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Industry & Investment

## Pasture Varieties used in New South Wales

2010 - 2011



The Grassland Society of NSW Inc.

Compiled by  
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## A Group of people with a common interest in developing our most important resource, our grasslands

The objectives of the Grassland Society of NSW are:

- to provide an organisation in which landholders are the major participants in the dissemination of pasture production information
- to provide opportunities for those concerned with grassland production to meet and exchange information
- to encourage the investigation of problems affecting grassland management
- to stimulate the incorporation of advances from research and producer experience into practice
- to provide a means of social and business contact for those engaged in grassland production
- to afford pasture production an ordered structure and an industry status

The Grassland Society of NSW was formed in March 1985. The Society membership maintains a unique blend of producers and technologists.

The Society holds a conference each year, publishes a quarterly newsletter and has branches across NSW.

Our internet address is [www.grasslandnsw.com.au](http://www.grasslandnsw.com.au)

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# Pasture Varieties used in New South Wales 2010 - 2011

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# INTRODUCTION

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This guide provides information on species and varieties/brands of pasture grasses, legumes and some herbs used in pastures. Forage and fodder crops are not covered with the exception of lucerne, ryegrass, chicory, plantain, lablab, burgundy bean and butterfly pea, all of which have a primary role in pastures as well as being used as forage/fodder crops. For information on species such as forage sorghums, millets, brassicas and winter cereals, contact I&I NSW or seed company agronomists.

## Species description and sowing rate

The sowing rate is for dryland areas. A sowing rate for irrigated areas (or irrigated/high rainfall or irrigated/tablelands areas) is included where the species is suited to these situations.

The sowing rates given cover a wide range of circumstances. Use the lower rates in lower rainfall situations, and the higher rates for high rainfall or irrigation.

In mixtures, use the lower rates and take care with the use of high seeding rates. Species sown at high seeding rates in mixtures can be competitive especially when more than one grass is being sown.

## Varieties/Brand names

Varieties/brand names are listed together with suppliers and other relevant detail that may assist in selection. Use the key points provided to ascertain which variety will suit your situation.

A variety or cultivar is an assemblage of cultivated individuals that is distinguished by any character (morphological, physiological, cytological, chemical or other) significant for the purpose of

agriculture, forestry, or horticulture and which, when reproduced (sexually or asexually), retains its distinguishing features. Material registered under Breeders Rights complies with the definition of a variety.

Where seed is sold under a brand name, it may or may not be registered as a variety.

## Area of adaptation

A guide to the minimum average annual rainfall (in mm) required to grow the species is provided. Note that this will normally refer to the limit for the earliest maturing variety. It does not refer to all varieties listed.

The map provided includes annual rainfall isohyets. Check rainfall isohyets that cover your location and compare both of these against the minimum rainfall for the species listed.

(south) and (north): identify the isohyet suited to a particular species, in the south and the north of the State respectively.

## Main seed source

The names of suppliers mentioned are based on the licensee or owner of the variety in question and are intended as a source of further information. It is not intended to provide a full list of retail outlets.

Where Plant Breeders Rights, licensing or marketing agreements are not involved, a supplier name may be provided in some instances to give retailers or producers a contact to source the seed or information.

## Certified seed/Quality assurance schemes

Wherever possible, use certified seed, as it is guaranteed true to type and meets strict standards

including purity and germination rate. A number of seed companies produce seed under their own quality assurance schemes that provide similar assurances to certified seed. When buying seed you should also consider other physical aspects of seed quality (see Appendices I – II)

## Variety performance

This list does not give any information as to the relative performance of a variety. You are encouraged to enquire through the nearest I&I NSW agronomist, agricultural adviser or seed company representative for comparative trial data on variety performance relevant to your area. Information on attributes listed against varieties is based on a wide range of sources including information provided by plant breeders and seed companies.

## General remarks

As each district spans many different environments, the comments on species/varieties are only a guide. Contact your District Agronomist or adviser for information about the suitability of the listed pasture varieties for your area.

*Important:* the minimum average annual rainfall provided for species is only a guide; growing conditions are extremely varied throughout the State. Other factors are often more important, and include:

- the soil's capacity to hold moisture
- slope and aspect
- elevation
- livestock management.

Temperate pasture species produce most of their feed during winter and spring. They tolerate cold and frost, and are widely adapted.

Tropical species are most productive during the warmer months. In New South Wales, their profitable use is limited by low effective rainfall in summer, low temperatures and frost.

Tropical pastures are confined, therefore, to the coastal districts, the northern and more northern central inland areas of the lower slopes and plains, and (with irrigation) the plains of the southern districts.

A mixture of temperate and tropical varieties suited to the area may improve the overall quality of the mixture, and give a better spread of feed across seasons. For example, tropical grasses on the Northwest plains are usually grown with barrel medics (a temperate species).

Some areas suited to temperate pastures can also support tropical varieties. An example is a mixture

of white clover (temperate) and paspalum (tropical) in southern inland irrigated and coastal districts.

Species in mixtures with different optimum sowing times are often sown separately. For example, an annual temperate legume may be sown with the last winter cereal crop, but the tropical grass needed in the mixture may be sown the following summer. Temperate grasses tend to produce higher quality feed than do tropical grasses, especially where pastures are not well managed.

### Further information

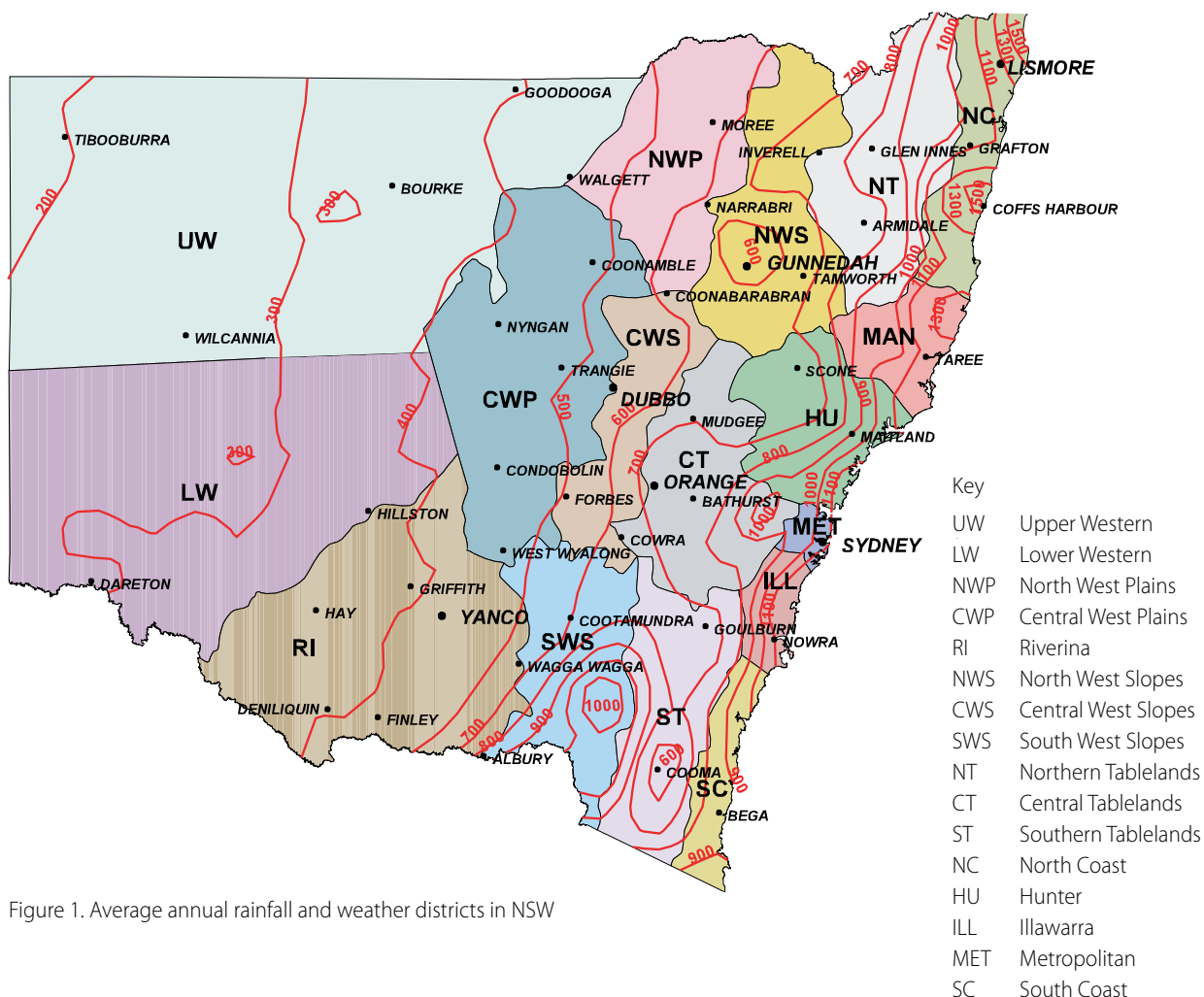
A range of printed primefacts on pasture species and related subjects or information on many species is available on the I&I NSW web page: <http://www.industry.nsw.gov.au>. Available titles are shown in

Appendix VIII. A contact list of seed sources is available in Appendix IX.

## DISCLAIMER/ CAUTIONS

The information contained in this publication is based on knowledge and understanding at the time of writing (July 2010). However, because of advances in knowledge, users are reminded of the need to ensure that information upon which they rely is up-to-date and to check currency of the information with the appropriate officer of I&I NSW or the user's independent adviser.

Recognising that some of the information in this document is





provided by third parties, the State of New South Wales, the author and the publishers take no responsibility for the accuracy, currency, reliability and correctness of any information included in the document provided by third parties.

The product and supplier trade names in this publication are supplied on the understanding that no preference between equivalent products or suppliers is intended and that the inclusion of a product or supplier does not imply endorsement by I&I NSW or the Grassland Society of NSW Inc. over any other equivalent supplier or product from another manufacturer.

The publishers apologise for omitting the name of any product or seed supplier from this publication. Please advise I&I NSW, so that inclusion can be considered for the next edition.

### **Animal health disorders**

Pasture improvement may be associated with an increase in the incidence of certain livestock health disorders. Livestock and production losses from some disorders are possible. Management may need to be modified to minimise risk.

Consult your veterinarian or adviser when planning pasture improvement (see Appendix VI).

### **Native vegetation**

Legislation covering conservation of native vegetation may regulate some pasture improvement practices where existing pasture contains native species. Inquire through your office of the Department of Environment, Climate Change and Water, Catchment Management Authorities

(CMAs) and the Natural Resources Commission for further details or web: <http://www.environment.nsw.gov.au/vegetation/index.htm>

## **PLANT BREEDERS RIGHTS**

The symbol (D) indicates that a variety is protected by Plant Breeders Rights (PBR).

PBR is applied for and granted to plant breeders under The Plant Breeders Rights Act of 1994. It is a type of copyright which protects the breeder's 'invention' of a new and uniquely different plant variety. It provides the right of commercialisation of this 'new' variety and as a flow on, via grower contracts, provides for the collection of royalties at one point during the production cycle.

PBR protection is normally valid for up to 20 years and under registration, the breeder has the exclusive right to sell, produce or reproduce, import, export and hold stock of the variety. Purchase of a PBR protected seed variety means that for individual farmers there are restrictions.

The major restriction to those who purchase seed of a PBR protected line is that the current seed or the produce of subsequent harvests cannot be sold as seed for sowing, without permission from the breeder or his agent.

This restriction includes seed sale and trading between farmers. There are however exemptions to these restrictions. Firstly seed may be held over on farm for own use. PBR protected lines may also be used on farm by either or both partners in a bona fide share cropping situation.

Do not rely on logos or a listing under PBR in this publication. Always check with the PBR office as to the registration status of a variety if you intend selling seed of that variety.

For more information on Plant Breeders Rights contact IP Australia on 1300 65 10 10 or web: <http://www.ipaustralia.gov.au/pbr/index.shtml>

# TEMPERATE LEGUMES

## Annuals

Grow during the cooler part of the year and are well adapted to winter rainfall areas in southern NSW. They produce seed in spring, die in summer and new plants grow from seed the following autumn.

### BISERRULA

#### *(Biserrula pelecinus)*

Deep-rooted, hard-seeded, drought tolerant, annual legume, growing in autumn, winter and spring. Performs well on lighter textured soils and will tolerate soil acidity (pH<sub>Ca</sub> 4.5–7.5). Good tolerance of soils with moderate to high exchangeable soil aluminium (Al) but sensitive to high levels of manganese (Mn). Susceptible to waterlogging. Tolerant of redlegged earth mite. Susceptible to aphids. Sensitive to some herbicides. High seed production. Persistent once set seed. Usually sown in mixtures with serradella and subterranean clover. Sow in autumn.

*Minimum average annual rainfall:* 375 mm – southern NSW; 525 mm – northern NSW

*Sowing rate:* 5–7 kg/ha alone; 0.5–2 kg/ha in mixtures.

*Inoculant:* WSM 1497

Variety/brand	Comment	Main seed source
Casbah	early-mid maturity; very high hard seed; tolerant of RLEM	Ballard Seeds, Seedmark
Mauro <sup>Ⓓ</sup>	mid-maturity, softer seed, resistant to RLEM	Ballard Seeds, Seedmark

## Clovers

Grow and set seed each year, ensuring they survive in areas with long hot summers and low rainfall. Wide range of species available including aerial and subterranean seeding types which are adapted to different locations, soil types and uses. Different inoculants required for different species.

### ARROWLEAF CLOVER

#### *(Trifolium vesiculosum)*

Erect, hard-seeded, deep-rooted, annual legume, mainly spring-summer growing. Suits grazing, hay and silage production. Adapted to a wide range of soil types but avoid alkaline clay soils (pH<sub>Ca</sub> >7.5). Poor tolerance of waterlogging. Sown in mixtures for short–medium term pastures or as a component of high-density legume crops. Good soil moisture needed in spring for yield potential to be reached. Rotational grazing required. Seed easily harvested. High hard seed levels. Seed should be scarified to improve germination. Productive and persistent.

*Minimum average annual rainfall:* 400 mm – southern NSW; 500 mm – northern NSW.

*Sowing rate:* 6–10 kg alone;

1–4 kg/ha in mixtures with species such as subterranean clover or serradella.

*Inoculant:* C

**Select varieties on the basis of maturity** – earlier maturing varieties suit drier, more marginal areas.

Variety/brand	Comment	Main seed source
<b>Early maturing</b>		
Cefalu <sup>Ⓓ</sup>		Seedmark
Zulumax		Seed Distributors
<b>Late maturing</b>		
Seelu		Public variety
Zulu II	very high hard seed	Seedmark
<b>Very late maturing</b>		
Arrotas		Tas Global Seeds

## BALANSA CLOVER

*(Trifolium michelianum)*

Self-regenerating, hard seeded, annual legume, growing mainly in spring. Semi-erect with tall, hollow stems. Used as pioneering legume or pasture component. Resistant to clover scorch and root rot. Tolerates waterlogging and is mildly salt tolerant. Suits acid to neutral soils (pH<sub>Ca</sub> 4.5–7.0). Produces good quality hay. Slow early growth but increases rapidly in late winter and spring. Prolific seeder with high proportion of hard seed. Graze dry residues in summer to ensure regeneration. (N.B. Hard seed levels can be variable depending on climate and management). Sow in autumn (dryland) with good moisture or early autumn (irrigated).

*Minimum average annual rainfall:* 350 mm – southern NSW; 650 mm – northern NSW

*Sowing rate:* 4–7 kg/ha alone;

0.5–1.0 kg/ha in mixtures;

5–10 kg/ha as a one year forage crop (irrigated).

*Inoculant:* C

**Select varieties on the basis of:**

**Maturity** – earlier maturing varieties are suited to drier more marginal areas.

**Seasonal growth** – select varieties to match feed requirements (consult local trial results where available).

Variety/brand	Comment	Main seed source
<b>Early maturing</b>		
Border		Seed Genetics
Enduro		Seed Distributors
Frontier <sup>(D)</sup>	high hard seed	Seedmark
<b>Mid season maturity</b>		
Paradana		Public variety
Taipan <sup>(D)</sup>		Auswest Seeds, Keith Seeds
<b>Late season maturity</b>		
Bolta <sup>(D)</sup>	very late maturity, high hard seed	Seedmark
Viper <sup>(D)</sup>		Auswest Seeds, Keith Seeds

## BERSEEM CLOVER

*(Trifolium alexandrinum)*

Tall, erect, annual legume, growing in autumn, winter and spring. Used as annual forage crop, with multiple cuts or grazings possible. Does not regenerate well in subsequent years, as very little hard seed. Suited to fertile, neutral pH soils. Mildly tolerant of waterlogging and salt. Susceptible to blue-green and spotted alfalfa aphids. Susceptible to frost. Sow as a pure stand or in mixtures with annual clovers or oats, or as a high density legume crop in late February to early April.

*Minimum average annual rainfall:*

600 mm – southern NSW;

750 mm – northern NSW

*Sowing rate:* 15–25 kg/ha alone (irrigated); 2–6 kg/ha in mixtures as part of a one year high density legume or cereal-legume crop.

*Inoculant:* B

**Select varieties on the basis of:**

**Disease resistance** – Resistance to diseases may be important in your situation e.g. clover scorch, phytophthora root rot, pythium rot, leaf rust. Check local requirements for the need for resistance.

Variety/brand	Comment	Main seed source
<b>Mid season to late maturing</b>		
Carmel Multicut	susceptible to clover scorch	Public variety
Elite II <sup>(D)</sup>	tolerant of clover scorch; resistant to pythium & phytophthora root rot	Seedmark
Memphis <sup>(D)</sup>	resistant to earth mite & disease & frost tolerant	Michel Belair, Upper Murray Seeds
Alexandria	tolerant of clover scorch	Seed Distributors

## BLADDER CLOVER

*(Trifolium spumosum)*

Productive, self-regenerating, hard-seeded, annual legume. Suits wide range of soil types (pH<sub>Ca</sub> 5–8.5). High levels of hard seed. Not suitable for sowing in soils susceptible to waterlogging. Tolerant of some herbicides. Maturity similar to Dalkeith subterranean clover.

*Minimum average annual rainfall:* 350 mm

*Sowing rate:* 6–10 kg/ha alone;

3–5 kg/ha in mixtures.

*Inoculant:* C

Variety/brand	Comment	Main seed source
Agwest Bartolo <sup>(D)</sup>		Ballard Seeds PGG Wrightson, Seed Distributors

## CRIMSON CLOVER

*(Trifolium incarnatum)*

Erect annual, aerial-seeding legume. Growth in autumn, winter and spring. Good early season growth. Used for grazing, silage and hay production. Suited to low fertility, sandy to loam soils with pH<sub>Ca</sub> 4.2–7. Tolerant of clover scorch. Susceptible to blue-green aphid and redlegged earth mite. Self-regenerating but soft-seeded; does not persist well. Sow in autumn.

*Minimum average annual rainfall:* 450 mm – southern NSW; 650 mm – northern NSW

*Sowing rate:* 8–10 kg/ha alone; 1–4 kg/ha in mixtures with subterranean clover or oats.

*Inoculant:* C

Variety/brand	Comment	Main seed source
Mid-late season maturity		
Blaza <sup>(D)</sup>	good winter growth	Seedmark
Caprera	good spring growth	Public variety

## EASTERN STAR CLOVER

*(Trifolium dasyurum)*

Erect, self-regenerating annual legume (also known as *Trifolium formosum*), growing from late autumn to mid-spring. Suits mildly acid to neutral soils (pH<sub>Ca</sub> 4.5–8.0) in areas with mainly winter rainfall pattern and short growing season. In NSW, best suited to lower rainfall wheat belt areas. Has delayed germination (up to 6 weeks) following autumn rain in second and subsequent regeneration years. Moderately tolerant of blue-green aphid and lucerne flea, moderately sensitive to redlegged earth mite, sensitive to cowpea aphid. Sensitive to some herbicides. Sow in autumn.

*Minimum average annual rainfall:* 350–500 mm

*Sowing rate:* 7–10 kg/ha alone; 2–4 kg/ha in mixtures.

*Inoculant:* C

Variety/brand	Comment	Main seed source
AGWEST® Sothis <sup>(D)</sup>	early-mid maturity, very susceptible to scorch, susceptible to chocolate spot & grey mould	Ballard Seeds, Seed Distributors

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## GLAND CLOVER (*Trifolium glanduliferum*)

Self-regenerating, hard-seeded, semi-erect annual legume. Suited to soils with pH<sub>Ca</sub> 4.5–8 and grows well in light textured soils. Resistant to redlegged earth mite, aphids and clover scorch. Moderately tolerant of waterlogging. Early maturing species flowering around 100 days after sowing, depending on sowing date and seasonal conditions. Useful in mixtures with other temperate legumes or lucerne. Produces high seed yields. Seed easily harvested. Sow in autumn.

*Minimum average annual rainfall:*

375 mm – southern NSW;

550 mm – northern NSW

*Sowing rate:* 0.5–4 kg/ha in mixtures.

*Inoculant:* Group C

Variety/brand	Comment	Main seed source
Prima	early maturity, resistant to RLEM & BGA	Auswest Seeds, Ballard Seeds, New Seeds, PGG Wrightson, Seedmark

## PERSIAN CLOVER (*Trifolium resupinatum*)

Erect, annual legume, growing in autumn, winter and spring. Suits clay and loam soils with pH<sub>Ca</sub> 5–8. Good tolerance of waterlogging and moderately tolerant of salinity. Used as a fodder or forage crop; good feed value as hay, silage or pasture. Also used as a component of high-density legume crops in cropping rotations. Good regrowth after grazing. Suitable in mixtures with short-term ryegrass. Hard-seeded varieties regenerate well but softer seeded varieties must be resown. Sow in mid-late autumn (dryland) or early February (irrigated).

*Minimum average annual rainfall:* 450 mm (southern NSW)

*Sowing rate:* 4–10 kg/ha alone; 1–3 kg/ha in mixtures.

*Inoculant:* O

There are two types of Persian clover:

*Trifolium resupinatum* var. *majus* (large-leaved forage type) known in some areas as ‘Shaftal clover’. Erect habit, thick hollow stems and large leaflets. Soft-seeded. Flowering and maturity is mostly late. Used in high density legume fodder crops.

*Trifolium resupinatum* var. *resupinatum* (early, small-leaved grazing type). More prostrate habit, thinner stems and smaller leaflets. Higher hard seed and seed yields than *majus*. Flowering and maturity mostly earlier than *majus* types. Used in dryland pastures.

**Select varieties on the basis of:**

**Use pattern** – Short-term or medium to long-term pasture, or high density annual forage.

**Maturity** – Later maturing varieties suit irrigation and high rainfall.

**Hard seed levels** – High hard seed levels give better regeneration. Use soft-seeded varieties for annual forage crop, and hard seeded varieties for self-regenerating pastures.

