

• australian wool  
**innovation**  
• limited

# Species for Profit

A Guide for Tasmanian Pastures and Field Crops

*This book is based on the latest knowledge and experience  
of many DPIWE and TIAR officers.*

*This knowledge has been used and incorporated into the text,  
creating a publication focused specifically on pastures, crops and  
livestock forage in the Tasmanian environment.*



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This book is based on the latest knowledge and experience of many DPIWE and TIAR officers. This knowledge has been used and incorporated into the text, creating a publication focused specifically on pastures, crops and livestock forage in the Tasmanian environment.

## **Contributors**

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## **Disclaimer**

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The information in this booklet is collated from project experience, expert advice and reference sources and is offered in good faith as a useful guide for those choosing fodder and pasture species. However, as each individual's circumstances are unique, it is your responsibility to closely and continuously monitor your own production and make the necessary decisions and adjustments to optimise results.

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## **The goal of this book...**

### **...the right plant for your situation.**

The purpose of this publication is to help producers choose the most appropriate species and cultivars, for their specific site, for pastures, forage or cash crops. These decisions are becoming more difficult as the choice range increases and the market place becomes more competitive.

Because of the diversity of climatic and environmental conditions within Tasmania, its not possible to have a small suite of universally recommended recipes. It must also be remembered that Tasmania is unique in Australia with its cool temperate climate. Best outcomes will not be achieved by accepting recommendations and cultivars based on experience derived under very different conditions.

Decision makers need to be able to describe the conditions of the area being sown, and use the information in this book as the basis for asking the right questions of potential seed suppliers. The goal is to plant the most appropriate species, with the best choice of cultivar to suit your specific paddock and the needs of your particular farm business.

This book depicts the diversity of available species, together with a summary of the characteristics that are important in agriculture. This will allow the reader to examine the merits of alternative species in comparison to those traditionally sown.

This book is primarily focussed at the species level because reliable data to allow objective differentiation between cultivars is rarely available. In some instances cultivars have been developed locally. These are highlighted as being the most appropriate for the Tasmanian environment.

Cultivar characteristics, which are important to each of the species, are highlighted so as to help in asking the right questions before making the final choice.

This book is divided into six sections to make it easy to navigate through all of the information contained. The first five sections contain details and characteristics of grass, legume, fodder crop, perennial herb and cash crop species. At the beginning of each section there is a table comparing key characteristics of each species. By using these tables and then checking the details in the species pages you will be able to make an informed choice of the correct species for your production system.

The Tips & Tricks contains terms and definitions, explains the importance of inoculating legumes along with providing a series of frequently asked questions and answers.

## What's in this book?

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### Grasses

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- Grass selection chart -  
*all that is good and bad about pasture grasses on one page!*
- Ryegrasses – separating out the species -  
*there are only 3 species but lots of cultivars and hybrids.*
- Annual and short-lived ryegrasses -  
*explains cultivars and hybrids of this species. Also see fodder section.*
- Perennial ryegrass -  
*easy to grow but is it really the most profitable choice?*
- Cocksfoot -  
*a productive, reliable grass.*
- Phalaris -  
*the most grub tolerant grass available.*
- Tall fescue -  
*persistent and loves the wet but needs care to establish.*
- Prairie grass -  
*good quality forage independent of maturity.*
- Grazing brome -  
*special purpose grass for well drained, fertile, high pH soils.*

### Pasture legumes – an overview

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- Why they are so important?

### Perennial legumes

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- Perennial legume comparison table -  
*get a perennial legume thriving and you're laughing. Is there one here to suit your environment?*
- White clover -  
*needs plenty of water. Some cultivars are tougher than others.*
- Short-lived red clover -  
*conditions must be excellent but its great while it lasts!*
- Stoloniferous red clover -  
*a winner for the medium rainfall areas?*
- Strawberry clover -  
*handles poor drainage, salinity and drought. Survives but does it thrive?*
- Caucasian clover -  
*a versatile long term legume.*

grasses

legumes

fodder crops

cash crops

perennial herbs

tips & tricks

- Lucerne -  
*an underutilised legume with great production potential, it is “King of the fodders”.*
- Big trefoil (Greater birdsfoot trefoil) -  
*a special legume for special environments.*
- Birdsfoot trefoil -  
*another specialist legume.*

### **Annual legumes**

---

- Annual legume comparison table -  
*sub clover is fine, but is there an annual legume in this chart that would suit your situation just that bit better?*
- Subterranean clover -  
*go for the late flowering lines to maximise benefit.*
- Arrowleaf clover -  
*keeps growing into early summer. Specialist forage opportunity.*
- Persian clover -  
*tolerant of waterlogging and salinity . Excellent feed quality.*
- Balansa clover -  
*similar to Persian but too hard seeded and early flowering for Tasmania.*
- Yellow and pink serradella -  
*for deep, well drained, sandy soils with low pH and fertility.*
- Biserrulla -  
*like serradella but less “acid loving”.*

### **Fodder crops**

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- Fodder crop comparison tables -  
*quick comparison of crop characteristics.*
- Brassica fodder crops -  
*overview and information on hazards when feeding brassicas.*
- Turnips -  
*flexible, adaptable and easy to grow.*
- Swedes -  
*an alternative to turnips.*
- Leafy turnip -  
*no bulb, fast growing, good regrowth.*
- Fodder rape -  
*a range of applications.*

- Kale (or chou moellier) - *slow maturing. Suited to winter feed production.*
- Cereals for fodder production - *an overview.*
- Dual purpose wheat - *finish stock in winter plus a bonus cash crop.*
- Oats - *for fodder, similar to annual ryegrass, but different.*
- Annual (eg Tama) and short-lived ryegrasses - *fast feed for autumn, winter and spring.*
- Forage legumes. - *companion plants or on their own. Also see annual legumes.*
- Maize - *high input, high yield. Frost sensitive.*
- Millet - *a warm season fodder crop. Frost sensitive.*

## **Cash crops**

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- Cereals for cash or feed grain – *an overview plus tips on choosing the best cultivar.*
- Cereal comparison table - *pick the one that best suits your needs.*
- Barley - *most frost resistant cereal. Tips for success.*
- Oats - *popular dual-purpose cereal crop for Tasmania.*
- Triticale - *tolerant of tough growing conditions.*
- Wheat - *winter or spring, dual or single purpose.*
- Grain legumes - *an overview.*
- Grain legumes comparison table - *cropping options you may not have thought about before.*
- Chickpeas - *a high value crop. Sow in spring.*
- Field peas - *for stock feed, human consumption or as part of a forage mix.*

grasses

legumes

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tips & tricks

- Faba beans -  
*legume most suited for wetter soils.*
- Lentils -  
*grown where cereals can be grown. Read the details.*
- Lupins -  
*including albus lupins and narrowleaf lupins.*
- Canola -  
*excellent as a cereal break crop.*

### **Grazing herbs**

---

- Chicory -  
*broad-leafed herb that can be used as a perennial summer forage crop.*
- Plantain -  
*yes, the broadleaf, perennial weed. Desirable for pasture?*

### **Productive pastures from saline areas**

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- The right species make moderately saline areas productive.

### **Terms and definitions**

---

The meaning of 'permanent', 'high rainfall' or 'pH (in water)'?

### **Steps to success**

---

- Ask the right questions -  
*of your paddock and your business.*
- Purchasing seed -  
*why certified?*
- Consider endophytes -  
*both a blessing and a curse.*
- Legumes must be effectively inoculated -  
*why do it? Because all plants need nitrogen.*
- Long-life inoculated legume seed -  
*they have use-by dates. Check them.*
- How to inoculate legume seeds -  
*doing your own.*
- Understanding sowing rates -  
*factors that determine a sowing rate.*

### **Frequently asked questions**

---

- Some answers from an agronomist.

