	6.6	0.1
	whole plant	51.1	5.0	6.6	0.2
Nut grass	whole plant				
Nutheads	whole plant				

Seeding (phase 3)

Plant species	Plant part	Digestibility %	Protein %	Energy MJ/kg	Phosphorus %
Other annual grass	whole plant	72.4	19.8	9.4	0.7
Other forbs	whole plant	62.3	14.6	7.7	0.3
Other grass	whole plant	67.8	11.2	9.6	0.4
Other plants	whole plant	43.0	7.0	4.7	0.3
Other sedge	whole plant	54.1	7.0	6.9	0.2
Peabush	leaf	79.1	34.1	10.1	0.5
	seed	57.2	22.4	7.5	0.4
	stem	42.8	9.4	5.3	0.3
	whole plant	73.8	24.8	9.9	0.3
Pepper grass	whole plant	48.5	6.5	6.4	0.3
Perennial grass	whole plant	37.9	5.7	4.6	0.3
Pigweed	whole plant	79.7	9.7	9.3	0.2
Pimilea	whole plant	65.6	14.5	8.1	0.3
Rat's tail couch	whole plant	43.5	8.4	5.8	0.2
Rosella	whole plant	50.7	6.1	5.9	0.4
Sesbania	leaf	79.1	34.1	10.1	0.5
	seed	57.2	22.4	7.5	0.4
	stem	42.8	9.4	5.3	0.3
	whole plant	73.8	24.8	9.9	0.3
Spiny flat sedge	whole plant	57.7	16.3	7.1	0.3
Tall sedge	whole plant	49.7	6.8	6.0	0.3
Tarvine	whole plant	62.9	11.9	8.0	0.3
Verbine	leaf	69.3	26.6	8.8	0.3
	seed	65.0	28.2	8.5	0.4
	stem	61.9	12.4	7.8	0.3
	whole plant	70.1	16.8	9.1	0.3
Wandering jew	whole plant	78.4	10.1	10.0	0.4

Hayed off (phase 4)

Plant species	Plant part	Digestibility %	Protein %	Energy MJ/kg	Phosphorus %
Other annual grass	whole plant				
Other forbs	whole plant	52.7	7.7	7.0	0.3
Other grass	whole plant				
Other plants	whole plant	39.2	4.6	3.6	0.1
Other sedge	whole plant				
Peabush	whole plant	54.9	15.4	7.3	0.3
Pepper grass	whole plant	46.9	3.8	6.3	0.4
Perennial grass	whole plant	36.0	4.5	4.6	0.2
Pigweed	whole plant				
Pimilea	whole plant				
Rat's tail couch	whole plant	39.2	4.1	5.3	0.2
Rosella	whole plant				
Sesbania	leaf				
	seed				
	stem				
	whole plant	54.9	15.4	7.3	0.3
Spiny flat sedge	whole plant	47.2	6.9	6.4	0.1
Tall sedge	whole plant				
Tarvine	whole plant				
Verbine	leaf				
	seed				
	stem				
	whole plant	53.2	10.9	7.1	0.2
Wandering jew	whole plant				

Appendix 1

Scientific techniques used for nutrient analysis

Nutrient samples were conducted at the DPI&F wet chemical analysis laboratory at the Animal Research Institute, Yeerongpilly, using the following techniques:

Parameter	Technique	Reference
Dry matter	weight change following oven heating at 105°C for 24h	Faichney and White (1983)
Moisture content	Expressed as a percentage = oven dried weight (80°C for 48h) divided by fresh weight x 100	
Inorganic ash	ignition in a muffle furnace at 600°C for 3h	Faichney and White (1983)
Phosphorus	colorimetric method following ignition at 600°C for 3h and HCl digestion	A.O.A.C. (1980)
Total nitrogen	combustion method using an ELEMENTAR RapidN analyser	Sweeny (1989)
Crude protein	Calculated from total nitrogen using the formula % CP= 6.25 x %N	
ADF and NDF	analysed using the FIBRETEC 2021 FIBRECAP system according to EEC standard	
IVDMD	the two stage (rumen fluid) technique of Tilley and Terry (1963) as modified by Minson and McLeod (1972)	Minson and McLeod (1972)
Metabolisable energy (ME)	Expressed as MJ/kg - mega joules of energy per kilogram of dry feed predicted from IVDMD using Equation 58 (ME = 0.15 times DOMD%, where DOMD% = (OMD%(100 - Ash%))/100) and OMD% is % Digestibility of the organic matter (Equation 55)	Technical Bulletin 33 (1975)

Plant identification

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By David Phelps and others, published by Meat and Livestock Australia, 2007

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