**Seasonal production** – Select varieties to match feed requirements (consult local trial results where available).

**Disease resistance** – Varieties differ in their resistance to disease. Seek local information on the need for resistance, particularly to leaf and stem rust, clover scorch and phytophthora root rot.

Variety/brand	Comment	Main seed source
<b>1. <i>Trifolium resupinatum</i> var. <i>majus</i></b> (also known as Shaftal clover) annual semi-erect to erect types, suitable for forage/fodder crops		
<b>Early to mid season, high hard seed levels</b>		
Flash	grazing tolerant	Seed Genetics
<b>Mid season, no hard seed</b>		
Lightening	tolerant of clover scorch, susceptible to leaf rust	Seedmark
<b>Late season, low hard seed levels</b>		
Anchor;		Auswest Seeds, Keith Seeds
Enrich	very late flowering	Seed Force
Laser <sup>(D)</sup>	tolerant of leaf & stem rust, clover scorch & phytophthora root rot	Seedmark
Maral	susceptible to leaf rust	Public variety
RD 8	rust tolerant	Seed Genetics
Turbo	good frost tolerance	Seed Distributors
Turbo Plus <sup>(D)</sup>	leaf disease resistant, frost tolerant	Michel Belair, Upper Murray Seeds

**2. *Trifolium resupinatum* var. *resupinatum*** self-regenerating, prostrate to semi-prostrate types, suitable for short-term or long-term pastures

<b>Early to mid season, high hard seed levels</b>		
Prolific	tolerant of clover scorch & phytophthora root rot	Seedmark, Ballard Seeds
Nitro Plus <sup>(D)</sup>	resistant to clover scorch & phytophthora root rot	Seedmark
SARDI	semi-prostrate	Seed Distributors

## PURPLE CLOVER

### (*Trifolium purpureum*)

Erect, annual, deep-rooted legume, growing in autumn, winter and spring. Suits wide range of soil types, from sandy loams through to clay loams with pH<sub>Ca</sub> 4.5–8.5. Tolerant of short-term waterlogging. High quality forage prior to flowering. Late flowering. Good dry matter production until late in growing season. High levels of hard seed. Poor seed production.

*Minimum average annual rainfall:* 550 mm

*Sowing rate:* 7–10 kg/ha alone;  
1–4 kg/ha in mixtures.

*Inoculant:* C

Variety/brand	Comment	Main seed source
Electra	late maturity, good disease tolerance, susceptible to aphids	Auswest Seeds, Upper Murray Seeds

## ROSE CLOVER

### (*Trifolium hirtum*)

Annual, self-regenerating, hairy legume, growing in autumn, winter and spring. Suits a wide range of soils, especially acid and lighter textured soils. Tolerant of redlegged earth mite. Highly palatable but feed value low after flowering. Sensitive to heavy grazing or cutting at flowering. Flower heads can cause impaction in ruminants if the sole source of feed. Commonly used as pioneer legume or in mixtures with medic or subterranean clovers. Regeneration is unreliable. Sow in autumn.

*Minimum average annual rainfall:* 400 mm – southern NSW;

650 mm – northern NSW

*Sowing rate:* 5–15 kg/ha alone; 0.5–4 kg/ha in mixtures

*Inoculant:* C

Variety/brand	Comment	Main seed source
Hykon;		Public variety
SARDI Rose	higher hard seed	Seed Distributors

## SUBTERRANEAN (SUB) CLOVER

### (*Trifolium subterraneum*)

Prostrate, self-regenerating annual which buries seed (bracycalycinums are mainly aerial seeding). Best suited legume for large areas of southern NSW with winter dominant rainfall. Produces high quality forage and hay. Grows mainly in autumn, winter and spring. Regenerates well from buried seed in autumn but false breaks can reduce seedbank. Suited to moderately acid to neutral soils (see below), from sandy soils to clay loams. Tolerant of grazing. Current varieties are low in oestrogen. Reliable seed set and improved persistence by choosing varieties that matches rainfall and soil type

of the district. Early maturing varieties suit drier areas. Mix of varieties take advantage of extended seasons (e.g. including a longer-season (later maturing) variety), or improve persistence (e.g. including shorter-season (early maturing) variety with high level of hard seed). Subterranean clover varieties are listed below from late to early maturity. Sow in early to late autumn.

*Minimum average annual rainfall:* 375 mm – southern NSW; 600 mm – northern NSW

*Sowing rate:* 4–10 kg/ha alone;  
3–6 kg/ha in mixtures with grasses and other legumes.

*Inoculant:* C

#### Select varieties on the basis of:

**Type of subterranean clover** – Three main types of subterranean clover:

*Subterranean* – adapted to neutral to moderately acid soils – black seeds

*Brachycalycinum* – suited to neutral to alkaline clay soils – mostly black seeds

*Yanninicum* – Suited to poorly-drained, waterlogged soils – yellow seeds.

**Hard seed levels** – High hard seed levels desirable where persistence needed in drier areas. Low levels suit higher rainfall areas with late maturing varieties (see Appendix V).

**Maturity** – Use early maturing varieties in drier more marginal areas, and later maturing varieties where spring rainfall is reliable or for irrigation (see Appendix V).

**Phytophthora root rot** – Tolerance important in poorly drained soils in high rainfall areas and under irrigation. Three known races of Phytophthora affecting subterranean clover. Varieties with resistance to fewer than all three races are designated as “partially resistant” in the table below.

**Production potential** – Especially winter production (which is very dependent on plant density). Long season production important where late spring conditions occur or where irrigation available – consult local trial results where available.

**Oestrogen levels** – Do not grow older varieties (e.g. Dwalganup, Yarloop) which may have high levels of plant oestrogens that can cause livestock infertility. All listed varieties have low levels and are unlikely to cause clover disease in sheep.

**Other diseases** – Clover scorch in particular may be a problem in higher rainfall districts.

Variety/brand	Comment	Main seed source
<b>Subterraneum sub species – suited to acid to neutral soils</b>		
<b>Very late maturing, very low hard seed levels</b>		
Leura <sup>(D)</sup>	partially resistant to root rot, susceptible to scorch	Wrightson Seeds
<b>Mid – late maturing, low hard seed levels</b>		
Denmark <sup>(D)</sup>	partially resistant to root rot, resistant to scorch	Seedmark
Karridale	partially resistant to root rot, moderately resistant to scorch	Public variety
Ovaflow	partially resistant to root rot	Seed Distributors
<b>Mid – late season, moderate hard seed levels</b>		
Goulburn <sup>(D)</sup>	partially resistant to root rot, resistant to scorch	Wrightson Seeds
<b>Mid season, low hard seed levels</b>		
Woogenellup	susceptible to root rot and scorch	Public variety
<b>Mid season, moderate hard seed level</b>		
June	susceptible to root rot, resistant to scorch	Public variety
Coolamon <sup>(D)</sup>		Auswest Seeds, PGG Wrightson
<b>Mid season, high hard seed levels</b>		
Campeda <sup>(D)</sup>	resistant to root rot & scorch	Seedmark
<b>Early – mid-season, very high hard seed levels</b>		
York <sup>(D)</sup>	partially resistant to root rot, susceptible to scorch	Seedmark
<b>Early – mid-season, moderate hard seed levels</b>		
Bindoon	improved RLEM tolerance at seedling stage in some conditions	PGG Wrightson
Seaton Park LF	resistant to root rot, susceptible to scorch	Public variety
<b>Early season, high hard seed levels</b>		
Dalkeith	partially resistant to root rot, susceptible to scorch	Public variety
Dalsa	partially resistant to root rot	Seed Distributors
Losa	partially resistant to scorch	Seedmark
Urana <sup>(D)</sup>	resistant to scorch	Auswest Seeds, PGG Wrightson
<b>Very early season, high hard seed levels</b>		
Izmir <sup>(D)</sup>	susceptible to aphids & leaf disease)	Auswest Seeds, Ballard Seeds, PGG Wrightson
Nungarin	susceptible to root rot & scorch	Public variety
<b>Brachycalycinum sub species – suited to neutral to alkaline soils</b>		
<b>Mid-season, low hard seed levels</b>		
Clare	susceptible to root rot and scorch	Public variety
Clare2	tolerant of scorch, BGA, RLEM	Seed Distributors
<b>Mid-season, moderate hard seed levels</b>		
Antas <sup>(D)</sup>	partially resistant to root rot & scorch	Seedmark

<b>Early – mid-season, moderate hard seed levels</b>		
Mintaro <sup>(D)</sup>	resistant to root rot & scorch	Seedmark
<b>Yaninnicum sub species – suited to poorly drained waterlogged soils</b>		
<b>Late season, moderate hard seed levels</b>		
Meteora	partially resistant to root rot, resistant to scorch	Public variety
Napier <sup>(D)</sup>	resistant to root rot & scorch	Seedmark
<b>Mid-season, moderate hard seed levels</b>		
Gosse <sup>(D)</sup>	resistant to root rot & scorch)	Seedmark
Hatrik	partially resistant to root rot	Seed Distributors
Riverina <sup>(D)</sup>	resistant to root rot & scorch	Auswest Seeds, PGG Wrightson
<b>Early – mid-season, low hard seed levels</b>		
Trikkala	partially resistant root rot, moderately resistant to scorch	Public variety

## MEDICS (*Medicago spp.*)

Self-regenerating, semi-prostrate, annual legumes, adapted to areas with a predominantly winter rainfall. Good quality forage for grazing. Useful in pastures alone or in mixtures with annual grasses. Mainly adapted to neutral to alkaline soil types. High levels of hard seed. Regenerates well from seed even after 1–3 years cropping. Susceptible to waterlogging. Range of species available, suiting different niche environments. Sow in autumn. Minimum average rainfall, sowing rate and inoculant group vary with variety.

**Select varieties on the basis of:**

**Maturity** – Use earlier maturing varieties in drier, more marginal areas of medic zone.

**Adaptation to soil type** – e.g. Jemalong and Jester are particularly suited to red clay loams; Mogul is adapted to heavy alkaline soils.

**Hard seed** – Use high hard seed levels where persistence needed; softer seeded types enhance regeneration, especially in the year after establishment.

**Aphid resistance** – Blue-green aphid tolerance highly desirable.

**Yield and persistence** – Consult local trial results where available.

## BARREL MEDIC (*Medicago truncatula*)

Grows mainly in autumn, winter and spring. Best suited to neutral to alkaline soils in lower rainfall areas of the wheat belt and further west. Suited to long-term pastures. Sow on good moisture between mid-April and end of May.

Minimum average annual rainfall: 275 mm – southern NSW; 400 mm – northern NSW

Sowing rate: 2–6 kg/ha in mixtures.

Inoculant: AM

Variety/brand	Comment	Main seed source
<b>Early – mid maturity, high hard seed</b>		
Caliph <sup>(D)</sup>	tolerant of BGA & SAA	Seed Distributors
<b>Mid – late maturity, moderate hard seed</b>		
Paraggio	BGA tolerant	Public variety
<b>Mid – late maturity, high hard seed</b>		
Sephi	tolerant of BGA & SAA	Public variety
Jester <sup>(D)</sup>	tolerant of BGA & SAA	Seedmark
<b>Mid – late maturity, high hard seed</b>		
Jemalong	susceptible to aphids	Public variety
<b>Mid maturity, high hard seed</b>		
Mogul <sup>(D)</sup>	resistant to SAA & BGA suits loams to alkaline clays	Seed Distributors

## BURR MEDIC (Spineless burr medic) (*Medicago polymorpha* var. *brevispina*)

Grows mainly in the autumn, winter and spring. Has spineless pods, unlike naturalised burr medic. Suits soil types from mildly acid red-brown sandy loams to red clay loams  $pH_{Ca} > 5.2$ . In NSW, suits areas similar to Caliph barrel medic. Tolerates waterlogging and mild salinity but susceptible to aphids. High seed yield and hard seed levels; persist well in low rainfall areas.

Sowing rates: 2–5 kg/ha in mixtures.

Inoculant: AM

Variety/brand	Comment	Main seed source
<b>Early maturity, high hard seed</b>		
Santiago		Public variety
<b>Mid-maturity, moderate hard seed</b>		
Scimitar <sup>(D)</sup>	tolerant of BGA	Seedmark
Cavalier <sup>(D)</sup>	displays good acid tolerance	Seed Distributors

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## LEAFMORE <sup>Ⓛ</sup> Forage Rape

- Cross between Winfred and Emerald.
- Vigorous establishment and high yielding.
- Early maturity (8–10 weeks).
- Excellent regrowth for up to 4 grazings.
- Multi-stemmed with semi erect growth habit.
- High forage quality with good leaf to stem ratio.
- Superior cold growth habit and frost tolerance.

## BOLTA <sup>Ⓛ</sup> Balansa Clover

- Tolerates waterlogging and mild soil salinity.
- Superior late spring growth – 40% more than Paradana in Oct/Nov.
- Highly tolerant to clover scorch.
- Particularly well suited to high production Ryegrass/Clover blends.
- High quality hay or standing feed.

## MINTARO <sup>Ⓛ</sup> Sub Clover

- Very vigorous establishment and amazing winter dry matter production.
- Mid season maturity–114 days to flowering (SA).
- Particularly well suited to neutral to alkaline soils.

## ATLAS PG

- Erect habit, winter active variety.
- High summer dormancy to stop summer shoot growth.
- Improved persistence in dry marginal Phalaris areas.
- Strong seedling vigour and high winter production.
- Suited to higher rainfall parts of the wheat belt.

## PEGASIS <sup>Ⓛ</sup> Lucerne

- Highly winter-active Lucerne bred for excellent production and persistence in dryland cropping rotations.
- Excellent option for when very productive plant stands need to be maintained for 3–4 years under rain fed conditions.
- Newly released alternative to other Highly winter cultivars like; L90, SARDI 10, Cropper 9.5, etc.
- Highly resistant to Spotted Alfalfa Aphid and moderately resistant to Phytophthora Root Rot.

## ANTAS <sup>Ⓛ</sup> Sub Clover

- The most productive sub clover currently available.
- Has very vigorous establishment and early winter growth.
- Large leaved with strong regrowth following grazing.
- Needs to set seed in the first year, Mid Maturity.

## HOLDFAST GT <sup>Ⓛ</sup> (Grazing Tolerant)

- Grazing tolerant winter active Phalaris.
- Selected for long term persistence under grazing.
- Increased productivity over the life of the stand.
- Lower levels of stager causing alkaloids.
- Holdfast GT exhibits excellent seedling vigour to aid successful establishment.
- Bred by the CSIRO breeding program.
- Good tolerance to acid soils.



*better seeds, better choices*

## DISC MEDIC

### (*Medicago tornata*)

Mid-maturing with high levels of hard seed. Grows well on neutral to slightly acid soils. High forage quality and hay production. High seedling vigour. Higher rate of seed set than most other medics. Avoid heavy grazing during flowering and pod fill.

*Minimum average annual rainfall:* 350 mm

*Sowing rate:* 10–15 kg/ha.

*Inoculant:* AL

Variety/brand	Comment	Main seed source
Tornata	mid-maturity	Seed Distributors

## GAMA MEDIC

### (*Medicago gurgosa*)

Erect type, growing mainly in the autumn, winter and spring. Suited to the western edge of the cropping zone (similar area to Cyprus barrel medic) and calcareous clay and loam soils (alkaline). Very tolerant of blue-green aphid and tolerant of spotted alfalfa aphid pre-flowering. Tolerant of redlegged earth mite and lucerne flea. Vigorous seedlings but intolerant of heavy grazing pressure or waterlogging. Suits hay production.

*Sowing rates:* 2–4 kg/ha.

*Inoculant:* AM

Variety/brand	Comment	Main seed source
Paraponto	early-mid maturity	Public variety

## HYBRID MEDIC

### (*M. tornata* × *M. littoralis*)

Hybrid between disc and strand medic, with similar performance to disc medic. Selected for neutral to alkaline sandy soils, especially deep sands. Resistant to blue-green aphid, moderately resistant to spotted alfalfa aphid but susceptible to lucerne flea. Early maturing. Usually used in mixtures. No varieties currently marketed.

*Minimum average annual rainfall:* 275 mm – southern NSW

*Sowing rate:* 3–8 kg/ha.

*Inoculant:* AL

## MUREX MEDIC

### (*Medicago murex*)

Grows mainly in winter and spring. Suited to long-term pastures. Adapted to red-brown earths to cracking clay soils with  $\text{pH}_{\text{Ca}} > 4.5$  and  $\text{Al} < 15\%$ . Most acid tolerant commercially available medic species. Compared with subterranean clovers of similar maturity, has higher proportion of hard seeds, stays greener for longer

(particularly during a dry spring) and residue breaks down more slowly over summer. High hard seed levels. Regeneration in subsequent years is variable. Tolerant of redlegged earth mite but susceptible to aphids. Susceptible to extended waterlogging. Sow on good moisture between mid-April and end of May.

*Minimum average annual rainfall:* 500 mm – southern NSW

*Sowing rate:* 2–6 kg/ha.

*Inoculant:* AM

Variety/brand	Comment	Main seed source
Zodiac	mid-late maturity	Public variety

## SNAIL MEDIC

### (*Medicago scutellata*)

Erect annual, with large snail-like pods, growing mainly in autumn, winter and spring. Best suited to heavy neutral to alkaline soils in lower rainfall areas of the wheat belt and further west. Suited to long-term pastures. Tolerant of spotted and blue-green aphid, redlegged earth mite and lucerne flea. Vigorous seedlings and good growth the first year. Moderately acceptable to stock. Pods grazed in summer and variable regeneration from seed reserves in soil (best on self-mulching soils). Suits hay production. Sow on good moisture between mid-April and end of May.

*Minimum average annual rainfall:* 400 mm – southern NSW; 500 mm – northern NSW

*Sowing rate:* 3–7 kg/ha.

*Inoculant:* AM

Variety/brand	Comment	Main seed source
Sava	early maturity	Public variety
Silver	early-mid maturity, resists SAA & BGA	Seed Distributors

## SPHERE MEDIC

### (*Medicago sphaerocarpus*)

Semi-prostrate to semi-erect species. Tolerant of acid soils ( $\text{pH}_{\text{Ca}} > 4.8$ ). Remains green and flowers longer in spring than other annual legumes of similar flowering time. Vigorous seedlings. Tolerant of redlegged earth mite at seedling stage. Tolerant of foliar diseases and phytophthora root rot. Susceptible to aphids. Moderate level of hard seed. Suitable for crop rotations. Sow in autumn.

*Minimum average annual rainfall:* 350 mm – southern NSW

*Sowing rate:* 8 kg/ha alone.

*Inoculant:* AM

Variety/brand	Comment	Main seed source
Orion	mid-maturity	Ballard Seeds

## STRAND MEDIC

*(Medicago littoralis)*

Grows mainly in winter and spring. Best suited to neutral to alkaline soils ( $pH_{Ca} > 5.8$  and  $Al > 5\%$ ) in lower rainfall areas of the wheat belt and further west. Only suited to well-drained soils of sandy texture. Suited to long-term pastures. Hard-seeded. Good regeneration from seed after 1–2 years cropping. Sow on good moisture between mid-April and end of May.

*Minimum average annual rainfall:* 275 mm – southern NSW

*Sowing rate:* 2–6 kg/ha in mixtures.

*Inoculant:* AL

Variety/brand	Comment	Main seed source
<b>Early maturing, moderately hard-seeded</b>		
Angel <sup>(D)</sup>	tolerant of soil residues from SU herbicides; resistant to BGA & SAA	Seedmark
Herald <sup>(D)</sup>	tolerant of BGA and SAA	Seed Distributors
Jaguar <sup>(D)</sup>		Auswest Seeds, Keith Seeds
<b>Mid-season, hard-seeded</b>		
Harbinger	susceptible to blue green aphid	Public variety
<b>Mid-season, moderately hard-seeded</b>		
Harbinger AR	tolerant of blue green aphid	Public variety

## SERRADELLA

Deep-rooted, self-regenerating annual legume, growing in autumn, winter and into spring. Suited to deep, sandy to sandy loam acid soils ( $pH_{Ca} < 6.5$ ) with moderate to high levels of exchangeable soil aluminium (Al) (except cv. Madeira). Sensitive to high levels of exchangeable manganese (Mn). Tolerant of aphids. Withstands heavy winter grazing. Persistent once seed bank established. Less herbicide options available than subterranean clover. Dehulled seed preferred if available. Seed in pods needs to undergo a breakdown period, so establishment slow. Can sow pods under cereal crop for regeneration in following year. Mixtures of varieties of different maturities and hard seed levels useful. Enhanced pod (i.e. partially processed, consisting of mix of pod and clean seed) is also available. Sow in autumn.

**Select varieties on the basis of:**

**Maturity** – Earlier maturing varieties suit drier more marginal areas; late varieties suit high rainfall areas.

**Hard seed levels** – Medium hard seed levels tend to increase second year production.

**Soil aluminium** – All varieties have high tolerance of exchangeable soil aluminium, except Madeira (low tolerance) and Elgara (moderate to high tolerance).

**Note:** Elgara seed may be in short supply.

## YELLOW SERRADELLA

*(Ornithopus compressus)*

Not suited to poorly drained or waterlogged soils.

*Minimum average annual rainfall:* 400 mm – southern NSW;

450 mm – northern NSW

*Sowing rate:* 7–10 kg/ha (dehulled); or 10–30 kg/ha (in-pod); 2–5 kg/ha in mixtures.

*Inoculant:* S

Variety/brand	Comment	Main seed source
<b>Mid – late season, high hard-seed levels</b>		
Avila		Public variety
<b>Early – mid season, high hard-seed levels</b>		
Charano <sup>(D)</sup>		Seedmark
Elgara		Public variety
Madeira		Public variety
Santorini <sup>(D)</sup>		Ballard Seeds
Yelbini <sup>(D)</sup>		Ballard Seeds
<b>Early season, medium hard-seed levels</b>		
King	suits acid sands with high Al	Ballard Seeds, GN Lummis
Yellotas		Auswest Seeds, Tas Global Seeds

## PINK SERRADELLA (French serradella)

*Ornithopus sativus*

Early to mid-season maturity with improved winter growth. Tolerates some waterlogging. Soft-seeded varieties suited to short-term production (1–2 years) or in pasture mixes to improve production in initial years. New hard-seeded varieties provide better regeneration in the second year than yellow serradella. Some tolerance of earth mites.

*Minimum average annual rainfall:* 350 mm – southern NSW; 400 mm – northern NSW

*Sowing rate:* 7–10 kg/ha (dehulled); 10–30 kg/ha (in-pod); 2–5 kg/ha in mixtures.