### **New plants**

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- For release over the next 5 years.



# Grasses

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## Pasture grasses comparison table

Species	Annual Ryegrass	Short-lived Ryegrass	Perennial Ryegrass	Cocksfoot (summer active)	Cocksfoot (summer dormant)	Tall Fescue (summer dormant)	Tall Fescue (summer active)	Phalaris	Prairie grass (brome)	Grazing brome
Attribute										
Life span (years)	A	2-4	P	P	P	P	P	P	2-4	P
Relative persistence	1	1	1-4*	4	4	4	3	5	1	2
Pest tolerance	1	1	1	4	4	4	4	5	2	2
Rust tolerance	5	3	2	4	4	3	3	5	4	4
Minimum rainfall (mm) *	500 to 750	700	700 or 500*	400	300	450	550	400	500	600
Drought tolerance	1	1	2	4	5	4	2	5	2	3
Summer dormancy	yes	yes	yes	no	yes	yes	no	yes	no	yes
Response to summer rain	1	1	1	5	1	1	5	1	4	4
Tolerance of sandy soils	3	2	2	5	5	3	3	4	4	4
Waterlogging tolerance	4	4	3	2	2	5	5	5	2	2
Tolerance of acid soils	2	2	2	3	3	2	2	1	1	1
Salinity tolerance	2	2	2	1	1	3	3	3	2	2
Irrigation Suitability	4	3	2-3*	5	1	1	5	2	4	4
Ease of establishment	5	5	5	3	3	2	2	3	4	4
Time to first grazing	S	S	S	L	L	L	L	L	S	S
Palatability of green leaf	5	5	5	5	5	5	5	5	5	5
Post flowering palatability	2	2	2	1	2	1	1	1	3	3
Animal health risks	low	see text	see text	low	low	low	low	see text	low	low

\* there are significant differences between cultivars.

Key -

1 - poor	2 - fair	3 - good	4 - very good	5 - excellent
A - annual	P - perennial	S - short	L - long	

grasses

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## **Ryegrasses – separating out the species**

---

If you want a permanent pasture, and you have chosen to grow ryegrass, perennial ryegrass (*Lolium perenne*) is the species you must choose. As described below, in the annual and short-lived ryegrass section, there are a range of short rotation ryegrasses, but their inclusion in permanent pastures will be detrimental to the pasture's longevity.

Botanically, ryegrasses are a member of the genus *Lolium* of which there are three species, *Lolium perenne* (perennial ryegrass), *Lolium multiflorum* (annual and short-lived ryegrass) and *Lolium rigidum* (Wimmera ryegrass). *Lolium rigidum* is not important in Tasmania but a number of short-lived ryegrasses (*Lolium multiflorum*) are commonly sown.

Annual grasses convert all vegetative tillers into reproductive tillers in spring so as to maximise seed production. Reproductive tillers die once they have set seed. Perennial grasses retain numerous vegetative tillers, which go on to produce more forage and tillers. Short term or short rotation ryegrasses have a varying balance of reproductive and perennial tillers.

## Annual and short-lived ryegrasses (*Lolium multiflorum*)

Ryegrasses are normally diploid (2 sets of chromosomes). A ryegrass described as tetraploid, has four sets of chromosomes. These plants have much larger seeds, (2 to 3 times heavier), their tillers are larger and fewer. They have improved palatability and stock intake because they have larger cells with a higher soluble carbohydrate (sugar) content compared to diploid cultivars.

Diploids generally have finer leaves, produce a more dense sward and are more tolerant to harder, closer grazing than tetraploids. Diploids are regarded as being more persistent because of their growth habit but recent research has demonstrated greater persistence of a tetraploid over its diploid parent. Many diploid and tetraploid annual and short-lived ryegrass cultivars are presently available in the market place. Annual cultivars are in the minority.

The majority of *Lolium multiflorum* lives for two to four or five years depending, in particular, on the level of summer moisture and summer grazing management. The term used in this book for this group is 'short-lived ryegrasses'. There are both diploid and tetraploid cultivars in this group and a number have shown outstanding performance in Tasmania.

*Lolium multiflorum* and *Lolium perenne* intercross readily so plant breeders have been able to develop a range of cultivars that are varied in terms of their genetic make-up and more importantly their agronomic performance. These groups of cultivars are often called 'hybrid ryegrasses'. Cultivars in this group often live for three to four years and in some literature are described as short-lived perennials.

Production and persistence of all *Lolium multiflorum* cultivars is dependent upon soil fertility, particularly nitrogen, adequate soil moisture, grazing or cutting to control seed set and reduced summer grazing intensity. This species has poor drought tolerance. Productivity declines over time and DPIWE research shows no animal production advantage from using these short-lived cultivars, rather than perennial cultivars, if the intention is to maintain the pasture for two years or longer.

Annual and short-lived ryegrass cultivars should not be sown with long lived perennial pasture species because their early vigour will kill, through competition, many, if not all, of the much slower establishing perennial grasses and legumes.

***For more information on annual and short-lived ryegrasses - see the fodder crop section.***

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

---

Perennial ryegrass is easy to establish because its seedlings are vigorous. Like all grasses, quality declines with flowering. However, palatability is better than many other grasses at this stage. Frost has minimal effect on leaf quality. When ryegrass is not dormant, it tolerates heavy, continuous grazing.

The suitability of perennial ryegrass for the hotter, drier areas of Tasmania (<600 mm rainfall) should always be questioned. It is assisted in surviving hot, dry summer periods through its natural post flowering dormant to semi dormant period.

This is not a true physiological dormancy and as a consequence most perennial ryegrasses exhibit poor long term persistence under dry, low rainfall conditions.

There is often a significant lag time between the initial autumn rain and when dormancy is broken and growth starts.

High temperatures restrict its growth even if moisture is available so the performance of perennial ryegrass under irrigation may be restricted in some conditions.

Some cultivars are more suited to irrigation than others.

Ryegrasses vary considerably in their tolerance/resistance to stem and crown rusts. Rusts reduce growth, feed value and palatability. Generally ryegrasses that have adequate nitrogen nutrition and/or are closely grazed will be less affected by rust.

Good fertility, especially nitrogen is required for ryegrass to persist and thrive. It is very susceptible to damage by cockchafer and corbies, especially on light soils.

*Consider specific paddock conditions before automatically choosing perennial ryegrass.*

### **Perennial ryegrass is -**

- Easy to establish.
- Easy to graze.
- Best suited to higher rainfall areas.
- Not at all tolerant of poor fertility.
- Dormant in hot weather.
- Highly susceptible to pest and disease damage.

*Ryegrass staggers in livestock, caused by toxins of an endophytic fungus concentrated in the crown of the plants, can occur in late summer and autumn. This can be avoided by sowing seedlots with low or nil content of endophyte, or ensuring that leaves reach at least 50mm in length before grazing. However, because the endophyte helps the plant combat disease and pest invasion, its removal may reduce persistence. Another practical solution is to ensure that some areas of the farm are ryegrass free.*

*Novel endophytes, that will protect the plants from some insects while causing less animal health problems, have been developed for ryegrass.*

### **Choice points for perennial ryegrass cultivars -**

- Tasmanian bred cultivars are Victoca<sup>Ⓛ</sup>, Jackaroo<sup>Ⓛ</sup> and Wintas.
- Make sure the cultivar chosen is truly perennial (ie persists for 20 years).
- For long term pastures, make proven persistence a high priority when choosing a cultivar.
- Choose cultivars adapted to the rainfall conditions of your area.
- The relationship between time of flowering and productivity in ryegrass is complex and usually not important in the Tasmanian climate.
- Be aware of issues related to endophyte level. Select cultivars and/or manage accordingly.

### **Seeding rate -**

10kg/ha

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

---

Cocksfoot is adapted to a wide range of soils where drainage is adequate. It is the pasture grass most tolerant of low soil fertility, low pH and high soil aluminium levels.

Cocksfoot is well adapted to surviving in sandy soils. It has good tolerance to surface and root feeding cockchafers and better tolerance to corbies than perennial ryegrass.

Cocksfoots vary greatly in their seasonal growth pattern ranging from the summer active/winter dormant, or the northern European types, through to summer dormant/ winter active, which are referred to as Mediterranean or Spanish cocksfoots.

The cultivars most commonly used in Tasmania, Porto and Currie, are intermediate types. They have moderate summer dormancy, responding well to summer and autumn rain without being excessively vulnerable to drought and stop-start rainfall. They also have some winter activity.

These intermediate cocksfoots must be well managed, especially in spring and early autumn so they don't become over competitive, overwhelming companion legume species, especially annual clovers.

New cultivars, Uplands<sup>Ⓛ</sup> and Sendance<sup>Ⓛ</sup>, are from a sub-species of cocksfoot called *hispanica*, or Spanish cocksfoot. They have high summer dormancy but are highly winter active.

They are exceptionally drought tolerant, tolerant of heavy frosts, are less prone to becoming clumpy if poorly managed and are more compatible with legumes than traditional cocksfoot.

However, they don't respond as well to summer rain and will not be as productive in higher rainfall areas. They have been developed by the Herbage Development Program of TIAR and DPIWE.

***Actively manage cocksfoot to maintain forage quality and companion legumes.***

### **Cocksfoot is -**

- Perennial with proven long term persistence.
- Very responsive to summer rain while able to survive low summer moisture and high temperatures, if of the intermediate types.



- Extremely drought tolerant, particularly the Spanish type.
- Free from any substances known to be toxic to stock.
- An alternative to ryegrass to manage the risk of staggers.
- Slow to establish due to weak seedling vigour.
- Highly competitive, once established.
- More difficult than ryegrass to remove prior to cropping.

*Green leaves of cocksfoot are equal in feed value to those of perennial ryegrass but cocksfoot must be managed well to maintain feed quality. Control of cocksfoot in late spring is necessary to prevent the accumulation of large quantities of unpalatable stems.*

*The leaves of Tasmania's traditional, intermediate type cocksfoots are subject to severe frost damage, reducing nutritional value. Excellent autumn, early winter growth accentuates this damage. Focus grazing to utilise this growth before it loses nutritional value. Spanish cocksfoot has better frost tolerance.*

### **Other choice points for selecting cocksfoot cultivars -**

- The Tasmanian bred cultivar is Porto.
- Most of the cultivar choice points have been addressed in general information above. Within the intermediate types however there are differences such as overall productivity, seedling vigour, leafiness and in how prostrate or upright they are. There is variation in their level of summer activity and potential winter activity.

### **Seeding rate -**

3kg/ha

## **Phalaris (*Phalaris aquatica*)**

---

Phalaris is of Mediterranean origin. It has short rhizomatous roots that enable it to gradually spread throughout the pasture. Phalaris is very persistent and has good tolerance of waterlogging, drought and pasture pests but its response to summer rain is relatively poor. Phalaris is best suited to heavy clay soils but will grow well on a range of soil textures provided they are non acidic.

Many phalaris cultivars have been selected for production and persistence on mainland Australia, where phalaris is very popular. The summers are extremely hot and dry and there is a lot of heavy cracking clay with its associated winter waterlogging and field cricket problems. The mainland winters are warmer so the winter activity of phalaris is important.

In Tasmania, winter growth is poor, regardless of the winter activity of the species. Species that have good summer activity will be the most productive and provide the most evenly distributed pasture production. Summer active cocksfoot and tall fescue will be better choices to achieve this. However, there are farmers in Tasmania who make very good use of phalaris to suit their specific local conditions.

One such local condition may be paddocks with consistently high populations of pasture grubs. Phalaris has excellent resistance to pasture pests. Another may be as a companion to lucerne, providing competition to weeds and production when lucerne is dormant in winter.

*Phalaris uses dormancy to survive hot, dry conditions and so has low summer productivity.*

### **Phalaris is -**

- Perennial.
- Sensitive to high aluminium levels, so is less tolerant of acid soil than other grass species.
- Tolerant of waterlogging and moderate salinity.
- Very resistant to most pasture pests and diseases.
- Not vigorous as a seedling and slow to establish.
- Intolerant of low soil fertility.

*Like all pasture species phalaris needs to be managed appropriately. For phalaris this includes avoiding the accumulation of large amounts of unpalatable biomass in late spring. However consideration also needs to be given to the need by phalaris to have its seed-heads elongate in spring so as to encourage bud development. These buds are a key to the long term persistence of phalaris. This is particularly important in its first year of growth.*

*Young green shoots of phalaris contain an alkaloid capable of poisoning sheep so management of regenerating plants is important. Hungry sheep or those denied access to phalaris for some time should not be allowed to graze plants regenerating after rain. The problem is exacerbated when plants are stressed by frosts or lack of moisture. Cattle are only affected very occasionally.*

### **Choice points for selecting phalaris cultivars -**

- Cultivar Australian has been the benchmark for Tasmanian recommendations and alternatives are often compared to it. Breeders have sought improvement to phalaris in relation to seedling vigour, tolerance of low pH soils and in reducing the risk of alkaloid poisoning as well as overall productivity.
- Phalaris cultivars vary in their level of winter activity. Cultivar Australian is semi-winter dormant. Semi-winter dormant cultivars are more prostrate and have increased persistence under continuous grazing. Winter active cultivars have a more erect growth habit. They have poor tolerance to continuous grazing and require strategic resting in winter to be persistent and to optimise productivity.

### **Seeding rate -**

3kg/ha

## **Tall fescue (*Festuca arundinacea*)**

---

In Tasmania, the qualities of tall fescue are not fully appreciated. This may, in part, be caused by its low seedling vigour.

Tall fescue planted in a mix with grasses with more vigorous seedlings is very likely to have its seedlings shaded out and so they fail to establish. Farmers are then denied the opportunity to experience tall fescue's advantages.

Once established, tall fescue is deep rooted, very persistent and has good drought tolerance. It is also tolerant of waterlogging and moderate salinity. Frost has a minimal effect on leaf quality.

**Summer active** cultivars of tall fescue are particularly suited to heavy, wet soils. In such conditions these cultivars make the most of the moisture available, and grow green feed well into summer.

This ability to provide quality feed in summer is further enhanced by tall fescue going to seed earlier than other grass species. This allows the seed heads to be eaten down early, at a time when other species are not flowering. Summer active tall fescue then reverts to vegetative growth, utilising late spring and any summer moisture to grow quality feed.

In animal production trials at Cressy Research and Demonstration Station, tall fescue showed an 18 percent productivity advantage over perennial ryegrass. Its summer productivity added to this performance.

**Winter active** cultivars of tall fescue are now available. They have a very different role to the summer active cultivars that have been the subject of this page so far. Summer dormant/winter active cultivars are an alternative to phalaris based pastures in areas with mild winters and harsh summers.

In cold Tasmanian winters these cultivars are unlikely to express their full potential of winter productivity.

They have a role in areas with long, dry summers, where it is difficult to get perennial species to persist.

An endophyte (brand name MaxP), has recently been made available that enhances the performance and persistence of tall fescue. Storage protocols and sow-by dates must be adhered to. Some planning and checking with suppliers as to the availability of cultivars with the endophyte will be worthwhile.