*Inoculant:* S

Variety/brand	Comment	Main seed source
<b>Soft-seeded, erect growth habit</b>		
Cadiz <sup>(D)</sup>	mid-maturity, extended flowering	Ballard Seeds, Seedmark
<b>Hard-seeded, prostrate growth habit</b>		
Erica <sup>(D)</sup>	mid-maturity, grazing tolerant, moderately tolerant of RLEM	Ballard Seeds, Seedmark
<b>Hard-seeded, erect growth habit</b>		
Margurita <sup>(D)</sup>	mid-maturity	Ballard Seeds
Serratas		Auswest Seeds, Tas Global Seeds

## WOOLLY POD VETCH

*(Vicia villosa)*

Self-regenerating annual legume, growing in autumn, winter and spring. Used as pasture, forage, hay and green manure crop. Suited to wide range of soil types, especially well-drained soils. Tolerates acid soils with moderate levels of exchangeable soil aluminium (Al). Susceptible to waterlogging. Resistant to chocolate spot and rust. Susceptible to redlegged earth mite. High level of hard seed; can be a weed problem in winter crops. (N.B. Grain may be toxic to livestock). Some other species of vetch available that are not self-regenerating and used primarily as forage crops, rather than for self-regenerating pastures. Sow in autumn.

*Minimum average annual rainfall:* 550 mm – southern NSW; 650 mm – northern NSW

Sowing rate: 4 – 10 kg/ha.

*Inoculant:* E

**Select varieties on the basis of:**

**Hard seed level** – Soft seeded varieties useful for short crop rotations. Higher hard seed levels increase regeneration potential.

**Productivity** – Especially in winter (consult local trial results where available).

Variety/brand	Comment	Main seed source
<b>Low hard-seed</b>		
Capello <sup>(D)</sup>	mid-maturity	Seedmark
<b>High hard-seed</b>		
Haymaker Plus <sup>(D)</sup>	mid-maturity	Seedmark
Namoi	mid-late maturity	Public variety

# SEED DISTRIBUTORS

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4.9 kgs per  
week more  
weight gain  
than  
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## Penfield Station Liveweight Gain Trial 2009/10

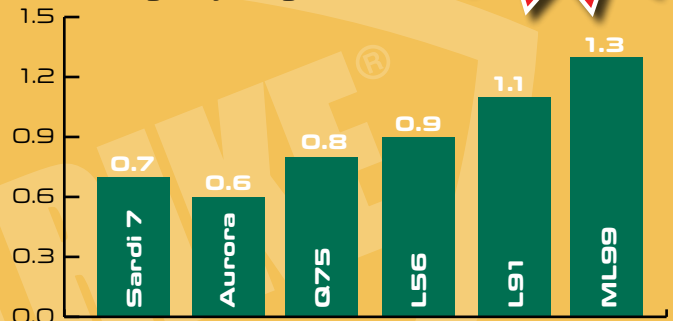
### Trial details:

- 14 genetically similar Angus steers were used
- Average start weight of animals was 364 Kg's
- 6 Lucerne varieties used; ML99, L91, Q75, L56, Aurora and Sardi 7
- Lucerne stand established in August 09', sowing rate: 15kg/ha with initial plant counts between varieties very similar
- 3 rotational grazing replications performed on each variety
- Livestock weighed weekly
- No supplements or other feed supplied
- All environmental conditions monitored, irrigated with linear irrigator
- Starting date: 09/10/2009
- Finishing date: 12/2/2010
- Trial length 18 weeks, 126 days

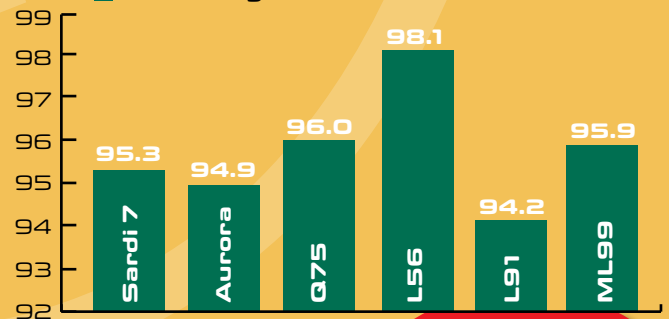
### Discussion:

From the trial, within the limitations of the environment, cattle weight gain performance was charted by cultivar over the trial period, with daily weight gains achieved (averaged over weekly periods per variety) ranging between 600g/day and 1.4kg/day. In 2010 further refinement of the trial protocol is to take place, with different species and approach to measurement being undertaken, watch this space for more information! Results are a guide to potential livestock weight gains that can be achieved on specific Lucerne varieties. Use this information as a tool to look at Forage production potential under traditional grazing systems.

**Kg/Day Weight Gain**



**Percentage of Residual Plants/M<sup>2</sup>**

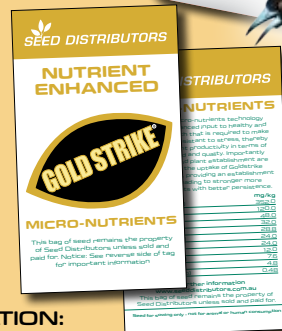


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- Proven effective nodulation and nitrogen fixation
- Improved potential for maximum yield
- Tougher, more durable protective seed coating
- Superior flowability for faster, hassle-free planting
- Goldstrike seed coating makes up 34% of total product weight

**New Industry Achievement**  
- 1000 viable Rhizobia per seed on stored Lucerne after 12 months and Medic and Sub Clover, after 6 months



FOR FURTHER TECHNICAL INFORMATION:

Paul Sippel 0427 255 292 Graeme Ralph 0425 871 968 Tim Francis 0419 995 416

## Perennials

Grow all year round if moisture available and usually survive for more than one year. Potentially fix more nitrogen than many annual species because they grow for longer.

### CLOVERS

Suit areas where moisture is available during summer (rainfall or irrigation). Provide good quality feed and used for grazing or for hay and silage. Vast range of types to suit different situations

#### RED CLOVER

*(Trifolium pratense)*

Short-term (2–3 years) perennial legume, growing mainly in summer and autumn. Suited to high rainfall areas with summer dominance. Performs best in cool coastal and tablelands areas. Some varieties used in irrigated pasture mixtures. Prefers well-drained, fertile, slightly acid to neutral soils (pH<sub>Ca</sub> 5.2–7). Resistant to spotted alfalfa aphid. Susceptible to earth mite and root rot. Can cause bloat in cattle. Habit varies with variety. Erect types useful for hay; prostrate types resist grazing. Sow in autumn or spring (irrigation and tablelands).

*Minimum average annual rainfall:*

700 mm – southern NSW;

800 mm – northern NSW

*Sowing rate:* 4–5 kg/ha alone; 1–2 kg/ha in mixtures.

*Inoculant:* B

**Select varieties on the basis of:**

**Oestrogen level** – Older varieties have higher oestrogen levels which can adversely affect performance of breeding stock; new varieties generally low in oestrogen.

**Maturity** – Earlier maturing types provide earlier feed in the spring.

**Ploidy** – Tetraploid types have larger leaves than diploid types.

**Seasonal growth** – Select high productivity to match livestock demand, especially winter growth. Consult local trial results where available.

**Stoloniferous habit** – May assist spread and increase persistence.

Variety/brand	Comment	Main seed source
<b>Early maturing diploids</b>		
Grasslands Colenso <sup>(D)</sup>	medium oestrogen	PGG Seeds
Grasslands Hamua 'Cowgrass'	old cultivar, high oestrogen	Public variety
Grasslands Sensation <sup>(D)</sup>	medium oestrogen	PGG Seeds
Renegade	medium oestrogen, erect	Seed Distributors
<b>Early maturing, stoloniferous diploids</b>		
Astred <sup>(D)</sup>	low oestrogen	Wrightson Seeds
Grasslands Broadway <sup>(D)</sup>	low oestrogen	PGG Seeds
SF Rossi	low oestrogen, hay type	Seed Force
Red812		Upper Murray Seeds
<b>Mid-season maturing diploids</b>		
Redquin	low oestrogen, erect	Public variety
Tuscan	medium oestrogen, grazing tolerant	Heritage Seeds
<b>Late season diploids</b>		
Grasslands Turoa	high oestrogen, semi-erect	Public variety
Rajah	low oestrogen, grazing tolerant	Seed Distributors
<b>Late season tetraploids</b>		
Grasslands Pawera	high oestrogen, erect	Public variety

#### STRAWBERRY CLOVER

*(Trifolium fragiferum)*

Prostrate perennial legume with similar growth habit to white clover but not as productive. Most growth in spring, summer and autumn. Tolerant of waterlogging, and persists well in high temperatures. Useful in seepage areas in lower rainfall areas mixed with salt tolerant grasses. Sow in autumn (dryland), or autumn or spring (irrigated). Often sown with white clover.

*Minimum average annual rainfall:* 600 mm – southern NSW; 650 mm – northern NSW

*Sowing rate:* 1–2 kg/ha alone (dryland); 2–4 kg/ha alone (irrigated); 0.5–1 kg/ha in mixtures.

*Inoculant:* B

Variety/brand	Comment	Main seed source
Grasslands Upward <sup>(D)</sup>	erect, high winter production	Wrightson Seeds
O'Connors	prostrate, small leaf, poor spring growth	Public variety
Palestine	erect, large leaf	Public variety

# Lucernes with the Stamina to go the distance

Developing grazing tolerant lucernes for Australia's dryland farms takes time - nearly two decades.

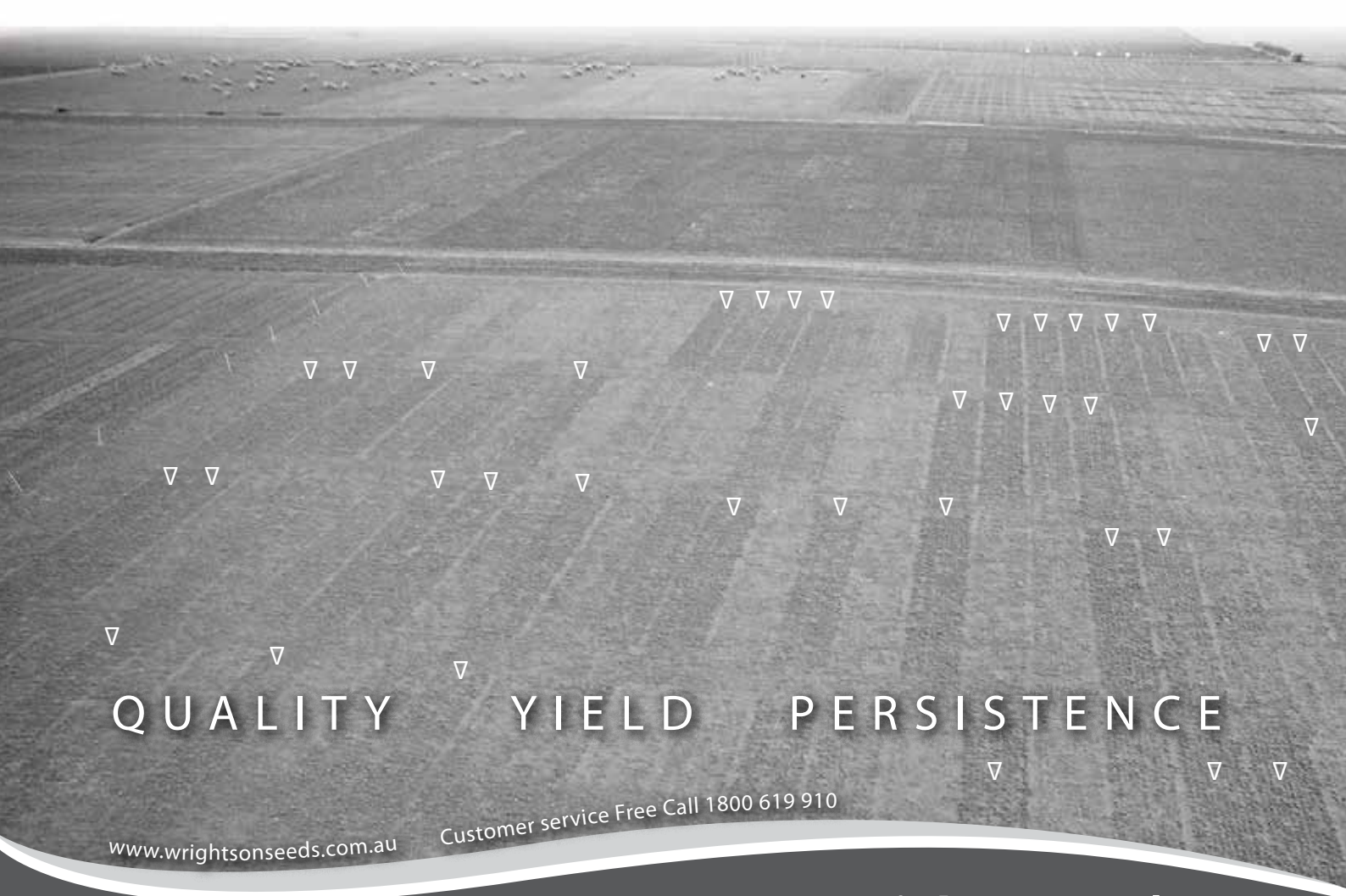
The first grazing tolerance breakthrough occurred in the USA with the development of lucernes that tolerated lengthy periods of set-stocking. An international partnership was formed with Wrightson Seeds and 24 of the best US lines were sent to Australia for further evaluation against 14 of the best Australian standards in NSW and Victoria.

These trials ran for a further seven years which included 2 periods of set-stocking

at 40 sheep/ha for 10 months each. The test lines were evaluated for production, dormancy, quality and persistence.

Every one of the new grazing tolerant lines persisted better than every Australian standard as shown in the photo below, where the grazing tolerant lines stand out as the darker strips.<sup>∇</sup>

Two varieties were selected as meeting all Wrightson Seeds criteria for yield, winter activity and outstanding persistence. These are **Stamina 5** and **Stamina GT6**.



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## WHITE CLOVER (*Trifolium repens*)

Prostrate perennial legume with most growth in spring, summer and autumn. Useful in high rainfall, coastal and tableland districts, and under irrigation for short or medium-term pasture. Suits wide range of soil types and relatively tolerant of acid soils ( $\text{pH}_{\text{Ca}} > 4.5$  with Al < 20%). High nutritive value and some varieties tolerate heavy grazing. High bloat risk. Intolerant of drought and high temperature; requires good summer rainfall or irrigation for survival. Can be grown with tropical or temperate grasses. Sow on good moisture in mid-autumn to early winter (dryland), and/or spring (irrigation and tablelands).

*Minimum average annual rainfall:* 700 mm – southern NSW; 775 mm – northern NSW

*Sowing rate:* 4–5 kg/ha alone (irrigated); 0.5–4 kg/ha in mixtures.

*Inoculant:* B

**Select varieties on the basis of:**

**Plant habit** – Larger-leaved varieties yield more than smaller-leaved types.

Note that these categories are broad and the characteristics of leaf size and stolon density are continuous (i.e. variety listed as ‘medium’ leaf size may be between a medium and a large leaf size). Prostrate types tend to be more tolerant of sheep grazing, while more erect varieties tend to be more suited to dairy cattle. The greater the stolon density, the greater the ability to spread and survive, especially under close grazing (e.g. sheep versus cattle).

**Seasonal production** – Overall productivity (especially winter) and persistence. Consult local trial results where available.

Variety/brand	Comment	Main seed source
<b>Large-leaved</b>		
Braidwood	good winter growth, frost tolerant	Seed Genetics
Excel Ladino <sup>(D)</sup>	good winter growth, early flowering, high seed yield	Seed Genetics
Grasslands Kopu II	good production & persistence	Wrightson Seeds
Haifa	good heat tolerance, production & persistence	Public variety
Jumbo	good winter growth, heat tolerant, resists RLEM	Seed Distributors
Osceola	summer active, suits cattle	Wrightson Seeds
Quest <sup>(D)</sup>	good production, persistence	Seedmark, Seed Force
RD 19 Taree Ladino <sup>(D)</sup>	erect, good winter growth, good seed production	Seed Genetics
Super Haifa <sup>(D)</sup>	good winter growth, early flowering, high seed yield	Auswest Seeds, Seed Genetics
Super Ladino <sup>(D)</sup>	prostrate, good winter growth, early flowering	Auswest Seeds, Seed Genetics

Will Ladino	erect, good spring - summer growth, heat tolerant, disease resistant	PGG Seeds
<b>Medium to large-leaved</b>		
Grasslands Bounty	good autumn production	Wrightson Seeds
Grasslands Tribute <sup>(D)</sup>	semi erect, persistent, good, autumn-winter growth, drought tolerant, leaf disease tolerant	PGG Seeds
Grasslands Trophy	drought tolerant, mid flowering, persistent	PGG Seeds
Weka	good autumn-winter growth, suits cattle	Heritage Seeds
<b>Medium-leaved</b>		
Canterbury <sup>(D)</sup>	early flowering	Seed Genetics
Esteem		Upper Murray Seed
Grasslands Demand <sup>(D)</sup>	good spring-summer growth, grazing tolerant	Cropmark Seeds
Grasslands Huia	poor winter growth, persistent	Public variety
Grasslands Pitau	good autumn-winter -spring production, suits cattle	Public variety
Grasslands Sustain <sup>(D)</sup>	erect, good production, persistence & grazing tolerance	Seed Force
Irrigation	poor winter growth, persistent	Public variety
Mink <sup>(D)</sup>	heat tolerant, persistent	Heritage Seeds
Super Huia <sup>(D)</sup>	good winter growth, early flowering, high seed yield	Seed Genetics
<b>Small-leaved, medium stolon density</b>		
Colt		Upper Murray Seeds
Grasslands Prestige <sup>(D)</sup>	grazing tolerant, suits sheep, good production, heat & drought tolerant	PGG Seeds
Grasslands Tahora <sup>(D)</sup>	prostrate, persistent, suits sheep	Wrightson Seeds
Riesling	heat tolerant, persists under grazing	Seed Distributors

## LOTUS (Birdsfoot Trefoil) (*Lotus corniculatus*)

Semi-erect to erect, summer-active perennial legume, especially suited to acidic ( $\text{pH}_{\text{Ca}} > 4.7$ ) and lower fertility soils. Low bloat risk. Plants generally short-lived; reseeding needed for long-term persistence. Will not tolerate overgrazing. Sow in autumn.

*Minimum average annual rainfall:* 700 mm

*Sowing rate:* 2 – 3 kg/ha.

*Inoculant:* *Lotus coniculatus*

Variety/brand	Comment	Main seed source
Grasslands Goldie <sup>(D)</sup>		Cropmark Seeds
Leo Lotus		JH Williams & Sons



## LUCERNE

(*Medicago sativa*)

Most widely grown perennial legume in pure swards or mixtures. Erect and leafy, providing excellent quality feed as standing feed, hay or silage. Main growth in spring, summer and autumn when moisture is available. Very productive under irrigation. Suited to wide range of well-drained, slightly acid to alkaline soils (pH<sub>Ca</sub> 5.2–7.5). Drought resistant. Becomes dormant under moisture or severe heat stress. Deep taproot can dry out soil profiles to depth. Does not tolerate waterlogging. Can cause bloat in cattle. Must be rotationally grazed or cut for good persistence. Varieties differ in insect and disease resistance and winter growth. Usually sown in autumn or spring (irrigated) when the soil temperature is high enough and there is sufficient moisture for establishment.

*Minimum average annual rainfall:*

375 mm – southern NSW;

400 mm – northern NSW

*Sowing rate:* 1–5 kg/ha (dryland, depending on rainfall);  
10–15 kg/ha (irrigated).

*Inoculant:* AL

Select varieties on the basis of:

**Late autumn/winter growth** – Select winter active varieties where winter feed/production required in cooler months or where seedling vigour essential for establishment. Semi-dormant and winter dormant types more persistent under grazing.

## Insects resistance

*Spotted alfalfa aphid* – (SAA) kills seedlings and established lucerne; resistance is essential. Most varieties are resistant to SAA, except Hunter River.

*Blue-green aphid* – (BGA) kills lucerne seedlings and reduces production. Resistance highly desirable. Not all varieties marketed have resistance.

**Disease resistance** – More important when lucerne is grown under irrigation, is cut for hay, or in warm humid environments.

*Phytophthora root rot* – Resistance essential under irrigation and desirable on poorly drained soil types dryland.

*Anthracnose (crown rot)* – moderate resistance desirable under irrigation and in humid environments. (N.B. Anthracnose is the stem symptom of the disease Colletotrichum crown rot).

*Bacterial wilt* – Resistance desirable on some river systems only (seek local advice).

*Stem nematode* – Resistance desirable on some river systems only (seek local advice).

**Potential hay quality** – leafy varieties with fine stems desirable for hay production. Highly winter active varieties may be more stalky, especially as lucerne stands thin. Some varieties claim to have more leaf and be of higher quality than others.

**Local productivity and persistence** – Consult local trial results where available.



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Variety/brand	Comment	Main seed source
<b>Winter dormant</b>		
54Q53 <sup>(D)</sup>		Seed Distributors
WL 342HQ MF		Wrightson Seeds
<b>Semi-dormant</b>		
Hunter River		Public variety
Kaituna <sup>(D)</sup>		Wrightson Seeds
L56 <sup>(D)</sup>		Seed Distributors
SARDI Five <sup>(D)</sup>		Heritage Seeds
SF Force 5		Seed Force
Stamina 5		Wrightson Seeds
Venus <sup>(D)</sup>		Seedmark
<b>Winter active</b>		
Aurora		Public variety
Flairdale		Alfagreen
Genesis <sup>(D)</sup>		Seedmark
Haymaster 7		Wrightson Seeds
Hunterfield		Public variety
Icon (SuperAurora) <sup>(D)</sup>		Auswest Seeds, Seed Genetics
Quadrella <sup>(D)</sup>		Auswest Seeds, Keith Seeds
Q75 <sup>(D)</sup>		Seed Distributors
SARDI Seven <sup>(D)</sup>		Heritage Seeds
SF Force 7		Seed Force
Stamina GT6		Wrightson Seeds
Titan 7		Auswest Seeds
Trifecta		Public variety
UQL-1 <sup>(D)</sup>		Auswest Seeds, Keith Seeds
WL 614 <sup>(D)</sup>		Wrightson Seeds
SF 714QL		Seed Force
<b>Highly winter-active</b>		
Alfamaster 10		Seedmark
ALA Pegasus <sup>(D)</sup>		Seedmark
Aquarius <sup>(D)</sup>		Seedmark
Australis (SuperSiriver) <sup>(D)</sup>		Auswest Seeds, Seed Genetics
Blue Ace (SuperSequel) <sup>(D)</sup>		Auswest Seeds, Seed Genetics
Hallmark <sup>(D)</sup>		Keith Seeds
Cropper 9.5		Wrightson Seeds
CUF101		Public variety
L90 <sup>(D)</sup>		Seed Distributors
L91 <sup>(D)</sup>		Seed Distributors

Magna 801FQ		Valley Seeds
ML99 Multileaf <sup>(D)</sup>		Seed Distributors
Multi FoliTM8		Wrightson Seeds
Saturn;		Seedmark
SARDI Ten <sup>(D)</sup>		Heritage Seeds
Sequel		Public variety
Sequel HR <sup>(D)</sup>		Auswest Seeds, Keith Seeds
SF Force 10		Seed Force
Silverado <sup>(D)</sup>		Michel Belair, Upper Murray Seeds
Siriver		Public variety
Siriver MkII <sup>(D)</sup>		Auswest Seeds, Keith Seeds
SuperCuf		Seed Genetics
SuperSonic <sup>(D)</sup>		Seed Genetics
Titan 9		Auswest Seeds
WL925HQ		Wrightson Seeds

## SULLA (*Hedysarum coronarium*)

Tall, erect, very productive, biennial or short-lived perennial legume with a deep taproot. Suitable for grazing, silage and hay. Suits warm temperate, Mediterranean and sub-tropical climates with warm winters. Adapted to neutral to alkaline clay and loam soils. Tolerant of aphids, moderately tolerant of redlegged earth mite and lucerne flea. Contains tannins which reduce bloat. Drought tolerant. May be useful to reduce ground water recharge. Susceptible to waterlogging and salinity. Seed requires dehulling.

*Minimum average annual rainfall:* 400–800 mm

*Sowing rate:* 10 kg/ha (dehulled).

*Inoculant:* WSM 1592

Variety/brand	Comment	Main seed source
Flamenco	early-maturity	Seed Distributors, Upper Murray Seeds
Flinders	mid-maturity	Seed Distributors
Moonbi	early-maturity, prostrate, adapted to grazing	Wrightson Seeds
Wilpena	mid-maturity, erect, adapted to silage and haymaking	Wrightson Seeds



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# TEMPERATE GRASSES

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### GRAZING BROME

(*Bromus stamineus*)

Deep-rooted, highly productive perennial grass, with fine leaves and dense tillers. Resistant to head smut. Most growth occurs in winter–spring. Suited to well-drained soils. Tolerant of grass grub and Argentine stem weevil. Requires close frequent grazing to perform well and persist. Compatible with cocksfoot, clover and herbs. Sow in autumn at temperatures above 10°C at a depth of 5–15 mm.

*Minimum average annual rainfall:* 600 mm – southern NSW; 750 mm – northern NSW

*Sowing rate:* 25 kg/ha alone; 10 kg/ha in mixtures.

Variety/brand	Comment	Main seed source
Grasslands Gala <sup>(D)</sup>		PGG Seeds
Nandu		Upper Murray Seeds

### PASTURE BROME

(*Bromus valdivianus*)

Highly palatable perennial grass with most growth during spring–summer and moderate growth in winter. Suited to fertile, well-drained soils. Grows well in mixtures with clovers and tolerates grazing well. Sow in spring–early summer.

*Minimum average annual rainfall:* 600 mm – southern NSW; 750 mm – northern NSW

*Sowing rate:* 25–30 kg/ha alone; 15–20 kg/ha in mixtures.

Variety/brand	Comment	Main seed source
Bareno		Heritage Seeds

## PRAIRIE GRASS

(*Bromus willdenowii*)

Erect annual or short-lived perennial grass. Most growth in autumn, winter and spring. Suited to fertile, well-drained soils. Must be rotationally grazed for good production and persistence. Sow in autumn alone or in mixtures with legumes (e.g. red and white clover) or other grasses.

*Minimum average annual rainfall:* 850 mm

*Sowing rate:* Up to 7 kg/ha in grass mixtures (dryland); 20–30 kg/ha with legumes (dryland); 40–60 kg/ha with legumes (irrigated).

Variety/brand	Comment	Main seed source
Ceres Atom		PGG Seeds
Grasslands Matua		Wrightson Seeds
Persister		Seed Distributors

## COLOURED BROME

(*Bromus coloratus*)

Long-lived perennial grass bred in Tasmania. Highly productive, palatable and persistent. Excellent late spring–early summer growth. High feed value. Tolerant of pasture grubs. Moderately tolerant of frost, drought and waterlogging. Similar maturity to Victorian ryegrass. Sow in autumn and spring to 10 mm deep (no deeper than 20 mm). Best suited to sowing in mixtures with legumes such as red clover.

*Sowing rate:* 15–25 kg/ha.

Variety/brand	Comment	Main seed source
Exceltas <sup>(D)</sup>		Auswest Seeds, Tas Global Seeds

## COCKSFOOT (*Dactylis glomerata*)

Tussocky perennial grass suited to low fertility soils. Tolerates acid soils. Sensitive to waterlogging. Good persistence under rotational grazing management. Keep short and leafy in spring to maintain quality. Sow in autumn or spring (irrigation and tablelands).

*Minimum average annual rainfall:* 450 mm – southern NSW; 750 mm – northern NSW

*Sowing rate:* 1–3 kg/ha in mixtures.

**Select varieties on the basis of:**

**Plant type** – Three types of cocksfoot – Mediterranean (summer dormant), European (summer active) and Intermediate.

*Mediterranean* varieties persist better under heavy grazing and in dry summer environments (e.g. southern NSW) than the European varieties.

*European* types are more summer active and have a more erect habit.

*Intermediate* types have characteristics between the two.

**Rust resistance** – Important in high rainfall areas (e.g. northern tablelands). Rust reduces yield, especially in autumn.

**Performance** – Persistence and seasonal productivity are important. Consult local trial results where available.

Variety/brand	Comment	Main seed source
<b>Mediterranean, high summer dormancy</b>		
Kasbah		Seedmark
Uplands <sup>(D)</sup>	<i>Dactylis glomerata</i> var. <i>hispanica</i>	Auswest Seeds, Tas Global Seeds
Sendace <sup>(D)</sup>	<i>D. glomerata</i> var. <i>hispanica</i>	Auswest Seeds; Tas Global Seeds
<b>Mediterranean, moderate summer dormancy</b>		
Currie		Public variety
Gobur		VicSeeds
<b>Intermediate, summer active</b>		
Ambassador		Seed Distributors
Drover <sup>(D)</sup>		Upper Murray Seeds
Grassly		Seedmark
Grasslands Kara <sup>(D)</sup>		PGG Seeds
Grasslands Tekapo		Wrightson Seeds
Grasslands Vision <sup>(D)</sup>		Cropmark Seeds
Grasslands Wana <sup>(D)</sup>		Cropmark Seeds
Howlong		Heritage Seeds
Megatas <sup>(D)</sup>		Auswest Seeds, Tas Global Seeds
Oxen		Ballard Seeds, Seed Distributors, Upper Murray Seeds
Porto		Public variety
SF Greenly		Seed Force
SF Lazuly		Seed Force
Yarck		Vic Seeds

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## FESCUE (Tall Fescue) (*Festuca arundinacea*)

Tussocky perennial grass, suited to wide range of soil types. Tolerant of acid and moderately saline conditions, and short periods of flooding. Moderately persistent and drought tolerant, depending on plant type, soil type and grazing management. In drier areas best suited to high altitudes. Sow in autumn or spring (irrigation and tablelands).

*Minimum average annual rainfall:* 650 mm (summer dominant); 450 mm (winter dominant) for Mediterranean types (*see below*)

*Sowing rate:* 6–15 kg/ha.

### Select varieties on the basis of:

**Plant type** – Two types of fescue available:

*Temperate (Continental or summer active)* – grows actively in spring, summer and autumn but less in winter, providing year-round quality feed. Adapted to areas with summer dominant rainfall, higher elevation or irrigation.

*Mediterranean (winter active, summer dormant)* – active growth in cooler months, dormant in summer. More tolerant of summer moisture stress than temperate types.

**Seedling vigour** – Fescue is slow to establish. Varieties with improved seedling vigour may enhance establishment.

**Rust resistance** – Important in high rainfall districts where rust is known to be a problem.

**Performance** – Consult local trial results where available for seasonal yields and persistence.

### Endophytes

*Endophytes* are fungi living within the plant in tall fescue and ryegrass, capable of producing alkaloids toxic to animals. Older fescue varieties (i.e. before the release of Demeter (e.g. Alta and Kentucky-31)) may contain high levels of wild-type endophytes which are most likely to cause problems in livestock. In areas with a long history (pre-1960) of tall fescue such as the northern tablelands, there is the potential for animal health problems associated with endophytes, but reports of such problems are not common.

Current tall fescue varieties available in NSW are free of wild-type endophytes.

Safe (or ‘novel’) endophyte varieties of tall fescue are available in NSW and trade as ‘MaxP’. These endophytes do not produce alkaloids toxic to livestock but do produce ‘plant-friendly’ alkaloids that deter insects and have other reported benefits to the plant.

Note that all turf varieties of tall fescue contain wild-type endophytes. (see: I&I NSW Primefact 535—*Endophytes of perennial ryegrass and tall fescue* for further information).

**Other factors** – maturity, leaf digestibility or quality, rhizomatous spread potential may also be important.

Variety/brand	Comment	Main seed source
<b>Temperate, very early flowering</b>		
Au Triumph		Public variety
Dovey		Heritage Seeds
Quantum		Wrightson Seeds
Quantum II (available with MaxP) <sup>(D)</sup>		Wrightson Seeds
<b>Temperate, early flowering</b>		
Pastoral <sup>(D)</sup>		Upper Murray Seeds
SF Festival		Seed Force
<b>Temperate, mid-late flowering</b>		
Grasslands Advance (available with MaxP) <sup>(D)</sup>		PGG Seeds
Demeter		Public variety
Grasslands Jesup (available with MaxP) <sup>(D)</sup>		PGG Seeds
Lunibelle		Cropmark Seeds
Savory		Seed Distributors
SF Finesse-Q		Seed Force
<b>Temperate, late flowering</b>		
Carmane		Seeds Distributors, Upper Murray Seeds
Martin2		Seed Distributors
Vulcan II		Wrightson Seeds
<b>Mediterranean, mid-season flowering</b>		
Charlem <sup>(D)</sup>		Upper Murray Seeds
Grasslands Fletcha (available with MaxP)		PGG Seeds
Fraydo <sup>(D)</sup>		Seedmark
Origin <sup>(D)</sup>		Seed Distributors, Upper Murray Seeds
Prosper		Heritage Seeds
Resolute <sup>(D)</sup>		Wrightson Seeds
SF Medallion		Seed force

## PERENNIAL VELDT GRASS

### *(Ehrharta calycina)*

Tufted perennial with most growth in autumn, spring and summer. Suited to light sandy soils and useful for erosion control. Sensitive to heavy grazing. Rotational grazing preferred for good persistence. Sow in autumn or early spring.

*Minimum average annual rainfall:* 550 mm – southern NSW; 600 mm – in northern NSW

*Sowing rate:* 0.5–3.0 kg/ha.

Variety/brand	Comment	Main seed source
Mission		Public variety

## PHALARIS

### *(Phalaris aquatica)*

Perennial tussocky grass which grows mainly in late autumn, winter and spring. Drought tolerant. Very persistent with appropriate grazing management. Tolerates flooding, wet and moderately saline soils. Better suited to moderate to high fertility soils. Sensitive to acid soils. Rotational grazing preferred, especially for semi-erect and erect types. All varieties can cause phalaris poisoning. Sow in autumn or early spring (irrigation and tablelands).

*Minimum average annual rainfall:* 525 mm – southern NSW; 700 mm – northern NSW

*Sowing rate:* 4–6 kg/ha alone, 1–3 kg/ha in mixtures.

**Select varieties on the basis of:**

**Plant habit** – Prostrate types compete better with weeds and when well established, tend to be more persistent. However, they tend to be less productive in winter than erect types. Erect types require more careful grazing management to ensure persistence.

**Seedling vigour** – Reducing competition from broadleaf weeds and annual grasses is vital during establishment, as phalaris seedlings have poor seedling vigour. Particularly important in low rainfall, marginal areas. Erect varieties have greater seedling vigour than prostrate types.

**Summer dormancy** – Where summer rainfall is infrequent and erratic, summer dormancy may enhance persistence. Important in areas such as the northern slopes and western NSW.

**Phalaris poisoning potential** – While all varieties can potentially cause poisoning, some have been selected to reduce the risk. In areas with a known problem, low risk varieties may assist, although livestock management of this problem is critical.

**Acid soil tolerance** – Phalaris is relatively intolerant of soil acidity, especially where exchangeable soil aluminium is high and phosphorus levels are low. Some varieties have been selected for improved acid soil tolerance. In

marginal situations, use of these varieties may improve long term productivity and persistence.

**Performance** – Seek local trial results where available for seasonal yields and persistence.

Variety/brand	Comment	Main seed source
<b>Prostrate, semi winter dormant, low summer dormancy</b>		
Australian		Public variety
Australian II <sup>(D)</sup>		Seedmark
Australian Gold		Upper Murray Seeds
Australis Australian		Seed Distributors
Grasslands Maru		Wrightson Seeds
Grazier <sup>(D)</sup>		Seed Distributors, Upper Murray Seeds
Uneta		Public variety
<b>Semi-erect to erect, winter active, low summer dormancy</b>		
Advance AT <sup>(D)</sup>	significantly improved acid soil tolerance	Seedmark
Holdfast		Public variety
Holdfast GT <sup>(D)</sup>	improved grazing tolerance	Seedmark
Landmaster <sup>(D)</sup>	able to grow in light, shallow soil	Seedmark
Sirosa		Public variety
Sirolan	Holdfast × Australian	Public variety
Stockman		Upper Murray Seeds
<b>Erect, winter active, medium to high summer dormancy</b>		
Atlas PG <sup>(D)</sup>	lower rainfall, summer dormant variety	Seedmark

## PUCCINELLIA (Sweet Grass)

### *(Puccinellia ciliata)*

Perennial grass, growing in autumn, winter and spring; dormant in summer. Tolerant of poorly drained areas. Tolerates saline soils better than tall wheatgrass but less vigorous. Not highly productive and sensitive to heavy grazing. Slow to establish. Usually sown in mixtures with tall wheatgrass and strawberry clover, except in very saline soils. Sow in autumn (dryland); autumn or late winter to early spring (irrigation).

*Minimum average annual rainfall:* 400 mm – southern NSW; 500 mm – northern NSW

*Sowing rate:* 3 kg/ha.

Variety/brand	Comment	Main seed source
Menemen		Public variety

## RYEGRASS (*Lolium* spp)

Diverse species with annual, perennial and hybrid types. Both diploid and tetraploid varieties and different maturities are available within each type.

### Select varieties on the basis of:

**Length of production required** – Annuals last 1–3 years while perennials can last 4–6 years.

**Maturity** – Earlier flowering varieties suit the drier areas of the perennial ryegrass zone. These varieties produce more feed early in winter than later in spring. Later maturity allows feed production in summer where moisture (e.g. irrigation) and temperature permit.

**Plant type** – Diploids have two sets of chromosomes while tetraploids have four.

*Tetraploids* have larger cells, leaves and seeds. They have good seedling vigour and establish quickly, producing early feed. They have slightly higher plant sugars and are more palatable than diploid types. They produce well under high input management systems.

*Diploids* tiller well, have finer leaves and still yield well if conditions are unfavourable

**Rust resistance** – Very important on the coast and in humid conditions. Check with your seed source as to latest rust resistance information for your area.

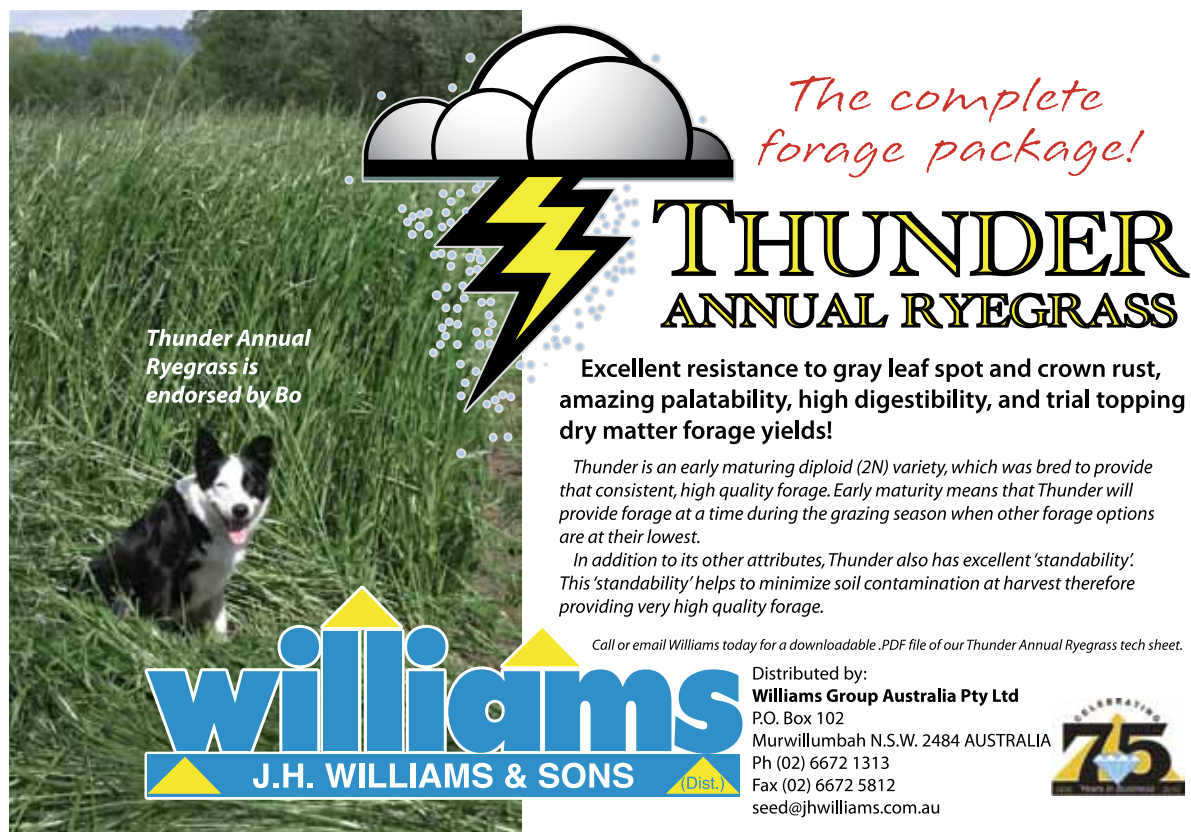
**Persistence and seasonal production** – Refer to local trial results where available.

### Endophyte

*Endophytes* are fungi which live within the plant in many forage grasses, including ryegrasses and fescues. They sometimes provide advantages to the plant (e.g. may enhance establishment and persistence) but some endophytes can produce toxins which can cause ryegrass staggers or other animal production losses. The effects in NSW have yet to be fully clarified. Endophytes are advantageous on the south coast where black beetle is a problem and on the southern highlands.

Ryegrass varieties are available with or without endophyte. Some varieties contain *novel endophytes* (AR1, AR37) which may enhance production and persistence. These endophytes relies on a substance known as peramine to deter insects; it produces no ergovaline (potential cause of a number of livestock health disorders) or lolitrem B (cause of ryegrass staggers).

For further information see: I&I NSW Primefact 535—*Endophytes of perennial ryegrass and tall fescue.*



*The complete forage package!*

# THUNDER ANNUAL RYEGRASS

**Excellent resistance to gray leaf spot and crown rust, amazing palatability, high digestibility, and trial topping dry matter forage yields!**

*Thunder is an early maturing diploid (2N) variety, which was bred to provide that consistent, high quality forage. Early maturity means that Thunder will provide forage at a time during the grazing season when other forage options are at their lowest.*

*In addition to its other attributes, Thunder also has excellent 'standability'. This 'standability' helps to minimize soil contamination at harvest therefore providing very high quality forage.*

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## RYEGRASS – SHORT-TERM FORAGE VARIETIES

Includes annual ryegrass (*Lolium rigidum*), Italian ryegrass (*L. multiflorum*), and hybrids of the two species. Wide range of varieties including those suitable as annual forage crops, through to varieties with a high perennial component, which can produce good yields of high quality forage for up to three years under good management and growing conditions. Require high soil fertility and good moisture for best results.

Some short-term forage varieties contain *novel endophyte* (ARI) which may enhance production and persistence. Other varieties listed may or may not contain endophyte.

*Minimum average annual rainfall:* 750 mm – southern NSW; 800 mm – northern NSW

*Sowing rate:* 8–25 kg/ha; 25–30 kg/ha (irrigated); 2 kg/ha in mixtures with short-term legumes.

## ANNUAL RYEGRASS (*Lolium rigidum*)

Annual self-regenerating winter – spring growing ryegrass. Early maturing. Suited to drier margin of ryegrass zone. Note that this species is aggressive and can be a weed in winter crops. Annual ryegrass toxicity, ergot and herbicide resistance can be a problem.

*Minimum average annual rainfall:* 400 mm – southern NSW; 600 mm – northern NSW

*Sowing rate:* 15 kg/ha alone; 5–10 kg/ha in mixtures

Variety/brand	Comment	Main seed source
Guard	resistant to Annual Ryegrass Toxicity	Valley Seeds
Wimmera		Public variety
Safeguard	resistant to Annual Ryegrass Toxicity	Valley Seeds

## ANNUAL ITALIAN (Westerwolds) RYEGRASS

(*Lolium multiflorum*)

Limited to one year's production only—grown as a forage crop. This group is also referred to as the Westerwolds (or Westerwolds) ryegrasses.

Variety/brand	Comment	Main seed source
<b>Early flowering diploids</b>		
DoubleCrop		Vicseeds
SF Flyer		Seed Force
Griffin		Heritage Seeds
Grassmax		Seedmark
<b>Early flowering tetraploids</b>		
Betta Tetila		Parkseeds
Drummer <sup>(D)</sup>		Seedmark
New Tetila		VicSeeds
SF Catapult		Seed Force
SF Sprinter		Seed Force
Sungrazer T		Wrightson Seeds
Tetila (USA)		Public variety
Tetila Gold		Upper Murray Seeds
<b>Mid season flowering diploids</b>		
Aristocrat II		Valley Seeds
Ceres Pronto		PGG Seeds
Fantastic		Upper Murray Seeds
Noble		Valley Seeds
Progrow <sup>(D)</sup>		Valley Seeds
SF Sultan		Seed Force
Surrey 2		Seed Distributors
<b>Mid season flowering tetraploids</b>		
Abundant		Seed Distributors
Andy		Cropmark Seeds
Atomic		Upper Murray Seeds
Grasslands Tama		Public variety
Jivet		Seed Distributors
Mach1		Auswest Seeds
Maximus		Heritage Seeds
R2		Seedmark
Robust <sup>(D)</sup>		Seedmark
Rocket		Seed Distributors
SF Adrenaline		Seed Force
T Rex		Heritage Seeds
Tetrone		Seed Distributors
Winter Star II		Wrightson Seeds
<b>Late season flowering diploid</b>		
Amie		Heritage Seeds
<b>Late season flowering tetraploids</b>		
Beefbuilder III		JH Williams & Sons
SF Speedyl		Seed Force

## ITALIAN RYEGRASS

### *(Lolium multiflorum)*

More persistent and can produce for 1–2 years under suitable growing conditions and management. Later flowering varieties require high rainfall or irrigation for maximum production and persistence.