***Don't grow tall fescue with other grass species that have vigorous seedlings.***

### Tall fescue is -

- Perennial and persistent, once established.
- Tolerant of waterlogging and moderate salinity.
- Deep rooted.
- Very productive in summer (summer active cultivars only) if moisture is available. Good response to irrigation.
- Not known to have livestock toxicity problems.\*
- Resistant to pests.
- Slow to establish. Careful grazing is required for the first 12 months.
- Less likely to overwhelm companion legumes (than cocksfoot or phalaris).

*\*The cultivars of tall fescue currently sold for grazing in Australia have no livestock toxicity problems. Fescues grown in some other countries, some very early cultivars and some turf species have an endophyte that causes a disease called 'fescue foot'. It is important to use certified seed of cultivars designed to avoid any risk from this endophyte. The previously mentioned novel endophyte (brand name MaxP) is not known to create any risk for livestock.*

*Introduced plants that are tolerant of salinity can invade saline areas that are set aside for their value as natural wetlands. Tall fescue should be kept separate from such areas.*

### Choice points when selecting a tall fescue cultivar -

- The Tasmanian bred cultivar is Demeter.
- Summer active cultivars are suited to heavy wet ground and irrigation.
- Summer dormant cultivars are available for areas and sites with extremely dry summers. Not intended to be productive during summer.
- Variations in leaf characteristics and claimed differences in rust resistance between cultivars may influence palatability.
- Variations in the winter production of summer active cultivars, variations in the actual level of summer dormancy of summer dormant/winter active cultivars, and variations in flowering times are other differences between cultivars.

### Seeding rate -

10 kg/ha

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

---

A short-lived perennial (2 to 4 years) with the ability to re-establish as seedlings under grazing, if seed heads are allowed to mature.

Has large leaves and tillers and offers excellent winter and early spring production in mild climates. Prairie grass is summer active and very suited to irrigation. It remains reasonably palatable to stock when seedheads are present.

Suited only to fertile soils with good drainage and a pH level above 5.5.

Trials are currently underway to evaluate the potential of prairie grass in Tasmania.

*Prairie grass is a special purpose pasture grass.*

### **Prairie grass is -**

- Short-lived.
- Susceptible to overgrazing, particularly in summer.
- Resistant to root feeding cockchafers.
- Susceptible to lucerne flea as a seedling.
- Not tolerant of waterlogging
- Endophyte free. No known livestock health problems.

*Sow de-awned, coated seed to ensure an even flow of seed from the drill.*

*A fungicide dressing should be applied to the seed to protect against smut.*

*Smut may reduce productivity as well as regeneration from seedlings.*

### **Choice points for selecting prairie grass cultivars -**

- Currently there is limited cultivar choice.

### **Seeding rate-**

Seed quality is variable.

Adjust seeding rate according to label information.

Usually 25 to 30 kg/ha

## **Grazing brome (*Bromus stamineus*)**

A relative of prairie grass but differs by having a higher tolerance to close hard grazing because it has a larger number of smaller tillers. However grazing brome should not be allowed to grow too tall (> 250 mm) before grazing.

Suited only to fertile soils with good drainage and a pH level above 5.5. It will not tolerate waterlogging.

Grazing brome is summer active thus good for irrigation and is productive in winter where the climate is mild.

Grazing brome is resistant to root feeding cockchafers, has good rust tolerance and is resistant to head smut.

Endophyte free.

No known livestock health problems.

*Grazing brome tolerates hard grazing better than prairie grass.*

### **Grazing brome is -**

- Perennial.
- Reasonably persistent.
- Suited to well drained, drier soil types.
- Not tolerant of acid soils.

*Never sow into cold soil, (less than 10 degrees C). Drill or broadcast and incorporate the seed. Use de-awned seed. Sow only with non aggressive companion species.*

### **Choice points for selecting grazing brome cultivars -**

- Currently there is limited cultivar choice and little Tasmanian experience.

### **Seeding rate -**

20-25 kg/ha

grasses

legumes

fodder crops

cash crops

perennial herbs

tips & tricks





# Legumes

grasses

legumes

fodder crops

cash crops

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## **Pasture legumes - an overview**

---

Legumes drive pasture production by producing nitrogen. They must be carefully inoculated to ensure success.

Adequate pasture nutrition is important for maintaining the dominance of improved species in a pasture. Nitrogen is one of the most important elements of pasture nutrition. Protein levels and the digestibility of pastures are improved by legumes, resulting in improved livestock performance.

### **How much nitrogen does the legume in your pasture produce?**

Legumes can produce at least 100 kg/ha of nitrogen in a year. This has a dollar value of at least \$100 if fertiliser nitrogen is used instead.

### **Points to consider about your paddock when choosing a suitable legume -**

- Rainfall or irrigation?
- Waterlogging?
- Soil moisture. Watertable depth?
- Soil depth and profile?
- Soil texture. Light soil - heavy soil?
- pH. Alkaline or acid?
- Pests?
- Diseases?
- How long does the pasture need to last?
- Grazing systems?
- Harvesting plans?

*more legume = more grass = more \$*

## Perennial legumes comparison table

Species	White clover	Red clover (short-lived)	Red clover (stoloniferous)	Strawberry clover	Caucasian clover	Lucerne	Birdsfoot trefoil	Greater lotus
Attribute								
Life span (years)	P	2-4	P	P	P	P	P	P
Drought tolerance	1	1	3	3	5	5	4	1
Minimum rainfall (mm)	>650	700	500	>500	300	300	500	800
Seasonal dormancy	none	none	none	none	winter	varied	none	none
Irrigation Suitability	5	5	5	4	5	5	3	na
Waterlogging tolerance	3	2	2	5	3	1	2	5
Salinity tolerance	1	2	2	4	1	2	2	1
Ease of establishment	3	4	4	3	2	3	1	3
Bloat safety	1	2	2	4	1	1	5	5
Tolerance of pH<5	1	1	1	1	2	1	2	5
Tolerance of high aluminium	2	2	2	2	2	1	2	5
Tolerance of continuous grazing	varied	1	4	4	5	1	1	2

Key -

1 - poor	2 - fair	3 - good	4 - very good	5 - excellent
P - perennial				

grasses

legumes

fodder crops

cash crops

perennial herbs

tips & tricks

## **White clover (*Trifolium repens*)**

---

A perennial, capable of very high production (mainly spring-summer-autumn) if fertility is high and moisture is adequate. Very suited to irrigation.

Poor drought tolerance and of little use in low rainfall areas. However, a small amount is often added to pasture mixes in these drier areas in the hope it will survive in damp spots.

White clover can also behave as an annual in drier areas, regenerating from seed when conditions are favourable.

White clover uses stolons (stems running across the surface of the ground) to expand the size of plants and put down new roots.

*White clover needs plenty of moisture.*

### **White clover is -**

- Perennial.
- Capable of reproducing from both seed and stolons.
- Suited to a wide range of soil types.
- Highly productive.
- Suited to irrigation.
- A major cause of bloat.

*In high rainfall areas white clover produces lush growth and contributes significantly to quality and quantity in highly productive pastures. In these situations it poses a significant bloat risk. It poses no other animal health risk.*

### **Choice points for selecting white clover cultivars -**

- Growth habit.

White clover has cultivars that are, at one end of the spectrum, upright, open and large leaved with a long growing season. These cultivars are more suited to rotationally grazed cattle pastures. They not only produce well but their upright growth habit reduces the likelihood of shading by vigorous grasses.

At the other end of the spectrum are small leaved cultivars with a high density of fine stolons, most of which are close to the soil and thus difficult

to graze. These have been developed to survive in set stocked sheep pastures. They are much more persistent and tolerant of hard grazing.