Variety/brand	Comment	Main seed source
<b>Early season flowering diploid</b>		
Dargo <sup>(D)</sup>		Vicseeds
Thunder		JH Williams & Sons
<b>Mid-season flowering diploid</b>		
Caversham		Wrightson Seeds
Eclipse <sup>(D)</sup>		Valley Seeds
Opal		Seed Distributors
<b>Mid-season flowering tetraploid</b>		
Jeanne		Seed Distributors, Upper Murray Seeds
<b>Late season flowering diploid</b>		
Awesome <sup>(D)</sup>		Upper Murray Seeds
Ceres Crusader <sup>(D)</sup>		PGG Seeds
Charger <sup>(D)</sup>		Seedmark
Concord		Wrightson Seeds
Conquest		Wrightson Seeds
Diplex;		Seed Distributors
Grasslands Warrior <sup>(D)</sup>		PGG Seeds
Hulk <sup>(D)</sup>		Heritage Seeds
Icon		Seed Distributors
SF Accelerate		Seed Force
SF Indulgence DipQ		Seed Force
Sonik <sup>(D)</sup>		Cropmark Seeds
<b>Late season flowering tetraploid</b>		
Denver		Michel Belair, Upper Murray Seeds
Feast II		Wrightson Seeds
Nourish		Wrightson Seeds
SF Emmerson		Seed Force

## HYBRID RYEGRASS – ITALIAN TYPE

Varieties with more Italian ryegrass than perennial in their breeding and are capable of contributing worthwhile production for 1–2 years.

*Festulium* is a ryegrass hybrid with *Festuca pratensis* (meadow fescue). It has similar characteristics and management requirements to Italian type hybrid ryegrass and is therefore included in this category.

Variety/brand	Comment	Main seed source
<b>Early season flowering tetraploid</b>		
Magnum		Seed Distributors
<b>Mid-season flowering diploid</b>		
Turbo		Valley Seeds
<b>Late season flowering diploid</b>		
Maverick G2 <sup>(D)</sup>		Wrightson Seeds
<b>Late season flowering diploid</b>		
SF Momentum		Seed Force
<b>Festulium (meadow fescue × Italian ryegrass)</b>		
Perun	mid-maturity	Seed Distributors

## HYBRID RYEGRASS – PERENNIAL TYPE

Hybrids with more perennial component than Italian ryegrass in their breeding. They are generally capable of 2–3 years production with potential for extended life under good management and seasonal conditions.

*Matrix* is a perennial ryegrass hybrid with *Festuca pratensis* (meadow fescue). It has similar characteristics and management requirements to perennial ryegrass hybrids with other *Lolium* spp. and is included in this category for these reasons.

Variety/brand	Comment	Main seed source
<b>Early diploid, low aftermath</b>		
Barberia <sup>(D)</sup>	nil endophyte	Heritage Seeds
<b>Mid-season flowering diploid</b>		
Revolution <sup>(D)</sup>		Cropmark Seeds
SF Audacity	nil endophyte	Seed Force
<b>Mid to late season flowering tetraploid</b>		
Banquet II END05 <sup>(D)</sup>		Wrightson Seeds
<b>Late season flowering diploid</b>		
Matrix <sup>(D)</sup>		Cropmark Seeds

## PERENNIAL RYEGRASS

### (*Lolium perenne*)

A highly nutritious, winter-spring growing perennial grass suitable for grazing, hay and silage. Can be grown dryland or under irrigation. Best suited to fertile soils. Low drought tolerance. Short-lived on the north coast. In drier situations suits higher altitudes.

*Minimum average annual rainfall:* 700 mm–southern NSW; 800 mm–northern NSW

*Sowing rate:* 3–20 kg/ha.

Perennial ryegrass can have varieties with and without novel endophyte.

There are several varieties available containing the novel endophytes AR1 and AR37. There are also other endophytes available e.g. NEA<sub>2</sub>, ENDO5.

Nil endophyte varieties (sold under the brand ‘Staggers Free™’) have no endophyte or lolitrem B.

Other varieties listed may or may not contain endophyte.

Variety/brand	Comment	Main seed source
<b>Very early maturing diploids</b>		
Boomer (Staggers Free™) <sup>(D)</sup>		Valley Seeds
Everlast		Seed Distributors
Fitzroy <sup>(D)</sup>		Wrightson Seeds
Kangaroo Valley		Public variety
Matilda		Parkseeds
Meridian (available with AR1) <sup>(D)</sup>		Heritage Seeds, Seedmark
SF Tenacity		Seed Force
Skippy		Vicseeds
Valley		Seed Distributors
<b>Early maturing diploids</b>		
Ausvic <sup>(D)</sup>		Vicseeds
Award <sup>(D)</sup>	Upper Murray Seeds	
Camel (Staggers Free™) <sup>(D)</sup>		Valley Seeds
Drylander		Seed Distributors
Roper (Staggers Free™) <sup>(D)</sup>		Valley Seeds
Victorian		Public variety
<b>Mid season diploids</b>		
Arrow (available with AR1 & AR37)		Heritage Seeds
Avalon (available with AR1) <sup>(D)</sup>		Vicseeds
Bolton <sup>(D)</sup>		Vicseeds
Ceres Cannon (available with AR1) <sup>(D)</sup>		PGG Seeds
Ceres Kingston		PGG Seeds
Extreme (available with AR1 & AR37) <sup>(D)</sup>		Wrightson Seeds
Grasslands Commando (available with AR1 & AR37) <sup>(D)</sup>		PGG Seeds
Grasslands Nui		Public variety
Grasslands Samson (available with AR1) <sup>(D)</sup>		PGG Seeds

Jumbuck <sup>(D)</sup>		Upper Murray Seeds
Prolong (Staggers Free™) <sup>(D)</sup>		Valley Seeds
SF Joule AR1		Seed Force
Tomson		Seed Distributors
<b>Mid season tetraploids</b>		
Grasslands Ohau (available with AR1 & AR37)		PGG Seeds
<b>Late season diploids</b>		
Platinum		Valley Seeds
Alto (available with AR1 & AR37)		Heritage Seeds
Ceres One50		PGG Seeds
<b>Late season tetraploids</b>		
Bealey (available with NEA2) <sup>(D)</sup>		Heritage Seeds
Brigalow		Upper Murray Seeds
Halo (available with AR37)		PGG Seeds
Optima		Seed Distributors
Quartet <sup>(D)</sup>		Wrightson Seeds

## TALL WHEATGRASS

### (*Thinopyrum ponticum*)

Tall growing tussocky perennial. Useful pioneering species in poorly drained saline soils. Grows mainly in spring and autumn. Slow to establish. Sow in early autumn for best results (dryland) or late winter to early spring (irrigation and high rainfall).

*Minimum average annual rainfall:* 400 mm–southern NSW; 500 mm–northern NSW

*Sowing rate:* 3–12 kg/ha.

Variety/brand	Comment	Main seed source
Tyrrell		Public variety
Dundas <sup>(D)</sup>	selected for increased feed quality	Wrightson Seeds

## TIMOTHY

### (*Phleum pratense*)

A shallow-rooted, leafy, tufted perennial, adapted to high rainfall, cool temperate conditions. Grows in spring, summer and autumn but growth slows in high temperatures. Grows best in high fertility, high moisture holding capacity soils in areas with reliable summer rainfall. Some are better suited to grazing, while others are hay types and not as persistent under grazing. High feed quality and very palatable to livestock. Grazing types require rotational grazing. Compatible with clovers and herbs.

*Minimum average annual rainfall:* 900 mm

*Sowing rate:* 5–8 kg/ha; 1–2 kg/ha in mixtures.

Variety/brand	Comment	Main seed source
Ceres Viking	densely tillered, early season grazing type	PGG Seeds
Grasslands Charlton		PGG Seeds

# NATIVE GRASSES

There are a number of native grass species available commercially which are valuable as pasture plants.

(Source: Industry & Investment NSW and Dr Ian Chivers, Native Seeds Pty Ltd)

Perennial native grasses can be classified as either C3 or C4 plants, which refer to differences in the photosynthetic process. All species have the C3 pathway, but the additional C4 pathway has evolved in species in the wet and dry tropics.

The two groups have different growth requirements:

- C3 plants are adapted to cool season establishment and growth, in either wet or dry environments;
- C4 plants are more adapted to warm or hot seasonal conditions, under moist or dry environments.

C3 grasses have greater frost tolerance and higher feed quality, but produce less herbage than C4 species. In natural conditions, C3 species are often more abundant in the shade of trees and on southerly aspects while C4 species often dominate full-sun conditions and northerly aspects), so provide greater ground cover across a range of conditions. A mixture of C3 and C4 species provides a broad spread of pasture production throughout the year for grazing.

## BARBED WIRE GRASS (*Cymbopogon refractus*)

Erect, long-lived, C4 perennial grass, growing mainly in spring and summer. Suitable for coastal areas and into ranges. Suits wide range of soils (sand, loam and clay) including those of low fertility. Can reach 120–150 cm high. Drought tolerant. Low frost tolerance. Yields well under rotational grazing. Sow into weed-free seedbed in early spring, or later with irrigation or summer rainfall. Seed very small; sow with inert carrier such as vermiculite. Seed should be surface sown and rubbed or rolled into the surface.

## COTTON PANIC (*Digitaria brownii*)

Long-lived, C4 perennial with a slowly spreading habit, growing 25–80 cm high. Grows mainly in summer and dormant in winter in inland locations. Adapted to coastal and inland areas, in the tropics and in the warmer temperate areas. Suits wide range of soils (sand, loam and

clay). Very drought tolerant and mildly tolerant of frost. Produces large bulk of valuable, highly palatable green fodder in warmer months after rainfall. May be selectively grazed if set stocked. Spreads by short rhizomes and seed. Sow into weed-free seedbed in early spring, or later with irrigation or summer rainfall. Seed is light and fluffy; pelletise seed for sowing. Sow no deeper than 5 mm on heavier soils.

## HAIRY ARMGRASS (Armgrass millet) (*Urochloa piligera*)

Annual or short-lived C4 perennial with warm season growth, up to 100 cm high. Previously known as *Brachiaria piligera*. Valuable fast-growing forage for grazing animals, producing large quantities of feed early in spring. Suits northern tablelands and slopes, and the central west. Suits wide range of soil types but prefers sandier soils. Heat tolerant. Low tolerance of drought and frost. Seed should be sown shallow into prepared seedbed.

## KANGAROO GRASS (*Themeda australis* syn. *T. triandra*)

Deep-rooted, C4 perennial grass with erect or sprawling tussocky habit. Noted for active summer growth and upright, reddish coloured seedheads. Dormant during winter. Occurs naturally from alpine to coastal areas, to dry inland in NSW. Suits sandy to heavy clays soils of low to moderately high pH. Tolerant of drought and heat. Low frost tolerance. Can grow 60–150 cm high. Deep-rooted so can help lower water tables and assist with control of dryland salinity. Has moderate to good feed value when actively growing. Becomes rank and unpalatable if not grazed or mown in summer. Persists well if rotationally grazed. Spreads by seed only. After harvest, seed dormant for six months. Sow clean seed in spring into prepared seedbed, around 10 mm deep. Summer rainfall or storms required to ensure full establishment before winter. Good seedling vigour but plants susceptible to grazing when small. Seed germinates readily in spring and summer with air temperatures over 25°C and soil temperatures over 20°C. Seed expensive as seed production is low and cleaning is difficult.

Sowing rate: 1–2 kg/ha

Variety/brand	Comment	Main seed source
Burrill		Native Seeds Pty Ltd

## MITCHELL GRASS (Curly Mitchell grass) (*Astrebla lappacea*)

Tufted, deep-rooted, C4 perennial native grass, growing mainly in summer from 30–90 cm high. Suits heavy grey cracking clay soils in arid to semi-arid parts of north-western NSW. Drought resistant due to shallow surface rhizomes which utilise light showers of rain and deeper vertical roots which access subsoil moisture. Low tolerance of frost, flooding and weed competition. Provides good year round pasture of moderate feed value. Regenerates from the crown and plants can survive 20–30 years if not overgrazed. Sow seed shallow (< 10 mm) in early or late summer. Seed should be greater than 12 months old at sowing. Follow-up rain required after six weeks to ensure germination and growth. Grows best in warm, wet conditions.

*Minimum average annual rainfall:* 250 mm

*Sowing rate:* 1–2 kg/ha.

Variety/brand	Comment	Main seed source
Yanda <sup>Φ</sup>		Native Seeds Pty Ltd

## QUEENSLAND BLUEGRASS (*Dichanthium sericeum*)

Erect, leafy, tufted C4 perennial grass, growing to 80 cm high. Suits clay soils of western plains and loams or rocky sites. Moderately tolerant of drought and frost. Palatable and nutritious feed, especially when young. Rotational grazing will help persistence. Sow seed from spring to early autumn. Late autumn seedlings can be damaged by frost. Sow seed on or close to surface (no deeper than 10 mm) and keep soil moist to ensure germination.

*Sowing rate:* 5–10 kg/ha (as florets)

## REDGRASS (Red leg grass) (*Bothriochloa macra*)

Tufted, short-statured, extremely hardy, C4 warm-season perennial grass which goes dormant during winter. Suits coastal, tablelands and slopes environments. Adapted to range of soil types but grows best on heavy clays and loams with slightly acid to neutral pH. High tolerance of drought and heat. Low to moderate frost tolerance. Moderate grazing value, especially after summer rain. Responds to fertiliser and grazing. Sow by broadcasting in spring or autumn. Rest in late summer to allow seed set.

## WALLABY GRASS (*Austrodanthonia spp.*)

Erect, tufted C3 yearlong green perennial, with fine leaves, growing 30–80 cm high during the cool season. Suits medium clays to light sandy loam soils. Tolerates low soil fertility but responds to fertiliser if soil deficient in nutrients. Highly tolerant of grazing, frost, drought, heat and acid soils. Will not tolerate waterlogging. Nutritious, productive and persistent when grazed intermittently. Sow in spring or late autumn when moisture from either rainfall or irrigation is available. Sow no deeper than 5 mm. Several species available which suit different conditions. Select varieties on the basis of adaptation to soil type.

*Minimum average annual rainfall:* 400 mm–southern NSW; 500 mm–northern NSW

*Sowing rate for seed in caryopsis form:* 0.3–2.0 kg/ha

Variety/brand	Comment	Main seed source
Taranna ( <i>A. richardsonii</i> ) <sup>Φ</sup>	suits medium textured soils	Native Seeds Pty Ltd,
Bunderra ( <i>A. bipartita</i> ) <sup>Φ</sup>	suits heavy textured clay soils	Native Seeds Pty Ltd
Bidgee ( <i>A. fulva</i> )	suits shallow and infertile soils	Native Seeds Pty Ltd
Smallflower wallaby grass ( <i>A. setacea</i> )	suits sandy to heavy soils	Native Seeds Pty Ltd
Wirra ( <i>A. tenuior</i> )	larger growing variety that suits heavier soils	Native Seeds Pty. Ltd.

## WARREGO SUMMER GRASS (*Paspalidium jubiflorum*)

Tussocky, warm-season, C4 perennial grass, 30–130 cm high. Essentially a tropical genus but extends to temperate regions. Adapted to the western slopes and plains of NSW. Suits variety of soil types and situations but most productive on heavier soils on lower slopes. Drier areas suits swamps and watercourses, and can survive periods of inundation. Favoured by livestock. Provides useful forage even after it has hayed off (after frost or insufficient soil moisture). Irrigation can prolong growing season. Large amounts of seed are produced but progressively falls as it matures. A 'seed litter' often present in productive stands at end of growing season. Sow shallow, into a weed-free seedbed in spring, using a conventional seedbox or by broadcasting.

## WEeping GRASS (Weeping rice grass) (*Mircolaela stipoides*)

Cool-season, tufted C3 perennial grass. Produces year-round high quality forage although slow winter growth. Adapted to higher rainfall areas of the tablelands and alps in NSW, especially damp or semi-shaded areas. Suits wide range of soils with pH<sub>Ca</sub> < 6.0 but grows best on loams. Tolerant of high soil aluminium, drought, frost and shade. Medium salt tolerance. Spreads by seed and short rhizomes. Sow into a weed-free seedbed 10–20 mm deep when soil moisture guaranteed following sowing. Seedlings grow slowly for first six months. Rest over summer to ensure good seed set.

*Sowing rate:* 5–8 kg/ha.

Variety/brand	Comment	Main seed source
Ovens <sup>Ⓢ</sup>		Native Seeds Pty Ltd
Bremmer		Native Seeds Pty Ltd

## WHEAT GRASS (Common wheat grass or Rough wheat grass) (*Elymus scaber*)

Short-lived, tussocky C3 perennial grass which grows 30–100 cm high. Suited to districts with cool winters such as the tablelands coastal ranges. Adapted to soils ranging from sand to clay-loams, and mildly acidic to alkaline pH. High frost tolerance, moderate shade and drought tolerance, and low salt tolerance. Plants remain green throughout summer if sufficient soil moisture. High to moderate feed value in winter and spring. Responds to fertiliser and grazing. Rotational grazing ensures persistence. Sow florets at a depth of 10 mm in autumn to winter. Seedlings establish rapidly and have high seedling vigour. Can be used as a cover crop with slower growing grass such as wallaby grass.

*Sowing rate:* 5–10 kg/ha (as florets).

Variety/brand	Comment	Main seed source
Oakey	drought resistant, frost tolerant, good winter/spring growth	Native Seeds Pty Ltd
Murray	suits warmer, drier conditions; moderate drought tolerance	Native Seeds Pty Ltd

## WINDMILL GRASSES

Several species of windmill grass, the best known being *Chloris truncata* and *Chloris ventricosa*. Both prefer heavier soils.

### WINDMILL GRASS (Umbrella grass) (*Chloris truncata*)

Short-lived, warm-season, prostrate, C4 perennial grass which forms a rounded tussock up to 50 cm high. Suits most environments, except south coast. Grows on clay soils in drier areas, preferring red or black earths. High heat and drought tolerance, moderate salt tolerance and low frost tolerance. Responds to summer rain, producing high amount of feed. Produces palatable fodder of low to moderate feed value when actively growing. Pioneer species that spreads rapidly by seed onto bare soil areas; valuable soil stabiliser. Sow into weed-free seedbed in early spring. Lightly scarify the soil, broadcast seed over surface, then scarify lightly again. Establishes quickly with minimal rainfall.

### TALL WINDMILL GRASS (*Chloris ventricosa*)

Erect, summer-growing, bunching, C4 perennial grass, growing to 100 cm high. Can live for several years. Adapted to western plains and coastal areas. Suits wide variety of soils, but prefers clay rather than sandy soils. Excellent drought and heat tolerance. Low to moderate frost tolerance. Produces green foliage for much of the year but dormant during winter. Moderate feed value and readily grazed during summer. Often used as pioneer species to stabilise soils whilst other grasses become established. Can be used with grasses such as kangaroo grass and redgrass. Sow seed shallow (no deeper than 10 mm) in warmer months when air temperatures are above 25°C. Rotationally graze and rest in summer to ensure establishment and spread.

*Sowing rate:* 1– kg/ha.

Variety/brand	Comment	Main seed source
LIG 548		Native Seeds Pty Ltd

# TROPICAL LEGUMES

## Annuals

### COWPEA

*(Vigna unguiculata)*

Fast-growing, annual legume, suitable for grazing or crop rotations. Drought and heat tolerant; sensitive to frost. Smaller seed than lablab (15,000 compared to 4,000 seeds/kg); produces smaller plants and being earlier maturing, produces less biomass. Susceptible to root diseases in wet years. Sow when soil temperature reaches 18°C for 3 days.

*Minimum average annual rainfall:* 500 mm

*Sowing rate:* 10–15 kg/ha.

*Inoculant:* I (CB1015)

Variety/brand	Comment	Main seed source
Poona	main cultivars available	Public variety
Caloona		Public variety
Red Caloona		Public variety
Ebony <sup>Φ</sup>		Heritage Seeds

### LABLAB

*(Lablab purpureus)*

Large-seeded, fast growing annual with large leaves and upright growth habit. Sow when soil temperature reaches 19°C for 3 days. Sensitive to frost. Sow at a depth of 40–60 mm using conventional machinery or direct drill with press wheels.

*Minimum average annual rainfall:* 550 mm (summer dominant)

*Sowing rate:* 15–20 kg/ha.

*Inoculant:* J (CB1024)

Variety/brand	Comment	Main seed source
Koala	early maturing, white seed, can be used for human consumption	
Highworth	late maturing, rarely set seed in NSW, forage, hay or silage	
Rongai	very late maturing, rarely sets seed in NSW, forage, hay or silage	

## Perennials

### ATRO

*(Macroptilium atropurpureum)*

Deep-rooted twinning perennial, growing mainly in summer and autumn. Regenerates from seed reserves in soil. Suited to wide range of soils. Tolerates drought but sensitive to frost. Not suited to continuous heavy grazing but once established, more tolerant than many other tropical legumes. Suits wide range of growing conditions. Persistent in higher rainfall areas of NSW; sporadic performance elsewhere. Rust is a potentially important disease in sub-tropical coastal areas of NSW. Sow in spring to summer.

*Minimum average annual rainfall:* 800 mm (summer dominant)

*Sowing rate:* 1–4 kg/ha.

*Inoculant:* M (CB756)

Variety/brand	Comment	Main seed source
Siratro		Public Variety
Aztec <sup>Φ</sup>	rust resistant selection	Selected Seeds, Queensland Agricultural Seeds & Southedge Seeds

### AXILLARIS

*(Macrotyloma axillare)*

Twinning perennial with most growth in spring, summer and autumn. Suited to well-drained soils. Does not tolerate waterlogging. Tolerates drought. Moderate tolerance of frost. Resistant to amnemus weevil. Sow in spring and summer with other tropical legumes.

*Minimum average annual rainfall:* 1000 mm (summer dominant)

*Sowing rate:* 0.5–1 kg/ha.

*Inoculant:* J (CB1024)

Variety/brand	Comment	Main seed source
Archer		Public variety

## BURGUNDY BEAN (*Macroptilium bracteatum*)

Relatively new twining and trailing, perennial species. Deep-rooted and drought tolerant. Good seeder with high proportion of soft seed. Regenerates well from regenerating plants and new seedlings. Sold as pelleted seed mix of two cultivars—Cadarga and Juanita. Cadarga upright, short lived with good seed production and Juanita more prostrate and longer lived. Sow at depth of 10–20 mm. Tolerates colder temperatures than many of the other tropical legumes. Sow from October to January.