- Cultivars vary in their summer activity. In areas of high summer rainfall or if irrigation is available, a summer active cultivar will be more productive. In areas where the rainfall is nearer the 625 mm annual rainfall lower limit for white clover, less summer activity is likely to result in better persistence.

### **Seeding rate -**

2 to 4 kg/ha if only clover in mixture.

0.5 to 1 kg/ha if supplementing other clovers.

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## **Short-lived red clover (*Trifolium pratense*)**

---

This form of red clover is an upright, short-lived perennial. It has a strong tap-root that allows it to use subsoil moisture in summer better than white clover.

It doesn't tolerate dry conditions or drought, or poorly drained soils.

Red clover provides extra feed in late spring and summer in high rainfall areas, irrigated pastures or on naturally summer-moist soils that are well drained.

It is also useful in short leys and may be sown in pure swards as a specialist crop for hay, silage or grazing.

Rotational grazing will promote plant longevity and persistence.

Most cultivars do not persist beyond 2 to 4 years.

*Lasts only 2 to 4 years and requires good growing conditions.*

### **Short-lived red clover is -**

- A short-lived perennial.
- Easy to establish.
- Not tolerant of waterlogging and poorly drained soils.
- Intolerant of drought.
- Suited to high rainfall districts or irrigation.
- Best suited to rotational grazing.

*Some cultivars contain phyto-oestrogens which may reduce fertility of stock grazed on green feed at mating.*

### **Choice points for selecting red clover cultivars -**

- Tolerance of general grazing versus fodder/hay crop use.
- Oestrogen level.
- Seasonal productivity.
- Seedling vigour.

### **Seeding rate -**

5 to 7 kg/ha if the only legume in the mix.

## **Stoloniferous red clover ( *Trifolium pratense* )**

Stoloniferous red clover is commonly known by its cultivar name, Astred<sup>Ⓛ</sup>. Its cultivar name will be used here for the purpose of brevity and because it is the only cultivar that has been extensively trialed in Tasmania at the time of writing.

Normal red clover has a limited lifespan. Astred<sup>Ⓛ</sup> is a long lived perennial. It has several features that enhance its persistence. It grows stolons which are creeping stems that grow across the ground, put down roots and grow new crowns, thus enabling it to reproduce vegetatively as well as by seed. Astred<sup>Ⓛ</sup> has low crowns and a prostrate growth habit making it more tolerant of continuous grazing. It also has a well developed taproot and so can exploit a large volume of soil for moisture and nutrients.

Astred<sup>Ⓛ</sup> has performed better than white clover in persistence trials in dry areas of Tasmania. It can be used as a pure sward for hay or grazing or can be part of a pasture mix. Like other red clovers, Astred<sup>Ⓛ</sup> provides high quality green feed in late spring and summer if moisture is available as ground water, from rainfall or through irrigation.

*A perennial clover with potential for medium rainfall areas.*

### **Stoloniferous red clover is -**

- Perennial.
- Easy to establish.
- Not very tolerant of waterlogging and poorly drained soils.
- More tolerant of dry conditions than other red and white clovers.
- Tolerant of continuous grazing.
- Low in oestrogen.

*A period of lax grazing in autumn is required for reproduction via new crowns established from stolons.*

### **Choice points for stoloniferous red clover cultivars -**

- The Tasmanian bred cultivar is Astred<sup>Ⓛ</sup>

### **Seeding rate**

5 to 7 kg/ha if the sole legume in a mix.

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## **Strawberry clover (*Trifolium fragiferum*)**

A long lived, prostrate, perennial clover that tolerates poorly drained, moderately alkaline and saline soil. These are conditions in which white, red and subterranean clovers either grow poorly or do not persist. Strawberry clover is most productive on heavy neutral to alkaline soils of reasonable fertility. In other conditions it may compare poorly with the other clovers. Check on local experience. Good stands are often seen in the coastal areas of Tasmania.

Close and continuous grazing, that reduces competition from grasses, favours strawberry clover. It spreads by both seed and stolons. Stolons are stems spreading across the surface of the ground that can put down roots, establishing new crowns.

*Suited to waterlogged, heavy and saline soils.*

### **Strawberry clover is -**

- Stoloniferous perennial.
- Persistent and moderately drought tolerant.
- Not vigorous as a seedling.
- Not a major bloat risk and is low in oestrogen.

### **Choice points for strawberry clover cultivars -**

Cultivar Palestine has been the most important and, for some time, the only cultivar recommended for pastures. There are alternative cultivars with the following variations in features.

- Some cultivars are more prostrate, with more smaller leaves. O'Connor's is one of these types and is said to be more suited to lawns than pastures but to be even more persistent than Palestine.
- Palestine is described as a larger leafed, more erect type. Other cultivars are claimed to be even more upright and productive.
- Palestine has poor winter growth. O'Connor's has poor winter and poor early spring growth. Some other cultivars are reported to have better winter activity. Winter activity is not important where it is very cold.

### **Seeding rate -**

2 kg/ha if the only legume in mixture.



## **Caucasian clover (*Trifolium ambiguum*)**

Caucasian clover, also known as Kura clover is a winter dormant, drought tolerant perennial clover for low and medium rainfall areas. It has an extensive root and underground stem system (rhizomatous) which allows it to spread through the pasture. This habit also protects the growing points from overgrazing, treading and high soil surface temperatures.

Seedlings of Caucasian clover are very slow to establish and get to productive levels. It is recommended it be sown with perennial grasses that have less competitive seedlings such as tall fescue or phalaris and that it not be overgrazed during establishment. Once established it is very persistent and can tolerate heavy grazing.

It grows actively in spring and summer. Its summer activity makes it very suited to irrigation. Caucasian clover persists better than white clover on acid soils with low phosphorous levels. It is also tolerant of attacks from pasture grubs.

*Relatively new to Tasmania.  
A perennial with potential for drier areas.*

### **Caucasian clover is -**

- Perennial.
- Winter dormant, spring-summer active.
- Adapted to a wide range of soil types.
- Tolerant of wet soils and some flooding.
- Not tolerant of salinity.
- Free from oestrogenic compounds.
- A bloat risk to stock if it is the dominant species.
- Tolerant of long dry periods.

*Caucasian clover has its own specific strain of rhizobia, Group cc283b. Effective inoculation of the seed with fresh rhizobia is critical.*

### **Choice points for caucasian clover cultivars -**

- Endura<sup>®</sup> is the only commercial variety currently available.
- A new cultivar with improved seedling vigour is being developed for Tasmania.

### **Seeding rate -**

3 to 5 kg/ha

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## **Lucerne (*Medicago sativa*)**

---

Lucerne is a perennial with a woody crown and an erect growth habit. It is suited to fertile, deep, well drained, neutral to alkaline soils. Its long tap root can access moisture deep in the soil profile, providing extraordinary summer growth and drought tolerance. Careful management, including grazing control and weed and pest control, is usually required for a stand of lucerne to persist.

Lucerne is mostly used as a perennial hay or fodder crop. It provides high quality forage that is readily saleable as hay or useable as a high protein addition to livestock diets. Because of the high value of the lucerne forage and its excellent summer production, lucerne is very suited to irrigation.

Lucerne may be grown as part of a mixed pasture sward but the conditions must suit lucerne. Rotational grazing is usually necessary to ensure survival. Grass species are sometimes planted with winter dormant lucerne cultivars to reduce the invasion of weeds in late autumn and winter, when the lucerne plants are dormant.

*Requires fertile, deep, well drained soils of pH 5.7 or higher.*

### **Lucerne is -**

- Perennial.
- Erect in its growth habit.
- Usually intolerant of continuous grazing.
- Intolerant of waterlogging.
- Not suited to soils with a high aluminium content.
- Frost tolerant.
- A high bloat risk.