*Minimum average annual rainfall:* 500mm

*Sowing rate:* 3–7 kg/ha.

*Inoculant:* CB1717

Variety/brand	Comment	Main seed source
Cadarga	more upright; produces more seed and dry matter	Heritage Seeds
Juanita	prostrate; has better mosaic virus resistance; more persistent	
B1 Burgundy	mixture of Cadarga and Juanita	Heritage Seeds

## BUTTERFLY PEA (*Clitoria ternatea*)

Semi-twining perennial which grows well on heavier soil types where lucerne not well adapted. Tolerates heavy grazing, but does not tolerate waterlogging or flooding. Used as rotational legume, lasting 3–4 years and will set seed in NSW. Requires higher temperatures for germination than other-tropical species. Not performed as well in southern Queensland or northern NSW where environment less tropical.

*Minimum average annual rainfall:* 650 mm

*Sowing rate:* 8–10 kg/ha.

*Inoculant:* M (CB756)

Variety/brand	Comment	Main seed source
Milgarra	large blue flowers	Public variety
Butterfly pea	mixture of various types with large blue & white flowers	Public variety

## CENTRO (*Centrosema pubescens*)

Perennial, trailing-climbing legume. Suits both coastal and tropical regions, as well as tablelands. Adapted to wide range of soil types from sandy loam to clay soils with soil pH<sub>Ca</sub> 5–6.5. Requires reasonable phosphorus levels. Cardillo has superior cold tolerance and moderate drought tolerance. Competes well with most tropical grass species. Withstands periods of heavy grazing. Sow with band seeder.

*Minimum average annual rainfall:*

1000mm (summer dominant)

*Sowing rate:* 1–3kg/ha in mixtures.

*Inoculant:* CB1923

Variety/brand	Comment	Main seed source
Common Centro	limited seed	Public variety
Cardillo <sup>Ⓞ</sup>		Southedge Seeds

## CREEPING VIGNA (*Vigna parkeri*)

Prostrate, twining perennial with most growth in cooler parts of summer and autumn. Suited to moist, well-drained soils but does not tolerate sustained waterlogging. Slow to establish. Moderately susceptible to frost and drought; after drought can regenerate from soil seed reserves. Tolerant of heavy grazing. Sow September to March (preferably early spring when soil temperatures reach 18°C and mid-summer).

*Minimum average annual rainfall:* 1100 mm (summer dominant)

*Sowing rate:* 2–3 kg/ha alone; 0.5–2.0 kg/ha in mixtures.

*Inoculant:* I (CB1015)

Variety/brand	Comment	Main seed source
Shaw	seed in short supply	Public variety

## DESMANTHUS (*Desmanthus virgatus*)

Perennial summer-growing legume suitable for clay soils in tropical and sub-tropical northern NSW and Queensland. Productive, persistent, and drought tolerant. Highly palatable to livestock. Marc is well suited for use in extensive grazing areas of native and sown grasses. Can yield 1–2 t/ha dry matter in mixes with perennial grasses (e.g. Buffel, Floren, Strickland, Swann and Bambatsi panic) and up to 3 t/ha in pure swards.

*Minimum average annual rainfall:* 550 mm

*Sowing rate:* 1–2 kg/ha.

*Inoculant:* CB 3126

Variety/brand	Comment	Main seed source
Marc <sup>Ⓞ</sup>		Progressive Seeds

## FORAGE PEANUT (*Arachis pintoi*)

Summer growing, non-bloating perennial. Suited to wide range of soil types, but avoid heavy clay soils. Used as ground cover plant in orchards. Very persistent and tolerant of drought and shading. Tolerates high levels of aluminium (Al) and manganese (Mn). Very frost sensitive.



*Minimum average annual rainfall:* 1000 mm (summer dominant)

*Sowing rate:* 10 kg/ha (seed in pod).

*Inoculant:* CIAT3101

Variety/brand	Comment	Main seed source
Amarillo		Public variety
Bolton		Southedge Seeds

## GLYCINE

*(Neonotonia wightii)*

Twining, trailing perennial, growing mainly in spring, summer and autumn. Suited to very fertile, well-drained soils. Does not tolerate continuous heavy grazing. Frost susceptible. Sow mixture of glycine varieties to ensure persistence on variable soil types. Sow in spring to late summer.

*Minimum average annual rainfall:* 1000 mm (summer dominant)

*Sowing rate:* 2–4 kg/ha.

*Inoculant:* M (CB756)

Variety/brand	Comment	Main seed source
Tinaroo		Public variety
Malawi	late flowering, suits low pH soils better. than Tinaroo, seed difficult to obtain	Public variety
Cooper	earlier flowering; more drought tolerant, seed difficult to obtain	Public variety

## GREENLEAF DESMIDIUM

*(Desmodium intortum)*

Twining perennial, growing mainly in summer and autumn. Performs best on well-drained fertile soils. Tolerates acid soils and waterlogging. Susceptible to frost. Does not tolerate continuous heavy grazing. Sow in spring and summer.

*Minimum average annual rainfall:* 1100 mm (summer dominant)

*Sowing rate:* (dryland) 0.5–1 kg/ha.

*Inoculant:* CB627

Variety/brand	Comment	Main seed source
Greenleaf		Public variety

## ROUNDLEAF CASSIA

*(Chamaecrista rotundifolia)*

Summer-growing perennial, well suited to acid, low fertility, light-textured soils. Good drought tolerance but frost susceptible. Non-bloating and tolerates heavy grazing. Only moderately palatable and can dominate pastures, as stock selectively graze alternative species.

*Minimum average annual rainfall:* 650 mm (summer dominant) inland; 800 mm on North Coast

*Sowing rate:* 0.5–1.0 kg/ha.

*Inoculant:* M (CB756)

Variety/brand	Comment	Main seed source
Wynn		Public variety



**PROGRAZE**  
Profitable, sustainable grazing

Sound species selection needs to be complemented with effective pasture and grazing management.

- PROGRAZE is a course based on established and proven principles of pasture and livestock production.
- Understanding these principles is the key to improving grazing systems, providing the basis for sound and effective grazing management systems.



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For further information on PROGRAZE contact:  
your local office of Industry & Investment NSW, or  
Phil Graham, PROGRAZE Coordinator  
Ph (02) 6226 2199 Fax (02) 6226 1581

# TROPICAL GRASSES

## BAHIA GRASS

*(Paspalum notatum)*

Perennial, with main growth during summer. Semi-erect habit. Suits low fertility, light-textured soils. Bahia grasses are potential weed species which dominate pastures; do not grow on or near fertile soils and streams (especially cv. Pensacola). Intensive grazing management essential to prevent domination of pastures. Compatible legumes include Amarillo and Bolton peanut, and white clover. Sow in spring–early summer, or late summer–early autumn.

*Minimum average annual rainfall:* 700 mm (summer dominant)

*Sowing rate:* 1–2 kg/ha. **If seed is coated adjust sowing rate upwards to allow for seed coat weight.**

**Select varieties on the basis of:**

**Frost tolerance**–Desirable to increase period of green feed availability and better winter feed.

**Palatability** –The better the palatability, the higher the feed quality and potential for livestock production.

Variety/brand	Comment	Main seed source
Competidor, Argentine	moderate frost tolerance, moderately palatable	Public variety
Pensacola	poor frost tolerance, low palatability	Public variety

## BLUE DAWN

*(Paspalum nicorae)*

Rhizomatous, perennial grass. Palatable to livestock and wildlife. Suited to sandy and friable loamy surface soils. Cold and drought tolerant. Will lose quality after heavy frost but good feed quality during warmer winter weather. Recovers from dry periods rapidly in spring with good rainfall. Tolerant of moderate shade and can suppress weeds such as blue heliotrope. Becoming important in higher rainfall sub-tropical climates, replacing kikuyu in many grazing situations. Successfully used as a ground cover on roadsides, sporting ovals, lawns and in high wear areas.

*Minimum average annual rainfall:* 750 mm

*Sowing rate:* 3–4 kg/ha. **If seed is coated adjust sowing rate upwards to allow for seed coat weight.**

Variety/brand	Comment	Main seed source
Blue Dawn <sup>Φ</sup>		Progressive Seeds

## BUFFEL GRASS

*(Cenchrus ciliaris)*

Perennial, tussocky grass with most growth during summer. Suited to range of soils but prefers well drained soils. Feed quality is poor in low fertility soils. Drought resistant and responds quickly to light rain except in the coldest months. Poor tolerance of waterlogging and frost. May out-compete native pastures. Not suited for short-term pasture in cropping rotation due to slow early growth and difficulty of removing by cultivation. Moderately palatable to stock and unsuitable for horses in monocultures. Seed fluffy and difficult to sow with conventional machinery. Use seed that is one year old to allow dormancy to break down. Barrel medic is the most useful companion legume while serradella is useful in acidic soils. If sowing with lucerne, reduce lucerne sowing rate to 0.75 kg/ha to reduce competition. Sow in spring or late summer–early autumn.

*Minimum average annual rainfall:*

275 mm in central NSW; 375 mm in northern NSW

*Sowing rate:* 0.5–3 kg/ha alone (dryland). **If seed is coated adjust sowing rate upwards to allow for seed coat weight.**

**Select varieties on the basis of:**

**Maturity**–Early maturing varieties most likely to establish and reproduce in the low rainfall and highly variable climate in the far west of the growing area. Use later maturing varieties in the east.

**Plant habit**–Tall varieties are less suited to sheep production than short varieties.

**Soil type**–Best suited to lighter textured soils but Biloela suits the heavier textured soils of northwest NSW.

Variety/brand	Comment	Main seed source
<b>Tall varieties</b>		
Biloela	late-maturity suits heavier textured soils	Public variety
<b>Short varieties</b>		
Gayndah	mid-maturity	Public variety
American	early-maturity	Public variety

## COUCH GRASS

*(Cynodon dactylon var. aridus)*

Perennial grass. Adapted to wide range of soil types. Performs well on light sandy soils and tolerant of alkaline soils and heat.

*Minimum average annual rainfall:* 625 mm

*Sowing rate:* 6–10 kg/ha. **If seed is coated adjust sowing rate upwards to allow for seed coat weight**

Variety/brand	Comment	Main seed source
Giant Bermuda		JH Williams & Sons

## CREEPING BLUEGRASS

*(Bothriochloa inculpta)*

Stoloniferous, late summer–autumn growing perennial. Well suited for use in waterways.

Moderate production potential on more fertile soils; will persist under low fertility conditions. Drought tolerant.

*Minimum average annual rainfall:* 500 mm (summer dominant).

*Sowing rate:* 2–4 kg/ha. **If seed is coated adjust sowing rate upwards to allow for seed coat weight.**

Variety/brand	Comment	Main seed source
Hatch		Public variety
Bissett <sup>Ⓢ</sup>	fine-leaved, superior stolon development and stolon rooting characteristic which may improve spread and persistence over Hatch.	Selected Seeds

## DIGIT GRASS

*(Digitaria eriantha spp. eriantha)*

Spring and summer-growing perennial. Suited to wide range of soil types (low fertility, lighter-medium to heavier textured) but most productive on light to medium soil types. Good drought tolerance; poor waterlogging tolerance. Very palatable; some frost tolerance; persistent.

*Minimum average annual rainfall:* 400 mm (summer dominant)

*Sowing rate:* 1–2 kg/ha. **If seed is coated adjust sowing rate upwards to allow for seed coat weight.**

Variety/brand	Comment	Main seed source
Premier		Public variety

## FINGERGRASS

*(Digitaria milanjana)*

Perennial, stoloniferous, summer-growing grass. Suits a range of soils but has special application on light to medium textured soils. Once established, can survive prolonged periods of drought. Withstands waterlogging but not prolonged flooding. Very palatable to all types of livestock, especially in the early stages of growth. Makes excellent high digestible hay.

*Minimum average annual rainfall:* 600 mm.

*Sowing rate:* 2–4 kg/ha bare seed. **If seed is coated adjust sowing rate upwards to allow for seed coat weight.**

Variety/brand	Comment	Main seed source
Strickland <sup>Ⓢ</sup>		Progressive Seeds
Jarra	More suited to the wet tropics	Public variety

## FLOREN BLUEGRASS (Angleton grass)

*(Dicanthium aristatum)*

Perennial tufted grass, naturalised in parts of Queensland. Especially well adapted to cracking clay soils in summer rainfall areas. Drought, flood and salt tolerant but susceptible to frost. Reasonable seedling vigour. Not a prolific seeder under NSW conditions (very late flowering) but can spread vegetatively.

*Minimum average annual rainfall:* 500 mm (summer dominant).

*Sowing rate:* 2–4 kg/ha. **If seed is coated adjust sowing rate upwards to allow for seed coat weight.**

Variety/brand	Comment	Main seed source
Floren <sup>Ⓢ</sup>		Progressive Seeds

## FOREST BLUEGRASS

*(Bothriochloa bladhii spp. glabra)*

Perennial, summer-growing tussock grass, suited to light textured, low fertility soils in summer rainfall area. Drought hardy and moderately frost tolerant. Tolerant of heavy grazing. Susceptible to waterlogging and leaf rust.

*Minimum average annual rainfall:* 600 mm (summer dominant)

*Sowing rate:* 2–4 kg/ha. **If seed is coated adjust sowing rate upwards to allow for seed coat weight.**

Variety/brand	Comment	Main seed source
Swann <sup>Ⓢ</sup>		Progressive Seeds

## INDIAN BLUEGRASS

(*Bothriochloa pertusa*)

Tufted perennial, naturalised on a wide range of soils in Queensland. Persists on moderate to low fertility soils more successfully than other grasses. Considered drought evading species. Forms dense mat, providing good ground cover for reduced soil erosion.

*Minimum average annual rainfall:* 600 mm

*Sowing rate:* 1–3 kg/ha. **If seed is coated adjust sowing rate upwards to allow for seed coat weight.**

Variety/brand	Comment	Main seed source
Medway <sup>Ⓛ</sup>	medium–late maturity	Selected Seeds
Keppel	medium–late maturity	Public variety

## KIKUYU

(*Pennisetum clandestinum*)

Prostrate, perennial grass with most growth in spring, summer and autumn. Suited to very fertile, well-drained soils. Runners spread rapidly in favourable conditions; very suitable species for erosion control. Responds well to nitrogen fertiliser and irrigation, combined with intensive grazing (e.g. strip grazing). Direct drill in winter with ryegrass or oats to provide a year-round feed supply. Suitable companion legumes include white clover or Kenya clover (far North Coast only) and lotus on suitable soil types. Dominant species; do not sow with other grasses. Pastures dominated by kikuyu unsuitable for horses. Sow or plant in spring to early summer or late summer–early autumn, depending on the district.

*Minimum average annual rainfall:*

800 mm (summer dominant)

*Sowing rate:* 1–4 kg/ha. **If seed is coated adjust sowing rate upwards to allow for seed coat weight.** By runners: 1 cutting (runner) per square metre.

### Select varieties on the basis of:

**Vegetative or seed propagated**–Seed not available for common kikuyu.

**Susceptibility to kikuyu yellows**–Important where yellows prevalent and where management ineffective.

Variety/brand	Comment	Main seed source
Common	vegetative propagation (runners) only	Public variety
Whittet		Public variety

## LOVEGRASS

(*Eragrostis curvula* var. *conferta*)

Tufted perennial with most growth in spring, summer and autumn. Suited to lighter-textured acid soils with high levels of exchangeable soil aluminium. Moderately palatable to stock. Useful for erosion control and for controlling spiny burr grass and blue heliotrope on light soils. Suitable companion legumes are serradella and biserrulla (acidic soils) and subterranean clover (neutral to moderately acidic soils). Sow in early spring or late summer–early autumn. (N.B. Annual legumes only suited to sowing in autumn).

**Do not sow in local government areas where the weed African lovegrass *Eragrostis curvula* declared noxious.**

*Minimum average annual rainfall:* 400 mm (summer dominant)

*Sowing rate:* 0.3–1.0 kg/ha. **If seed is coated adjust sowing rate upwards to allow for seed coat weight.**

Variety/brand	Comment	Main seed source
Consol		Public variety

## MOLASSES GRASS

(*Melinis minutiflora*)

Matting to tussocky summer-growing perennial. Exudes sticky substance from leaf hairs and has distinctive odour not unlike molasses. Adapted to low to medium fertility soils.

*Minimum average annual rainfall:* 800 mm (summer dominant)

*Sowing rate:* 2–4 kg/ha (sole species); 1–3 kg/ha (mixtures).

Variety/brand	Comment	Main seed source
Common		Public variety

## PANIC SPECIES

Perennial grass with most growth in spring, summer and autumn. Pastures dominated by panic may cause photosensitisation in livestock. Suitable companion legumes include: lucerne, barrel medic and/or subterranean clover, depending on soil type and rainfall. Sow in mid-spring, or late summer–early autumn (sow companion annual legumes only in autumn). When sowing with lucerne, reduce lucerne sowing rate to 0.75 kg/ha to reduce competition.

### BAMBATSI (Makarikari) PANIC (*Panicum coloratum* var. *makarikiense*)

Erect to semi-prostrate habit. Particularly suited to very fertile, clay soils. Outstanding tolerance of waterlogging and drought. Some tolerance of frost. Poor seedling vigour but very persistent once established.

*Minimum average annual rainfall:* 450 mm (summer dominant)

*Sowing rate:* 2–4 kg/ha. **If seed is coated adjust sowing rate upwards to allow for seed coat weight.**

Variety/brand	Comment	Main seed source
Bambatsi		Public variety

### GATTON PANIC (Guinea grass) (*Megathyrsus maximus* var. *maximus*)

Similar in production to green panic but superior to Petrie green panic on low fertility soils. A palatable species, but persistence often disappointing; related to poor management, especially heavy grazing management.

*Minimum average annual rainfall:* 500 mm (summer dominant)

*Sowing rate:* 3–4 kg/ha. **If seed is coated adjust sowing rate upwards to allow for seed coat weight.**

Variety/brand	Comment	Main seed source
Gatton		Public variety

### GREEN PANIC (*Megathyrsus maximus* var. *pubiglumis*)

Tufted habit. Suited to wide range of soils, except very light or very heavy textured soils. Responds well to improved fertility. Moderate tolerance of drought. Responds readily after rain. Tolerates shade. Sensitive to frost. Use seed that is one year old to allow for seed dormancy. Persistence often disappointing; related to poor management, especially heavy grazing management.

*Minimum average annual rainfall:* 500 mm (summer dominant)

*Sowing rate:* 3–5 kg/ha. **If seed is coated adjust sowing rate upwards to allow for seed coat weight.**

Variety/brand	Comment	Main seed source
Petrie		Public variety

## PASPALUM (*Paspalum dilatatum*)

Perennial grass growing mainly in spring and summer. Suited to fertile soils. Responds well to irrigation. Moderate frost tolerance. Can become sod-bound in long-term pastures. Seed often of low viability. Seed heads infected by ergot can affect stock health. Under irrigation not normally sown in mixtures with other grasses. Suitable companion legumes include white clover, strawberry clover and lotus. Sow in spring–early summer, or late spring–early autumn.

*Minimum average annual rainfall:* 800 mm (summer dominant)

*Sowing rate:* 4–10 kg/ha. **If seed is coated adjust sowing rate upwards to allow for seed coat weight.**

Variety/brand	Comment	Main seed source
Common		Public variety

## PURPLE PIGEON GRASS (*Setaria incrassata*)

Erect perennial, growing mainly in spring and summer. Suited to wide range of soils, particularly heavy textured soils. Some tolerance of waterlogging. Susceptible to frost. Relatively easy to establish. Pastures dominated by purple pigeon grass unsuitable for horses. Suitable medium term pasture where barrel medic, subterranean clover and/or lucerne used as companion legumes. Choice of companion species dependent on soil types and rainfall. Sowing with lucerne, reduce lucerne sowing rate to 0.75 kg/ha to reduce competition. Use seed that is one year old to allow for seed dormancy. Sow in mid-spring, or late summer–early autumn.

*Minimum average annual rainfall:* 450 mm (summer dominant)

*Sowing rate:* 1–4 kg/ha. **If seed is coated adjust sowing rate upwards to allow for seed coat weight.**

Variety/brand	Comment	Main seed source
Inverell		Public variety

## RHODES GRASS

(*Chloris gayana*)

Perennial with most growth in spring, summer and autumn. Suited to wide range of soils, from light textured sandy loams to heavy textured soils. Moderate resistance to drought. Susceptible to frost. Spreads readily by runners (stolons). Good erosion control because of strong stolon growth and vigorous root system. Highly competitive; good control of spiny burr grass. Easier to establish than many other tropical grasses although fluffy seed difficult to sow with conventional machinery. Suitable companion legumes for inland sowings: lucerne, barrel medics, serradella, subterranean clover and woolly pod vetch. Suitable companion legumes for coastal sowing: white clover, Kenya clover, atro (Siratro) and lotus. Sow in spring, or late summer–early autumn.

*Minimum average annual rainfall:* 500 mm (summer dominant)

*Sowing rate:* 1–4 kg/ha. **If seed is coated adjust sowing rate upwards to allow for seed coat weight.**

### Select varieties on the basis of:

**Maturity**–Earlier maturing types better suited to marginal growth areas and/or soils with poor moisture holding capacity. The later maturing lines more suited to higher rainfall areas and respond to higher levels of input (e.g. nitrogenous fertiliser, irrigation and intensive grazing management).

**Local production and persistence trial information**–consult local trial results where available.

Variety/brand	Comment	Main seed source
<b>Early flowering diploids</b>		
Pioneer		Public variety
<b>Late flowering diploids</b>		
Katambora		Public variety
Topcut <sup>Ⓢ</sup>		Selected Seeds
Finecut <sup>Ⓢ</sup>		Selected Seeds
Nemkat <sup>Ⓢ</sup>		Seedmark
<b>Very late flowering tetraploid</b>		
Callide	larger leaves; responds well to increased fertility & maintains feed quality if well managed irrigation	Public variety
Reclaimer <sup>Ⓢ</sup>	improved salt tolerance and forage quality	Selected Seeds
Gulfcut <sup>Ⓢ</sup>	improved salt tolerance and forage quality	Selected Seeds

## SABIGRASS

(*Urochloa mosambicensis*)

Stoloniferous, perennial, summer-growing grass, growing to 40 cm high. Suited to wide range of soils. Extremely drought tolerant, palatable and persistent. Best grass species evaluated for mine site rehabilitation. Ability to germinate and establish on moderately saline soils. Better erosion control on sloping land than standard buffel/rhodes grass mixtures. Better winter growth and lower level of seed dormancy than Nixon sabigrass (tufted grass). Suitable companion species are stylo and desmanthus.