*Graze and mow lucerne so as not to damage new emerging shoots.*

### **Choice points for lucerne cultivars -**

- There is a wide choice of cultivars with about 30 commercially available in Australia.
- Winter activity, the level of response to short days and cold temperatures, is one of the main choice points for lucerne. Winter activity is valuable in dry land farming systems in mediterranean climates where there is some

warmth to go with winter moisture. The level of winter activity affects the persistence of lucerne stands and information should be obtained on the best option for your situation.

- Lucerne cultivars vary in their resistance to various insects and diseases.
- A range of characteristics, such as softness of stems and the leaf to stem ratio, affect haymaking qualities.
- Some cultivars have better tolerance to grazing than others. Characteristics of the crown, including height and width, affect a cultivar's tolerance to grazing.

### **Seeding rate -**

Varies with available moisture and plant density requirement.

Examples: High rainfall and favourable dryland areas - 4 to 6 kg/ha. On good river flats the rate should be slightly higher. A pure irrigated stand for hay requires a seeding rate of about 12 to 15 kg/ha .

## **Greater lotus (*Lotus uliginosus* syn. *L. pedunculatus*)** **(Greater birdsfoot trefoil, big trefoil or lotus major)**

Greater lotus has special value on poorly drained, acid soils. It is tolerant of waterlogging, a range of soil types and low fertility. It is well suited to shade. It is used in New Zealand in agro forestry because it tolerates shade and needle litter better than clovers.

It grows well through spring, summer and autumn in moist conditions, providing grazing pressure is not too constant or high. Greater lotus has rhizomes which helps it spread and persist. It has good resistance to pasture pests and is not known to cause bloat in livestock.

In better conditions that suit alternatives like white clover and lucerne, greater lotus will not establish, compete and grow as well as these other species. Soil temperatures of less than 15°C will retard establishment significantly.

*Suited to low fertility, damp, acid soils.*

### **Greater lotus is -**

- Perennial.
- Has good pest resistance.
- Tolerant of acidity down to pH 4.5.
- Suited to areas where soils remain wet most of the time.

*Group D inoculum is required at new sowings. This is a different strain of inoculum from those required by other lotus species.*

### **Choice points for greater lotus cultivars -**

- Tetraploid cultivars have been developed as an alternative to diploid types. These have larger seeds, better seedling establishment and higher production.

### **Seeding rate -**

1.5 to 3 kg/ha

## **Birdsfoot trefoil (*Lotus corniculatus*)**

Birdsfoot trefoil is an erect, tap rooted perennial legume that resembles lucerne in its use and management.

While it is much less productive than lucerne, it tolerates lower fertility. In contrast to lucerne, some cultivars tolerate low pH soils. While its waterlogging tolerance is only fair, it is better than lucerne.

Like lucerne it is best suited to deep, well drained soils.

Birdsfoot trefoil forage contains condensed tannins that help prevent bloat in livestock. Research is also pointing to other nutritional and animal health advantages from condensed tannins.

While its taproot is not as long as that of lucerne, it is more branched and the roots are more extensive in the topsoil.

Birdsfoot trefoil has good drought tolerance and is productive during summer if moisture is available. Victorian experience suggests it is suited to areas with mild summers and a minimum 600 mm rainfall. In reality, birdsfoot trefoil is not used to any great extent in Australia.

Grazing needs to be controlled as the regrowth buds of birdsfoot trefoil sprout from the leaf forks. Grazing should not be lower than 2.5 cm for prostrate types and 5 cm for erect types.

Seedlings develop slowly so weed control needs to be good and sowing with aggressive pasture species is not advised. Grazing should be restricted until the plants are fully established.

*Suited to low fertility, deep, well drained soils.*

### **Birdsfoot trefoil is -**

- A shorter-lived perennial lotus.
- Susceptible to overgrazing.
- Slow to establish.
- Variable between cultivars in its tolerance of acid soils.
- Tap rooted.
- Non bloating.

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*Inoculation of seed is essential because birdsfoot trefoil has its own special strain of rhizobia. High rhizobia numbers are essential for successful nodulation.*

**Choice points for birdsfoot trefoil cultivars -**

- Persistence, tolerance to acid soils and plant growth form (prostrate or erect) are attributes breeders have focused on. There is some variation between lines in the level of winter activity. However, the range of cultivars available is quite limited.

**Seeding rate -**

3 kg/ha

## Annual legumes comparison table

Species	Sub clover <i>T. subterraneum</i>	Sub clover <i>T. yanninicum</i>	Sub clover <i>T. brachycalycinum</i>	Arrowleaf clover	Persian clover Sub spp. <i>Majus</i>	Persian clover Spp. <i>Resupinatum</i>	Balansa clover	Serradella Pink	Serradella Yellow	Biserrula
Attribute										
Min rainfall required	300	600	300	600	600	500	400	500	300	300
Hard seeded-ness	*	*	*	High	Low	High	High	*	*	High
Red-leggedearth mite tolerance	2	2	2	1	1	1	1	5	5	2
Bloat safety	2	2	2	5	1	1	1	5	5	5
Irrigation suitability	1	1	1	5	4	4	4	4	2	1
Waterlogging tolerance?	1	4	1	1	5	5	5	1	1	1
Salinity tolerance	1	2	1	1	3	3	3	2	2	1
Tolerance of pH < 5	2	2	1	1	1	1	1	5	5	2
Tolerance of aluminium	1	1	1	1	1	1	1	5	5	4

\* Level of hardseeded-ness depends upon the cultivar

This table shows relative tolerance to a range of environmental factors - not overall productivity.

Key -

1 - poor	2 - fair	3 - good	4 - very good	5 - excellent
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## **Subterranean clover (*Trifolium subterraneum*)**

Subterranean (sub) clover is, in terms of Australian pasture improvement, the original, and in many situations, still the best annual self-regenerating clover. It starts germinating in autumn and is productive until it buries its seed burrs during spring. Because it flowers and produces seeds near the ground, grazing can continue during flowering without excessively reducing seed production.

More than 50% of the seed has a coating to prevent germination in the year of production and is thus said to be hard. This characteristic allows the species to survive droughts and false breaks. Most sub clover cultivars have a workable ratio of hard to soft seeds for Tasmanian conditions. Softer seeded cultivars are best for these conditions.

Some alternative annual legumes do not work well in Tasmanian conditions because they have too much or too little hard seed. Sub clover seeds are large, creating vigorous seedlings. Late flowering/maturing cultivars are best for Tasmania.

### **Subspecies of subterranean clover**

The most commonly used subspecies is *subterraneum* which is well adapted for slightly or moderately acid loam soils that have reasonable drainage. Seeds of this subspecies are black.

The second subspecies of importance in Tasmania is *yanninicum* which is suited to slightly or moderately acid, heavy soils and has good tolerance to waterlogging. It has more upright growth than subspecies *subterraneum*, making it more suited to grazing by cattle and for fodder conservation. Seeds of this subspecies are yellow.

A third subspecies *brachycalycinum* is not important in Tasmania. It is suited to neutral or alkaline, cracking, self mulching soils. It does not actively bury its burrs like the other subspecies and has performed poorly in Tasmanian trials.

*Excellent annual regeneration.*

### **Sub clover is -**

- Annual and dependent on seed for the following years growth.
- Very drought tolerant.
- Shallow rooted so can't utilise deeper soil moisture.
- Susceptible to red-legged earth mite and lucerne flea damage.



- Poorly tolerant of waterlogging except where sub-species *yanninicum* is used.
- A potential weed in cropping systems.
- Highly productive in spring but no summer production.
- Not suited to spring sowing.