*Minimum average annual rainfall:* 550 mm

*Sowing rate:* 2–4 kg /ha bare seed. **If seed is coated adjust sowing rate upwards to allow for seed coat weight.**

Variety/brand	Comment	Main seed source
Saraji <sup>Ⓢ</sup>	stoloniferous	Progressive Seeds
Nixon	tufted species	Public variety

## SETARIA

(*Setaria sphacelata*)

Tall, perennial grass, growing mainly in early spring to late autumn. Suited to wide range of soils. Tolerates acid soils and moderate waterlogging. Greater tolerance of cool temperatures than most other tropical grasses. Suitable companion legumes: white clover, lotus or tropical legumes such as atro (siratro). Setaria dominant pastures unsuitable for horses.

Sow in spring to early summer when sowing with tropical legumes or under irrigation; February/March preferred for Setaria alone or with white clover (dryland).

*Minimum average annual rainfall:* 900 mm (summer dominant)

*Sowing rate:* 1–3 kg/ha. **If seed is coated adjust sowing rate upwards to allow for seed coat weight.**

### Select varieties on the basis of:

**Frost tolerance**–Desirable to increase period of green feed availability and produce better winter feed.

**Local production and persistence**–Consult local trial results where available.

Variety/brand	Comment	Main seed source
<b>Frost susceptible</b>		
Splenda <sup>Ⓢ</sup>		Heritage Seeds
Kazungula		Public variety
<b>Frost tolerant</b>		
Narok		Public variety
Solander		Public variety

# PASTURE HERBS

## CHICORY

(*Chicorium intybus*)

Warm season growing, deep-rooted perennial providing potentially high quality feed. Used as specialist forage crop for stock finishing or high quality component of mixed perennial pastures. Free-seeding and able to regenerate where grazing management allows. Requires rotational grazing for persistence. Tolerant of soil acidity but prefers fertile, deep soils. Where legumes are not part of the pasture, nitrogen fertiliser may be necessary. Susceptible to some herbicides used in pastures. Sow in early autumn to avoid frost or spring (tablelands and irrigation).

*Minimum average annual rainfall:* 600 mm - southern NSW; 750 mm northern NSW

*Sowing rate:* 0.5–2.0 kg/ha in pasture mixtures. Often sown at 2–4 kg/ha with 0.5 kg/ha white clover or 0.5–1.0 kg/ha red clover.

Variety/brand	Comment	Main seed source
Balance		Seed Distributors
Ceres Grouse		PGG Seeds
Chico		Cropmark
Commander		Heritage Seeds
Grasslands Choice <sup>Ⓢ</sup>		PGG Seeds
Puna		Wrightson Seeds
Puna II <sup>Ⓢ</sup>		Wrightson Seeds
Punter		Seed Force

## PLANTAIN

(*Plantago lanceolata*)

Deep-rooted perennial herb growing all year. Highest growth rates in warmer months. Drought hardy and can regenerate from seed. Adapted to low fertility soils. Can be sown as a pure stand, but more often used as component of perennial pasture mixture. Compatible with perennial ryegrass and subterranean clover based pastures. When sown without legumes, nitrogen fertilisers required to maximise yield. Young leaf material is particularly palatable, but to maintain production, keep grazing under control. Will not tolerate some herbicides commonly used in pastures. Sow autumn or spring (tablelands and irrigation).

*Minimum average annual rainfall:* 500 mm southern NSW; 650 mm northern NSW

*Sowing rate:* 8–10 kg/ha alone; 3–4 kg/ha in mixtures.

Variety/brand	Comment	Main seed source
Ceres Tonic <sup>Ⓢ</sup>		PGG Seeds
Hercules		Seed Force

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Productive and persistent over a wide range of soil and climatic conditions  
Valuable year round production      Source of key minerals





True perennial with good persistence      Improved dry matter production  
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[www.pggseeds.com.au](http://www.pggseeds.com.au)

## APPENDIX I. National seed quality standards for certified seeds

The National Seed Quality Standards are the voluntary minimum standards for physical seed quality agreed to by the Australian Seed Federation of Australia (ASF) and the Grains Council of Australia. These standards are applied to all certified seed of public cultivars and to seed sold by ASF members. In many cases seed companies will apply physical standards well in excess of these. The national standards may be used as a guide to determine an acceptable level of physical seed quality prior to purchase.

### GRASSES

Species	Minimum Pure Seed % by mass	Minimum Germination % by count	Maximum Other Seeds % by mass
Bahia grass	60	60	2.00
Buffel grass	90	20	2.00
Cocksfoot	90	70	3.00 <sup>1</sup>
Creeping bluegrass	50	20	5.00
Guinea grass	40	25	0.70
Italian ryegrass	97	80	1.00
Kikyuyu	95	60	1.00
Lovegrass	97	70	0.50
Purple pigeon grass	80	40	3.00
Phalaris	97	65	1.00
Perennial veldt grass	65	40	1.00
Perennial ryegrass	97	75	1.00 <sup>2</sup>
Rhodes grass (Diploid)	80	20	4.00
Rhodes grass (Tetraploid)	75	10	4.00
Setaria	60	20	1.20
Tall fescue	96	70	3.00 <sup>3</sup>
Tall wheat grass	85	65	2.00

### LEGUMES

Species	Minimum Pure Seed % by mass	Minimum Germination % by count	Maximum Other Seeds % by mass
Annual medics	98	70 <sup>4</sup>	2.0 <sup>5</sup>
Arrowleaf clover	98	60	1.00
Balansa clover	98	65	1.00
Berseem clover	98	80	1.00
Biserrula	98	70	0.50
Crimson clover	98	65	1.00
Joint vetch	95	50	2.00
Kenya white clover	97	50	1.00
Lucerne	98	60	0.50
Persian clover	98	65 <sup>6</sup>	1.00
Red clover	97	60	0.50
Rose clover	98	70	1.00
Strawberry clover	98	60	1.00
Subterranean clover	98	70	0.50
Serradella	90	75 <sup>7</sup>	1.00
White clover	97	60	2.00

<sup>1</sup> 3% maximum, of which no more than 1.00% shall be seeds other than *Lolium* species

<sup>2</sup> In a bad blind seed disease year standards may be adjusted multilaterally

<sup>3</sup> 3% maximum, of which no more than 1.00% shall be seeds other than *Lolium* species

<sup>4</sup> Germination % does not include hard seeds

<sup>5</sup> 2% maximum, of which more than 0.5% shall be seeds other than burr medic

<sup>6</sup> Cv. Kyambro – 50% germination

<sup>7</sup> Minimum germination for certification – includes normal and hard seeds



## APPENDIX II. Reading a seed certification label

### Cultivar

Cannot be assessed by seed analysis. Purchase Certified Seed or seed produced under a suitable Quality Assurance scheme to ensure seed is the correct cultivar.

### Line Number

Unique identifying code used to match seed test results with the seed lot. Branded on all bags of seed and included on all sales documents.

### Pure Seeds

Percent of seed of the nominated species i.e. 99.1% subterranean clover.

### Abnormal Seedlings

Seed that germinates but is damaged in some way. Unlikely to produce healthy plants.

Certificate of Seed Analysis								
Certificate of Analysis Number: 1234556								
Issued without alteration or erasure								
<b>Common Name:</b> Subterranean Clover			<b>Line Number:</b> AUS/N66/1/742					
<b>Cultivar:</b> Junee			<b>Other ID:</b> East 42					
<b>Species:</b> Trifolium subterranean			<b>Lab Number:</b> 78910					
<b>Number of Bags:</b> 400			<b>Issue Date:</b> 15/05/2001					
<b>Weight of Lot:</b> 10,000 kg								
Purity - % weight			GERMINATION - % Number					
Pure Seeds	Inert Matter	Other Seeds	Number of Days of Test	Normal Seedlings Final Count	Hard Seed	Fresh Un-germinated seed	Abnormal Seedlings	Dead Seeds
99.1	0.6	0.3	10	66	10	0	16	8
Other Seeds in 250.0 grams								
<b>Format:</b>	<b>Common name</b>	<b>Botanical name</b>	<b>Number</b>					
	Red Clover	Trifolium pratense	54					
	Millet	Echinochloa spp.	2					
	Wireweed	Polygonum aviculare	1					
<b>Inert Matter:</b> Broken Seed, Dirt, Decoated Seed								
These analysis results relate only to the sample as received by the Laboratory Sample details as stated by the Applicant								
<i>J Smith</i> OFFICER IN CHARGE								

### Inert Matter

Amount of non-seed material or broken seed particles. May include fungal material such as ergot and sclerotes.

### Hard Seed

Seed that is dormant.

### Other Seeds

Amount of other seed present. Check this carefully for any undesirable weeds.

### Normal Seedlings

This is the GERMINATION Percentage. Generally valid for up to 12 months from date of testing.

## APPENDIX III. Average seed counts for major pasture species

Variety	Seed Unit '000 / kg
<b>Temperate Grasses</b>	
Cocksfoot	1344
Perennial veldt grass	712
Phalaris	650
Prairie grass	110
Puccinellia	5000
Ryegrass (perennial)	500–600
Ryegrass Italian	460
Ryegrass hybrid (Diploid)	500–600
Ryegrass hybrid (Tetraploid)	200–300
Ryegrass annual	418
Tall fescue	404
Tall wheat grass	190
Timothy	250

<b>Temperate legumes</b>	
Balansa clover	1400
Barrel medic	235
Berseem clover	326
Crimson clover	250
Gland clover	1430
Lotus	2062
Lucerne	440–500
Murex medic	262
Persian clover	1456
Red clover (Diploid)	528
Red clover (Tetraploid)	295
Rose clover	331
Snail medic	390
Strawberry clover	766
Subterranean clover	117
White clover	1572
Woolly pod vetch	25
Yellow serradella	196

Variety	Seed Unit '000 / kg
<b>Tropical Grasses</b>	
Bahia grass	1000
Bambatsi panic	1600
Buffel grass	600
Floren bluegrass	833-1160
Gatton panic	1160
Green panic	1280
Kikuyu	410
Paspalum	570–700
Premier digit grass	1700-2500
Purple pigeon	550
Rhodes grass	2800
Setaria	1300–1900
Swann forest bluegrass	3750-5800

<b>Tropical legumes</b>	
Amarillo peanut	6–7
Atro	79
Axillaris	120
Creeping vigna	75
Greenleaf desmodium	750
Lotononis	3500
Kenya clover	700–1000
Wynn cassia	250

<b>Pasture herbs</b>	
Chicory	830
Plantain	500

## APPENDIX IV. Characteristics of commercially available lucerne varieties

The ratings below are provided by seed companies or breeders. This list is intended as a guide only. It does not represent results of comparative tests between these varieties, or represent recommendations by I&I NSW.

Compiled by Mary-Anne Lattimore, District Agronomist, I&I NSW, Yanco

Variety	Winter growth#	SAA	BGA	PRR	Anthraco+se+	SN	BW
<b>Winter-dormant</b>							
54Q53 $\phi$	4	R	MR	HR	HR	HR	HR
WL 342HQ-MF	4	R	R	HR	HR	R	HR
<b>Semi winter-dormant</b>							
Hunter River*	5	S	S	S	S	S	S
Kaituna $\phi$	5	R	HR	MR	R	HR	R
L56 $\phi$	5	HR	HR	HR	HR	HR	HR
SARDI Five $\phi$	5	HR	HR	HR	HR	R	~
SF Force 5	5	MR	~	HR	HR	HR	MR
Stamina 5 $\blacktriangle$	5	HR	R	R	HR	HR	~
Venus $\phi$	5	HR	R	MR	LR	~	~
<b>Winter-active</b>							
Aurora*	6	HR	HR	R	MR	R	LR
Hunterfield*	6	HR	LR	S	S	S	S
Icon $\phi$ (SuperAurora)	6	HR	HR	HR	S	~	~
Stamina <sup>®</sup> GT6	6	HR	R	R	HR	HR	~
WL 614	6	HR	HR	HR	MR	R	R
Flairdale $\phi$	7	R	HR	R	LR	R	~
Genesis $\phi$	7	HR	R	R	R	~	~
Q75 $\phi$	7	HR	R	HR	HR	R	MR
Quadrella $\phi$	7	R	R	MR	R	LR	S
SARDI Seven $\phi$	7	HR	HR	HR	HR	R	~
SF Force 7	7	R	~	HR	MR	HR	R
SF 714QL	7	HR	HR	HR	MR	R	R
Trifecta*	7	R	HR	MR	R	LR	R
UQL-1 $\phi$	7	HR	HR	HR	HR	~	~
<b>Highly winter-active</b>							
Aquarius $\phi$	8	R	HR	HR	LR	R	MR
Australis (SuperSiriver) $\phi$	8	R	HR	R	MR	~	~
Hallmark $\phi$	8	HR	R	HR	HR	HR	~
Magna801FQ $\blacktriangle$	8	HR	R	HR	MR	R	R
Multi Foli <sup>®</sup> -8	8	HR	HR	HR	R	R	R
Blue Ace (SuperSequel) $\phi$	9	HR	HR	R	LR	~	~
CUF101*	9	R	HR	MR	S	S	S
L90 $\phi$	9	R	HR	HR	HR	R	LR
L91 $\phi$	9	HR	HR	HR	HR	R	R
ALA Pegasus $\phi$	9	HR	LR	R	MR	~	~
Salado $\phi$	9	R	HR	LR	LR	MR	~
Saturn <sup>™</sup>	9	HR	HR	HR	MR	MR	~
Sequel*	9	R	R	MR	R	S	S
Sequel HR $\phi$	9	R	R	R	HR	R	~
Silverado $\phi$	9	HR	HR	HR	HR	MR	~
Siriver*	9	HR	MR	S	S	S	S
Siriver MkII $\phi$	9	HR	R	LR	S	~	~
SuperCuf	9	HR	HR	R	LR	~	~
SuperSonic $\phi$	9	R	HR	HR	MR		
WL 925HQ	9	HR	HR	HR	MR	R	MR
Cropper 9.50	9.5	HR	HR	HR	MR	R	MR
Alfamaster 10 $\blacktriangle$	10	~	~	~	~	~	~
ML99 Multileaf <sup>®</sup> $\phi$	10	HR	HR	~	HR	MR	~
SARDI Ten $\phi$	10	HR	HR	R	R	R	~
SF Force 10	10	HR	HR	HR	MR	R	LR

**Pest & disease resistance:** HR - highly resistant; R - resistant; MR - moderately resistant; LR - low resistance; S - susceptible.

# Varieties listed alphabetically within groups of increasing late autumn–winter growth (i.e. 3–very slow, 6–moderate, 10–very active). Dormancy groupings are not absolutely distinct; the range of dormancy is continuous.

$\phi$  Protected by Plant Breeders Rights

® Registered trademark

™ Trademark

~ No data available

\* Public variety, not covered by Plant Breeders Rights.

+ These ratings do not reflect all races of anthracnose (*Colletotrichum trifolii*). The distribution and importance of all identified races in NSW is not known.  
New variety

## APPENDIX V. Characteristics of some clover varieties<sup>#</sup>

Compiled by Brian Dear, Senior Principal Research Scientist, Industry & Investment NSW, Wagga Wagga

### 1. Subterranean clovers

Species/ Cultivar	Days to Flower wagga	Min rainfall* (mm) Southern NSW	Hard seed	Attribute
<b>Subterranean clover (<i>Trifolium subterraneum</i>)</b>				
Izmir	95	350	VH	
Nungarin	102	375	H	
Losa	105	400	M	
Dalkeith	110	400	H	
Urana	110	400	H	
Coolamon	110	400	M	
Seaton Park	125	450	M	
Bindoon	125	450	M	Seedling RLEM tolerance
York	125	450	H	
June	128	500	M	
Campeda	130	500	M	
Woogenellup	140	500	L	
Goulburn	145	525	M	
Karridale	146	600	L	
Denmark	149	600	L	
Rosa Brook	150	600	M	Seedling RLEM tolerance
Mount Barker	143	600	L	
Leura	156	700	L	
<b>Subterranean clover (<i>Trifolium yannanicum</i>)</b>				
Riverina	128	525	M	Wet soils/Irrigation
Gosse	136	600	M	Wet soils/Irrigation
Larisa	150	800	L	Late maturing
Napier	150	800	H	Very late maturing
Meteora	158	900	H	Very late maturing
<b>Subterranean clover (<i>Trifolium brachycalycinum</i>)</b>				
Clare	142	550	L	High clay cracking soils
Rosedale	120	525	M-H	High clay cracking soils
Antas	134	550	M	
Mintaro	115	500	M	

Hard Seed: VH- Very high; H-High; M-Moderate; L-Low; VL-Very Low. Al – aluminium; Mn-Manganese

\* Rainfall figures are a guide only and will vary with aspect, slope, soil type and altitude

### 2. Other temperate clover species

Species/ Cultivar	Days to Flower Wagga	Min. rainfall* (mm) Southern NSW	Hard seed	Attribute
<b>French serradella (<i>Ornithopus sativus</i>)</b>				
Cadiz	125	450	VL	No hard seed.
Margurita	125	400	H	Acid and Al tolerant /Mn sensitive
Erica	121	400	H	
Serratas		450		Claimed to have better Mn tolerance
<b>Biserrula (<i>Biserrula pelecinus</i>)</b>				
Mauro	125	400	VH	Acid and Al tolerant /Mn sensitive
Casbah	115	350	VH	
<b>Bladder clover (<i>Trifolium spumosum</i>)</b>				
Bartolo	110	350	H	Requires good drainage.
<b>Gland clover (<i>Trifolium glanduliferum</i>)</b>				
Prima	100	390	M	Tolerant poor drainage, insect resistant including RLEM
<b>Balansa clover (<i>Trifolium michelianum</i>)</b>				
Frontier	105	375	H	Tolerant poor drainage
Paradana	120	500	H	Tolerant poor drainage
Bolta	130	550	H	Tolerant poor drainage
<b>Eastern star clover (<i>Trifolium dasyurum</i>)</b>				
Sothis	100	350	H	Very delayed germination

Hard Seed: VH- Very high; H-High; M-Moderate; L-Low; VL-Very Low. Mn-Manganese; Al-Aluminium

\* Rainfall figures are a guide only and will vary with aspect, slope, soil type and altitude

<sup>#</sup> Information presented in the two tables is not a complete list of available varieties and represents only those varieties which have been researched by I&I NSW; other varieties are available. Please consult the seed supplier for information on maturity, minimum rainfall requirements and levels of hard seed for varieties not listed.

## APPENDIX VI. Veterinary notes on livestock disorders associated with pasture species

Dr Chris Bourke, formerly Principal Research Scientist, I&I NSW, Orange

An increase in the incidence of certain livestock health disorders may be associated with pasture improvement. Livestock and production losses can result from some of these disorders. Management may need to be modified to minimise risk to livestock health. Consult your veterinarian or adviser when planning pasture improvement.

A number of livestock disorders are associated with pasture improvement, and their occurrence is common across many pasture species. These disorders are as follows:

**Enterotoxaemia** (pulpy kidney) is a constant risk when 'improved' or 'exotic' pasture species are grazed, particularly with rotational or cell grazing management systems.

Sporadic cases of **polioencephalomalacia** (PE) may occur when livestock are grazed under a rotational or cell grazing management system.

**Hypomagnesaemia** (grass tetany) can be a seasonal risk for stock on many grass dominant pastures.

Significant **oxalate, nitrate or cyanogenic accumulations** may occur in many pasture species in some seasons. Grazing ruminants usually adapt successfully to such feed, provided they are not suddenly placed on them while in a feed-deprived state. Adaptation to cyanogenic compounds is much more limited, and livestock owners should get a cyanide test done on high risk species such as sorghum and its hybrids before grazing is allowed.

**Acute Respiratory Distress Syndrome (Fog Fever)** is an occasional risk in cattle that have been moved off a poorer pasture and onto a lush green grass or legume pasture.

**Bloat** is a constant risk in cattle that are grazing lush pastures consisting of medic (*Medicago* spp.) or clover (*Trifolium* spp.).

Livestock health disorders that are of importance in relation to a particular pasture species are listed below. Fortunately, appropriate management can reduce the risk associated with most of these problems. Consult your veterinarian or livestock advisor for further advice, especially when planning pasture improvement projects.

### ANNUAL LEGUMES

**ARROWLEAF CLOVER** (*Trifolium vesiculosum*): Can cause bloat in cattle.

**BALANSA CLOVER** (*Trifolium michelianum*): Bloat in cattle; urinary calculi (clover stones) incidence may increase in sheep; occasionally red gut in sheep.

**BERSEEM CLOVER** (*Trifolium alexandrinum*): Bloat in cattle; urinary calculi (clover stones) incidence may increase in sheep; occasionally red gut in sheep.

**BISERRULA** (*Biserrula pelecinus*): Photosensitisation in sheep has been observed in sheep grazing biserrula pastures in Western Australia.

**BARREL MEDIC** (*Medicago truncatula*): Photosensitisation in horses, occasionally red gut in sheep, frequently bloat in cattle.

**BURR MEDIC** (*Medicago polymorpha*): Ingestion of this plant has been associated with cases of photosensitisation in sheep, cattle and horses, as well as bloat in cattle. Phytoestrogens can have negative effects on the reproductive process and on the reproductive tract of grazing livestock.

**CRIMSON CLOVER** (*Trifolium incarnatum*): Bloat in cattle is possible, but seldom occurs.

**GAMA MEDIC** (*Medicago rugosum*): No known livestock effects, however bloat risk likely

**GLAND CLOVER** (*Trifolium glanduliferum*): No livestock disorders have been reported but, as with most legumes, could be expected to cause bloat in cattle. Cv. Prima contains low levels of coumarins which can be converted to dicoumarol in mouldy hay. Care should be taken not to feed mouldy hay to livestock. Pigs are extremely sensitive to dicoumarol.

**HYBRID MEDIC**: Can cause bloat in cattle.

**MUREX MEDIC** (*Medicago murex*): Photosensitisation in horses, occasionally red gut in sheep, frequently bloat in cattle.

**SNAIL MEDIC** (*Medicago scutellata*): Photosensitisation in horses, occasionally red gut in sheep, frequently bloat in cattle.

**SPHERE MEDIC** (*Medicago sphaeocarpus*): Can cause bloat in cattle.

**STRAND MEDIC** (*Medicago littoralis*): Photosensitisation in horses, occasionally red gut in sheep, frequently bloat in cattle.

**PERSIAN CLOVER** (*Trifolium resupinatum*): Photosensitisation sometimes; bloat in cattle; urinary calculi (clover stones) incidence may increase in sheep; red gut in sheep occasionally.

**ROSE CLOVER** (*Trifolium hirtum*): The ingestion of old flower heads may be associated with fibre ball (phytobezoar) development in the abomasum of cattle, and with wool contamination in sheep.