*A seeding rate for sub clover of 10 kg/ha appears high, but in terms of seeds per hectare, it is no higher than other legumes such as white clover at a rate of about 1kg/ha. Sub clover has very large seeds (80,000 to 200,000 /kg) while white clover has very small seeds (typically 1,600,000 /kg).*

### **Choice points for sub clover cultivars -**

- Time of flowering. How late into spring sub clover continues growing, before burying its seed burrs and dying off, depends on the time of flowering. Earlier flowering cultivars reduce the risk of the season drying off before seed production is complete. Spring in most of Tasmania goes on longer than it does in many mainland areas. Late flowering cultivars will make better use of this longer growing season, and be more productive.
- Tolerance to waterlogging. Choose a cultivar from subspecies *yanninicum* where waterlogging occurs.
- Ratio of soft and hard seeds. Higher levels of hard seededness gives better persistence in the face of false breaks, bad growing seasons and cropping phases. However, in cool climates, a high level of hard seededness may result in an inadequate quantity of seed breaking dormancy. An abundance of softened seed is needed for high levels of regeneration and productivity in autumn. Cultivars Denmark<sup>(1)</sup> and Leura<sup>(1)</sup> are soft seeded.
- Pest and disease tolerance.
- Oestrogen levels. Most new cultivars have low oestrogen levels. (High levels can cause infertility in livestock.)
- Prostrate or upright growth habit. Prostrate plants tolerate hard grazing better, upright plants compete with grasses better and are better for hay production.
- Productivity. New cultivars are at least 30 percent more productive than old ones such as Mt Barker and Woogenellup. Sowing new cultivars is therefore a significant advantage.

### **Seeding rate -**

6 to 10 kg/ha in a mixture.

## **Arrowleaf clover ( *Trifolium vesiculosum* )**

An annual clover that has only recently become commercially available in Australia so its full potential may not yet be realised.

A late maturing cultivar (Arrotas<sup>Ⓛ</sup>) has been produced for Tasmanian conditions. Late maturing cultivars like Arrotas<sup>Ⓛ</sup> have the ability to continue growing feed through late spring and into summer. Sub clover, currently the most used annual clover, dies off in spring, regardless of the moisture available.

Arrowleaf clover's ability to access moisture into summer is enhanced by a deep taproot. Sub clover has shallow roots.

Winter production is poor compared to subterranean, persian and balansa clovers but late maturing cultivars of arrowleaf clover such as Arrotas<sup>Ⓛ</sup>, are significantly more productive than these in late spring and early summer.

Cultivar Arrotas<sup>Ⓛ</sup> may be suitable as a specialist hay, silage or forage crop. It is very productive throughout spring as well as having the potential to grow into summer.

Arrowleaf clover shares sub clover's ability to regenerate by producing large amounts of seed, but arrowleaf has an extremely high proportion of hard seeds and regeneration is often poor in the second year. By the third year the seed in the soil, that was produced in the first year, will have had time to soften. Hard grazing of pastures containing arrowleaf clover during summer, to remove residues, will help soften seeds and improve regeneration.

Arrowleaf clover must be let go to seed in the first year to create a large soil seed bank. Grazing or hay cutting should be deferred during flowering and seed set.

***Management to ensure seed set and autumn regeneration is very important.***

### **Arrowleaf clover is -**

- Annual.
- Upright in its growth habit.
- A low bloat risk.
- Suited to a range of soil types providing they are well drained and pH 5.0 to 7.0.
- Intolerant of low pH or high aluminium, manganese or iron levels.

- Very sensitive to red-legged earth mite attacks as a seedling.
- Intolerant of waterlogging.
- Very slow to establish with little winter growth.

*The seed should be sown in autumn into a well prepared, weed free seedbed. The seed is small and seedlings slow to establish. Grazing should be deferred during the early growth stage. Arrowleaf clover is very sensitive to being sown too deep (more than 10 mm). It must be inoculated with a specific rhizobia. (Group C)*

### **Choice points for arrowleaf clover cultivars -**

- The Tasmanian bred cultivar is Arrotas<sup>Ⓛ</sup>.
- Time of flowering. Some cultivars are earlier flowering to suit mainland conditions. Later flowering is advantageous in Tasmania to provide the longest possible growing season. Arrotas<sup>Ⓛ</sup> is a very late flowering cultivar.
- Reduced levels of hard seededness is better in cool climates like Tasmania.

### **Seeding rate -**

5 to 10 kg/ha

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## **Persian clover (*Trifolium resupinatum*)**

### **Sub species *majus* & *resupinatum***

---

This species is sometimes called shaftal clover. However, the name Persian clover is widely preferred.

Persian clover is not a mainstream species in permanent pastures in Tasmania. However, Persian clover has two distinct subspecies which may be of use in special situations.

**Subspecies *majus* is soft seeded.** Because it is soft seeded, *majus* is usually limited to use as a one year fodder or hay crop, often mixed with a short term grass species. It lacks hard seeds. Rain in summer will cause the soft seeds to immediately germinate, and in most cases die off, when the soil dries up. Therefore, *majus* is unable to self regenerate in the long term.

Subspecies *majus* is an erect plant that recovers well after grazing or cutting for hay and can continue to produce well into summer under irrigation. It is characterised by thick, fleshy hollow stems that have high nutritive value even when dried off.

**Subspecies *resupinatum* has a good level of hard seeds.** *Resupinatum* is self regenerating and is suitable for use in permanent pasture. It is semi erect and produces fewer stems, smaller leaves and more lateral shoots than soft seeded *majus*. It is less productive as a one year forage crop.

Subspecies *resupinatum*, with its hard seeds, should be considered as a self regenerating annual legume option in a range of situations, including waterlogged and moderately saline conditions that might suit strawberry clover.

Subspecies *resupinatum* is also productive during summer if moisture is available.

*Has tolerance to waterlogging and moderate salinity.*

### **Persian clover is -**

- Annual. (Capacity for self regeneration varies).
- Intolerant of acid and sandy soils.
- A bloat risk.
- Low oestrogen.
- Slow to cure as hay. Roller conditioning may be advantageous.

*Persian clover's very small seeds require a fine, weed free seed bed and should be sown no deeper than 10mm. Very susceptible to attack by red-legged earth mite and lucerne flea.*

*Unless, by virtue of early rains or irrigation, Persian clover is planted early in autumn, its autumn and winter growth is poor.*

*Needs a special Persian clover inoculant - Group O.*

### **Choice points for Persian clover cultivars -**

- Selection of desired sub species.
- Single year crop or permanent pasture.
- Level of hard seed.
- Early or late maturing.
- Tolerance to disease.
- Growth habit (prostrate, semi erect or erect).

### **Seeding rate -**

8 kg/ha if sowing alone. 4 to 6 kg/ha in mixtures.

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## **Balansa clover ( *Trifolium michelianum* )**

---

Balansa clover is well adapted to most soils in the pH 5.2 to 8.0 range, but not deep sands. It is highly tolerant to waterlogging and has tolerance of mild salinity. It is an effective substitute for sub clover in the right conditions.

There have been reports in Tasmania of balansa growing well for one year, but failing to regenerate in subsequent years. Balansa is very hard seeded which is useful with cropping phases and harsh summers, but it may be a failing in Tasmania's milder conditions which are slower at breaking hard seed coatings. Grazing the pasture bare during summer and autumn will help soften the seed and improve germination. Take care not to overgraze perennial species in the pasture.

Balansa clover is semi erect in its growth habit and has proved very satisfactory in Victoria as a monoculture or as a companion with short term grasses. It is highly suited to hay production. It is an aerial seeder, so deferring grazing during flowering and seed set is necessary to create a good bank of seed. This is critical during its first year for regeneration in future seasons.