Bloat in cattle; urinary calculi (clover stones) incidence may increase in sheep; occasionally red gut in sheep.

**SERRADELLA** (*Ornithopus* spp.): No problems reported.

**SUBTERRANEAN CLOVER** (*Trifolium subterraneum*): Infertility, sometimes due to oestrogenic compounds (mainly *T. subterraneum* var. *Dwalganup*); bloat in cattle; urinary calculi (clover stones) incidence may increase in sheep; red gut in sheep occasionally. Phytoestrogens can have negative effects on the reproductive process and on the reproductive tract of grazing livestock.

**WOOLLY POD VETCH** (*Vicia villosa*): 'Ill thrift' syndrome in cattle, with dermatitis and diarrhoea (sometimes).

### PERENNIAL LEGUMES

**BIRDSFOOT TREFOIL** (*Lotus corniculatus*) (see also *Lotus*): Is known to sometimes produce cyanogenic glucosides, but reports of cyanide poisoning associated with it are very rare. Its ingestion can occasionally be associated with cases of photosensitisation.

**CAUCASIAN CLOVER** (*Trifolium ambiguum*): Can cause bloat in cattle.

**LOTUS** (*Lotus uliginosus* syn *L. pedunculatus*): Sometimes cyanogenetic glycosides (*L. cruentus* syn. *coccineus*). Milk taint (*L. corniculatus* and *L. major* syn. *pedunculatus* syn. *uliginosus*).

Occasionally develops tannin levels high enough to reduce feed intake.

**LUCERNE** (*Medicago sativa*): Bloat in cattle. Photosensitisation in horses, occasionally red gut in sheep. Infertility in livestock due to oestrogenic compounds has been associated with ingestion of lucerne leaves stressed by leaf diseases or by insect attack. Can contain low levels of coumarins which can be converted to dicoumarol in mouldy hay. Care should be taken not to feed mouldy hay to livestock. Pigs are extremely sensitive to dicoumarol.

RED CLOVER (*Trifolium pratense*): Infertility sometimes due to oestrogenic compounds; bloat in cattle; urinary calculi (clover stones) incidence may increase in sheep; occasionally red gut in sheep.

STRAWBERRY CLOVER (*Trifolium fragiferum*): Infertility sometimes due to oestrogenic compounds; bloat in cattle; urinary calculi (clover stones) incidence may increase in sheep; occasionally red gut in sheep.

WHITE CLOVER (*Trifolium repens*): Bloat in cattle; urinary calculi (clover stones) incidence may increase in sheep; occasionally red gut in sheep. Phytoestrogens can have negative effects on the reproductive process and on the reproductive tract of grazing livestock

### TEMPERATE GRASSES

BERMUDA COUCH GRASS (*Cynodon dactylon*): can be cyanogenic,

COCKSFOOT (*Dactylis glomerata*): No problems reported.

GRAZING BROME (*Bromus stamineus*): No problems reported.

KANGAROO GRASS (*Themeda triandra*): No problems reported

PASTURE BROME (*Bromus valdivianus*): No problems reported.

PERENNIAL VELDT GRASS (*Ehrharta calycina*): No problems reported.

PHALARIS (*Phalaris aquatica*): Sometimes phalaris staggers; occasionally phalaris sudden death syndrome.

PRAIRIE GRASS (*Bromus willdenowii*): Awns may penetrate skin of sheep; possible wool contaminant.

PUCCINELLIA (*Puccinellia ciliata*): No problems reported.

RYEGRASS (*Lolium spp.*): Ryegrass staggers, Summer endophyte hyperthermia-ill thrift, ergot of rye poisoning.

RYEGRASS – ANNUAL (*Lolium rigidum*): Annual ryegrass toxicity; ergot of rye poisoning .

TALL FESCUE (*Festuca arundinacea*): Summer endophyte hyperthermia-ill thrift, or winter lameness (peripheral gangrene), associated with ergot alkaloid production within the grass.

TALL WHEATGRASS (*Thinopyrum ponticum*): No problems reported.

TIMOTHY (*Phleum pratense*): No problems reported.

WALLABY GRASS (*Austrodanthonia spp.*): Can occasionally accumulate

dangerous amounts of cyanogenic glycosides

WEEPING GRASS (*Microlaena stipoides*): No problems reported.

### TROPICAL LEGUMES

ATRO (*Macroptilium atropurpureum*) = Siratro: No problems reported.

AXILLARIS (*Macrotyloma axillare*): No problems reported.

CREeping VIGNA (*Vigna parkeri*): Nitrate poisoning has occurred with a related species.

FORAGE PEANUT (*Arachis pintoi*): No problems reported.

GLYCINE (*Neonotonia wightii*): No problems reported.

GREENLEAF DESMODIUM (*Desmodium intortum*): No problems reported.

ROUNDLEAF CASSIA (*Chamaecrista rotundifolia*): Some cassia species e.g. (*C. obtusifolia*) and (*C. occidentalis*) have been associated with poisoning in ruminants and horses — both leaves and seeds were toxic, and muscle damage was the main effect. So far there have been no problems reported for *C. rotundifolia*.

### TROPICAL GRASSES

BAHIA GRASS (*Paspalum notatum*): Not known if there is a risk of nervous ergotism ('staggers').

BAMBATS PANIC (= Makarikari panic): (*Panicum coloratum* var. *makarikariense*) Liver disease with associated photosensitisation (sporadic outbreaks in ruminants).

BUFFEL GRASS (*Cenchrus ciliaris*): Frequently hyperparathyroidism ('big head') in horses, occasionally nephrosis or hypocalcaemia in ruminants, due to oxalates. This genus can occasionally accumulate dangerously high levels of selenium when grown on some soil types

CREeping BLUEGRASS (*Bothriochloa insculpta*): No problems reported.

DIGIT GRASS (*Digitaria eriantha* ssp. *eriantha*): No problems reported.

BLUEGRASS (*Dicanthium aristatum*): No problems reported..

FOREST BLUEGRASS (*Bothriochloa bladhii* ssp. *glabra*): No problems reported.

GATTON PANIC OR GREEN PANIC (*Megathyrsus maximus*): Frequently hyperparathyroidism ('big head') in horses, occasionally nephrosis or hypocalcaemia in ruminants, due to oxalates.

INDIAN BLUEGRASS (*Bothriochloa pertusa*): No problems reported.

KIKUYU (*Pennisetum clandestinum*): Frequently hyperparathyroidism ('big head') in horses, occasionally nephrosis or hypocalcaemia in ruminants, due to oxalates. Very occasionally nitrate poisoning. Kikuyu poisoning is an unusual rumen disorder that can sporadically occur in cattle, especially where rapid Autumn growth follows a protracted dry period.

LOVEGRASS (*Eragrostis curvula* var. *conferta*): No problems reported.

MITCHELL GRASS (*Astrebula lappacea*): Can cause blindness and deaths in cattle on the rare occasions when the grass becomes infected with the fungal corals of *Coralocytostroma ornicopreoides*.

MOLASSES GRASS (*Melinis minutiflora*): No problems reported

PASPALUM (*Paspalum dilatatum*): Nervous ergotism ('staggers').

PURPLE PIGEON GRASS (*Setaria incrassata*): Frequently hyperparathyroidism ('big head') in horses, occasionally nephrosis or hypocalcaemia in ruminants, due to oxalates.

RHODES GRASS (*Chloris gayana*): This genus can occasionally accumulate dangerously high levels of selenium on some soil types.

SETARIA (*Setaria sphacelata* var. *sericea*): Frequently hyperparathyroidism ('big head') in horses, occasionally nephrosis or hypocalcaemia in ruminants, due to oxalates.

### PASTURE HERBS

CHICORY (*Chicorium intybus*): A bitter milk taint has been recognised as a problem with chicory when used in some dairy situations (this can be overcome with grazing management). Leaves have been reported to be poisonous to pigs, and the roots poisonous to cattle, but these incidents appear to be rare. There have been no reports of poisoning under Australian growing conditions.

PLANTAIN (*Plantago lanceolata*): No livestock disorders have been encountered.

## APPENDIX VII. Points to consider when selecting a pasture mix

Pastures may consist of a single species (e.g. lucerne) or more often a mixture of grasses and legumes. Mixtures are often preferred for a number of reasons — production benefits, weed control, erosion control, diversity in relation to pest control, etc.

Assuming that the species and varieties being considered are well adapted to the climate of the area, other factors to consider in sowing mixtures are as follows:

### Enterprise

Any pasture needs to address the needs of the enterprise in terms of feed quality, feed quantity and animal grazing habit. This may be handled by separate paddocks of either single grass species or legumes, or by specific mixtures designed to supply a particular quantity and/or quality of feed at a specific time.

### Soils

#### Soil type

Where there is a large variability in soil types in a paddock it is often worthwhile increasing the number of species or varieties as opposed to a simple mixture of one grass and one legume to cover the variability. Minor soil variations often will not warrant increasing the number of species in a mixture.

#### Soil pH

Differences in pH for example may be covered by including serradella in with an otherwise sub clover dominant mixture, or including cocksfoot in with phalaris etc. to cover areas of low pH in an otherwise neutral to slightly acid soil.

#### Drainage & salinity

Species tolerant to waterlogging and/or salinity, are often included in mixtures to provide coverage in parts of the paddock that are poorly drained. e.g. Yaninicum subterranean clovers like Riverina may be added to other subterranean clover varieties

to allow for low lying areas, where it will thrive and other varieties may fail. Similarly, where salinity is a problem in parts of a paddock, tolerant species such as strawberry clover and tall fescue are added to a mixture depending on the level of salinity present.

#### Fertility

This is less of a reason to expand a pasture mixture, as fertility needs can usually be met by legume nitrogen and adding fertiliser. There may be instances where a high fertility demanding species such as phalaris may be added to a mixture otherwise reliant on cocksfoot to take advantage of high fertility areas in a paddock and vice versa. Similarly bambatsi panic, a species suited to high fertility clay soils, is often mixed with rhodes grass (capable of growing on low fertility soils), to cover paddock variability in terms of soil type.

#### Aspect

Drier slopes (e.g. western aspect) may benefit from adding a more hardy, persistent perennial or a shorter maturing variety than those suited to more favoured aspects. This may be a simple case of substituting an early maturing subterranean clover, such as Dalkeith for a portion of the Goulburn or Junee in the mixture, so that the Dalkeith will dominate on the north facing hill and Goulburn or Junee on the remainder of the paddock. Similarly where it is suited to the soil and fertility conditions, the rhizomatous phalaris varieties like Australian will be far more persistent on western slopes than cocksfoot.

#### Plant characteristics

There is a wide range of reasons for including or excluding species with differing plant characteristics in mixtures. This ranges from adding an annual component to an otherwise perennial mixture to improve persistence in western areas

or vice versa in higher rainfall areas. Stoloniferous plants may be a useful addition to a mixture to increase stability and the likelihood of reliable ground cover thus reducing erosion risk and weed invasion.

Plant characteristics such as seedling vigour and competitiveness may be used in a mixture to ensure the botanical composition is suitable. In some situations species vigour can have deleterious effects such as when perennial ryegrass (with high seedling vigour) is sown with tall fescue – as a result fescue establishment is often poor especially from late autumn/ winter sowings. Resistance to disease or insect pests may also be a reason to add a variety to a mixture to improve the reliability of production and/or persistence from the pasture.

#### Livestock health

Species are often included or excluded to reduce the risk of a particular livestock disorder. Bloat is often the reason why grasses are added to lucerne or high legume-content pastures to reduce the incidence of bloat. See Appendix VI for livestock disorders associated with species.

#### Grazing management considerations

The optimum grazing management for species differs and may dictate what should be included in a mixture, especially where longevity of species is important. Whilst most species that we use are fairly forgiving of short term mismanagement, most will benefit in the long term from tactical grazing at one stage or another (e.g. to enhance seed set, recruitment of seedlings, improve tillering etc).

## APPENDIX XIII. Further information

Publications available from  
Industry & Investments Web Page  
[www.industry.nsw.gov.au](http://www.industry.nsw.gov.au) or from  
the I&I NSW Bookshop Phone:  
1800 028 374 (toll free)

### Temperate grass species

Annual Italian and short rotation  
ryegrass varieties 2010

Cocksfoot

Perennial brome grasses

Perennial ryegrass

Phalaris

Puccinellia

Short-term ryegrass

Tall fescue

Tall wheatgrass

Timothy

### Temperate legume species

Arrowleaf clover

Balansa clover

Barrel medic

Berseem clover

Biserrula

Caucasian clover

Crimson clover

French serradella

Gland clover

Hybrid disc medic

Lotus – Birdsfoot trefoil

Lotus – Greater lotus

Lucerne

Murex medic

Persian clover

Red clover

Rose clover

Slender serradella

Snail medic

Sphere medic

Strand medic

Strawberry clover

Subterranean clover

Sulla

Trophy white clover

Urana subterranean clover

White clover

Woolly pod vetch

Yellow serradella

### Tropical grass species

Bahia grass

Bambatsi panic

Bluegrass (Angleton grass)

Buffel grass

Consol lovegrass

Creeping bluegrass

Digit grass

Forest bluegrass

Gatton panic

Green panic

Kikuyu

Paspalum

Purple pigeon grass

Rhodes grass

Setaria

Tropical legume species

Atro

Axillaris

Desmanthus

Forage peanut

Glycine

Green leaf desmodium

Kenya clover

Lotononis

Round-leafed cassia

Shaw creeping vigna

### Pasture herbs

Chicory

Narrow leaf plantain

### Native grass species

Box grass and knottybutt grass

Common wheatgrass

Cotton panic grass

Curly Mitchell grass

Curly windmill grass

Hairy panic

Kangaroo grass

Native millet

Neverfail

Paddock lovegrass

Plains grass

Poa tussock or tussock grass

Purple wiregrass

Queensland bluegrass

Redgrass

Ringed wallaby grass or white top

Rough speargrass or corkscrew grass

Silky browntop

Silvertop wallaby grass (or Redanther  
wallaby grass)

Slender rats tail grass or native  
Parramatta grass

Snow grass

Tall windmill grass

Wallaby grass

Warrego summer grass

Water couch

Weeping grass or microlaena

Windmill grass

Wiregrass

### Pasture establishment

Band seeders for pasture  
establishment



Economics of lucerne establishment for the western wheat belt

Eight steps to perennial pasture establishment

Grassed up – guidelines for revegetating with Australian native grasses

Inoculating and pelleting pasture legume seed

Rejuvenating perennial pastures

Subterranean pastures

Successful establishment of tropical perennial grasses in North West NSW

Summer survival of seedling phalaris

## Grazing management

Grazing management for native pastures on the north west slopes of NSW

Grazing management of lucerne

Matching pasture production to livestock enterprise – estimates of pasture production

Guidelines for grazing in the Gwydir Wetlands and Macquarie Marches

Suitable land management practices for graziers

The grazier's guide to pastures

Pasture assessment and livestock production

## Production management

Measuring herbage mass – the median quadrat technique

Endophytes of perennial ryegrasses and tall fescue

Best management practices for temperate perennial pastures in NSW

Getting the best from old man saltbush

Pasture Pays (video/DVD)

Maintaining ground cover for reduced erosion and sustained production

Management of coolatai grass on the north west slopes of NSW

Management of profitable and sustainable pastures – a field guide

Pastures in cropping rotations – north west NSW

Managing kikuyu for milk production

Pasture cropping

Rejuvenating perennial pastures

Water use by crops and pastures in southern NSW

Economics of lucerne establishment for the western wheat belt

Economics of pasture improvement in the western wheat belt

## Soils, fertilisers & manures

Dung beetles – working for you

Poultry litter/manure and BSE controls for carriers and spreaders

Best practice guidelines for using poultry litter on pastures – full version

Are my soils acid?

Pastures and acid soils

Fertiliser calculations

Fertiliser for pastures

Cycling phosphorus in grazing systems

## Weed control

Weed control in pastures and lucerne

Weed control for cropping and pastures in central west NSW 2006

Coolatai grass

Noxious and environmental weed control handbook

## Pest & diseases

Scarab grubs in northern tablelands pastures

## Groundcover & sustainability

Increasing soil organic carbon of agricultural land

Maintaining ground cover to reduce erosion and sustain production

Managing ground cover in the cropping zone of southern NSW

## Drought, fire & floods

Pasture and crop considerations following drought

Pasture options after a coastal flood

Pasture recovery after bushfires

Pasture sustainability and management in drought

## Suggested pasture mixtures for different areas of NSW

Central Tablelands

Central West Dry Land Cropping Zone

Hawkesbury-Nepean, Hunter and Manning Valleys

Monaro

Northern Tablelands

Richmond, Tweed and Upper Clarence

Southern Tablelands

Upper South West Slopes

West Wyalong District

## APPENDIX IX. Sources of pasture seed listed in this guide

These sources are the primary sources of seed. They are in many cases the head licensee for that variety or a contact that will be useful if seed cannot be sourced readily through a retailer.

### Auswest Seeds

2–8 Tobias Street FORBES NSW 2871  
Ph: (02) 6852 1500  
Fax: (02) 6852 1393  
Email: auswest@auswestseeds.com.au  
www.auswestseeds.com.au

### Ballard Seeds

PO Box 1137 NARROGIN WA 6312  
Ph: (08) 9881 5711  
Fax: (08) 9881 5722  
Email: leigh@ballardseeds.com.au  
www.ballardseeds.com.au

### Cropmark Seeds Pty Ltd

475 Mickleham Road ATTWOOD VIC 3049  
Free Call 1800 889 039  
Fax: 1800 889 037  
www.cropmark.com.au

### GN Lummis

'Wilga View' GILGANDRA NSW 2827  
Ph: (02) 6848 5010  
Fax: (02) 6848 5010

### G & J Godfrey

MUTCHILBA QLD 4872  
Ph: (07) 4093 1245  
Fax: (07) 4093 1245  
Email: godfrey@pintopeanut.com.au  
www.pintopeanut.com.au

### Heritage Seeds

Heritage Seeds Pty Ltd  
PO Box 4020 MULGRAVE VIC 3170  
Free Call 1800 727 007  
Fax: (03) 9561 9333  
Email: heritage@heritageseeds.com.au  
www.heritageseeds.com.au

### J H Williams & Sons

(Williams Group Australia Pty Ltd)  
PO Box 102 Murwillumbah NSW 2484  
Ph: (02) 6672 1313  
Fax: (02) 66725812  
Email: seed@jhwilliams.com.au  
www.jhwilliams.com.au

### Keith Seeds

Keith Seeds Pty Ltd  
PO Box 123 KEITH SA 5267  
Ph: (08) 8755 1777  
Fax: (08) 8755 1815  
Email: admin@keithseeds.com  
www.keithseeds.com.au

### Michel Belair–Seed Technology

PO Box 246 BELAIR SA 5052  
Ph: 0418 833 576  
Email: kaehne@ozmail.com.au

### Native Seeds Pty Ltd

PO Box 133 SANDRINGHAM VIC 3191  
Ph: (03) 9555 1722  
Fax: (03)9555 1799  
Email: enquiries@nativeseeds.com.au  
www.nativeseeds.com.au

### Newseeds

PO Box 33 BALLDALE NSW 2646  
Ph: (02) 6035 1222  
Fax: (02) 6035 1229

### Parkseeds Pty Ltd

129 Olivers Road MANSFIELD VIC 3722  
Ph: (03) 5779 1888  
Fax: (03) 5775 1407  
Email: parkseeds@parkseeds.com.au

### PGG Seeds

PO Box 1402 DONCASTER EAST VIC 3109  
Ph: 0427 772 488  
Fax: (02) 60 725 407  
Email: skoljo@pggseeds.com  
www.pggseeds.com

### PGG Wrightson Group

PO Box 333 LAVERTON VIC 3028  
Free Call 1800 619 910  
Fax: 1800 619 940  
Email: kburke@wrightsonseeds.com.au  
www.wrightson.com.au

### Progressive Seeds

Lot 2, Lake Manchester Road MT CROSBY QLD 4306  
Ph: (07) 3201 1741  
Fax: (07) 3201 1006  
Email: info@pseed.com.au  
www.progressiveseeds.com.au

### Queensland Agricultural Seeds Pty Ltd

366–368 Anzac Avenue TOOWOOMBA QLD 4350  
Ph: (07) 4630 1000  
Fax: (07) 4630 1005  
Email: pastures@quseeds.com.au  
www.qaseeds.com.au

### Seed Distributors

14–16 Hakkinen Road WINGFIELD SA 5013  
Ph: (08) 8445 1111  
Fax (08) 8445 7777  
www.seeddistributors.com.au

### Seed Force

104–106 Drummond St SHEPPARTON VIC 3630  
Ph: (03) 5832 3800  
Fax: (03) 5821 8999  
www.seedforce.com.au

### Seed Genetics Australia Pty Ltd:

138 Greenhill Rd UNLEY SA 5061  
Ph: (08) 8271 6000  
Fax: (08) 8271 6077  
Email: mharvey@seedgeneticsaustralia.com  
www.seedgeneticsaustralia.com.au

### Seedmark

Level 1, 145 South Terrace ADELAIDE SA 5000  
Free Call 1800 112 400  
Fax: 1800 677 805  
Email: seedsinfo@seedmark.com.au  
www.seedmark.com.au

### Selected Seeds

PO Box 210 PITTSWORTH QLD 4356  
Ph: (07) 4693 1800  
Fax: (07) 4693 1899  
Email: andrewferguson@selectedseeds.com.au  
www.selectedseeds.com.au

### Southedge Seeds

2 Tinaroo Creek Rd MAREEBA QLD 4880  
Ph: (07) 4086 2400  
Fax: (07) 4092 2345  
www.southedgeseeds.com.au

### Tas Global Seeds

43 Oaks Rd OAKSTAS 7303  
Ph: (03) 6397 3184  
Fax: (03) 63973101  
www.tasglobalseeds.com

### Upper Murray Seeds

1014A Nowra St ALBURY NSW 2640  
Ph: (02) 6040 6464  
Fax: 02 6040 6470  
Email: albury@uppermurrayseeds  
www.uppermurrayseeds.com.au

### Valley Seeds Pty Ltd

295 Maroonah Link Hwy Yarck VIC 3719  
Free Call 1800 226 905  
Ph: (03) 5797 6203  
Fax: (03) 5797 6307  
Email: info@valleyseeds.com

### Vicseeds Production Pty Ltd

PO Box 1544 GEELONG VIC 3220  
Ph: (03) 5221 7577  
Fax: (03) 5221 7877  
Email: vicseeds@vicseeds.com.au  
www.vicseeds.com.au

### Wrightson Seeds (Aust) Pty Ltd

PO Box 333 LAVERTON VIC 3028  
Free Call 1800 619 910  
Fax: 1800 619 940  
Email: kburke@wrightsonseeds.com.au  
www.wrightson.com.au