*Very hard seeded and may not regenerate well in Tasmanian conditions.*

### **Balansa clover is -**

- Annual (Self regeneration not reliable in Tas).
- Semi erect and very productive.
- Not affected by aphids and clover scorch disease but more susceptible to red-legged earth mite than sub clover.
- A high bloat risk - low oestrogen.
- Not suited to deep sands.

*Harvested seed must be scarified to soften it before sowing. It is small seeded and must be sown very shallow. Balansa clover uses the same rhizobia as sub clover (Group C).*

### **Choice points for Balansa clover cultivars -**

- Early (>350mm) or late maturation (>500mm) depending on local rainfall. For fodder crops or a one year rotation, later maturing cultivars are better.

### **Seeding rate**

5 kg/ha. Lower rates only if sowing conditions and pest control are excellent.

## Serradella -

### **Yellow (*Ornithopus compressus*) and Pink (*O. sativus*)**

Serradella is adapted to deep, well drained, sandy soils with low pH and low fertility levels. It is particularly tolerant of low phosphorous levels. It will also tolerate moderate to severe aluminium and manganese levels, both of which reduce the productivity and persistence of other legumes such as white and sub clover and lucerne.

Serradella has a deep root system that allows it to continue growing actively during the early to mid summer periods, after other annual legumes have finished their growth cycle.

It has relatively good resistance to insect and disease attack.

**Yellow serradella** is characterised by having a very high percentage of hard seeds, prostrate growth habit and yellow flowers.

Cultivars of **pink serradella**, which have been available in the past, have been relatively soft seeded. Cultivars with a balanced level of hard seededness are now becoming available.

**Pink serradella** has an erect growth habit and pink flowers.

Both are annuals that germinate in autumn/early winter and produce during winter, spring and early summer.

Up to now, there has been a recommendation for equal quantities of seed of both species to be included in sowing mixtures. The intended result of this is that **pink serradella** dominates for 2-3 years and then declines in incidence to be replaced by the **yellow serradella** as its seeds soften and germinate. However, with the development of cultivars of **pink serradella** with a good level of hard seededness, **yellow serradella** may be less important.

Both serradellas are non-bloating and contain condensed tannins. These tannins protect protein in the rumen, which increases protein absorption and digestive efficiency in ruminants.

Group S inoculant should be used.

*Suited to deep, well drained soils.  
Roots need to be able to go down at least 50 to 80 cm.*

### **Serradella is -**

- Annual. (Self regeneration ability varies between species and cultivars).
- Low oestrogen.
- Not very tolerant of waterlogging (Yellow serradella has no tolerance, pink serradella tolerates short periods).

- Not well adapted to alkaline, clay or hard setting soils.

*Serradella will be damaged by normal broadleaf herbicides.*

*However, serradella will withstand heavy grazing in winter. This feature can be used to suppress competing weeds. Grazing pressure must be reduced during flowering to ensure good seed set and subsequent plant populations.*

### **Choice points for serradella species and cultivars -**

- The Tasmanian bred cultivar of pink serradella is Seratas<sup>Ⓛ</sup>.
- Early or late maturation.
- Upright or prostrate growth habits.
- Soft or hard seeds.

### **Seeding rate -**

4 to 8 kg/ha

## **Biserrula (*Biserrula pelecinus*)**

Biserrula is a legume species of the serradella type. That is, it has vetch like leaflets and is prostrate to erect with a spreading growth habit. Like serradella, it is a promising plant for deep, well drained, light textured soils that more productive species don't do well on. It is very hard seeded.

*Similar to serradella - see that section for more information.*

### **Biserrula differs from serradella in that it -**

- Tolerates a pH of between 5.2 and 8.0 so it is less “acid loving”.
- Has more rapid development than serradella.
- Shows less tolerance to insect problems.
- Requires a special biserrula inoculant.

### **Choice points for biserrula cultivars -**

- Time of maturity.
- Level of hard seededness.

### **Seeding rate -**

3 to 10 kg/ha



# Fodder crops

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## Fodder crop comparison table 1

Species	Turnips	Swedes	Leafy turnips eg <i>Pasja</i>	Fodder rape	Kale/ Chou moellier	Persian clover sub sp <i>Majus</i>
Attributes						
Typical time of sowing	Oct - Jan	Oct - Dec	Nov - Mar	Oct - Jan	Oct - Dec	Mar
Time of fodder supply	Jan - Jul	Mar - Aug	Dec - Jul	Feb - Jun	Mar - Aug	Jun - Feb
Potential tonnes DM/ha*	up to 12 t/ha	up to 20 t/ha	up to 10 t/ha	8-12 t/ha common	larger crop than rape	hay cut 3-5t/ha + regrowth
Typical energy MJME/kg DM*	13	13	12-14	12	12	9.5
Typical protein % CP	12%	12%	13%	14%	14%	20-25%
Growing conditions required	can be used as pioneer	moist summers	timely grazing	pre-sow weed control	wet, cool districts	needs excellent seedbed
Moisture requirements	tolerates sporadic rain	higher rainfall than turnips	requires consistent moisture	tolerates sporadic rain	high for high yields	irrigate for summer growth
Ease of establishment	easy	fair	easy	fair	fair	needs care
Issues for next crop or pasture	may breed up weed seeds	long time in the ground	quick rotation	may breed up weed seeds	large stems	increased soil nitrogen
Waterlogging tolerance	poor	poor	poor	poor	poor	excellent
Animal health issues	choking, nitrate, pulpy kidney	nitrate, pulpy kidney	nitrate, pulpy kidney	nitrate, rape scald, scours, pulpy kidney	nitrate, red water, pulpy kidney	bloat risk

\* DM. Dry Matter. Weighed with all moisture removed.

## Fodder crop comparison table 2

Species	Oats - as leaf forage	Wheat - dual purpose as leaf forage	Ryegrass - annual eg Tama	Ryegrass - short-lived eg Italian	Maize - mature forage	Millet - as leaf forage
Attributes						
Typical time of sowing	Feb-Mar	Feb - Mar	Mar	Mar - Apr	Oct - Nov	Oct - Nov
Time of fodder supply	6-8 weeks post sowing til lockup	June - Aug	6 weeks post sowing	6 weeks post sowing	Feb - May	Feb - Apr
Potential tonnes DM/ha*				less than annuals in 1st year	20 t/ha plus	1/2 maize in same conditions
Typical energy MJME/kg DM*	9.3	9.3	10.5	10.5	10 - 11	9.2
Typical protein % CP	10%	10%	15-18%	15-18%	8%	11.6%
Growing conditions required	tolerates cloddy seed beds	nitrogen for regrowth	reasonable seedbed prep	reasonable seedbed prep	warm and plenty of water	warm and plenty of water
Moisture requirements	needs early autumn moisture	needs early autumn moisture	needs early autumn moisture	needs early autumn moisture	usually irrigated	usually irrigated
Ease of establishment	very easy	very easy	easy	easy	specialist equipment	easy
Issues for next crop or pasture	good weed control possible	good weed control possible	good weed control possible	good weed control possible	herbicide residues?	ground available in autumn
Waterlogging tolerance	poor	fair	good	good	na	na
Animal health issues	nitrate	nitrate	nitrate	nitrate	none known	none known, no prussic acid

\* DM. Dry Matter. Weighed with all moisture removed.

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## **Brassica fodder crops (*Brassica spp.*)**

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There are many plants in the brassica family that are important in agriculture. These range from weeds such as wild radish to high value crops like canola and cabbage.

They are vigorous annuals, with large fleshy leaves and, sometimes, edible roots. Forage brassicas are valuable as a relatively easy to grow fodder crop to provide feed at times of the year when pasture grows poorly such as mid summer and winter.

Brassicas have very high digestibility and, typically, their crude protein levels are well balanced for livestock production (12 to 14 %). The production of such high quality feed, in periods of feed shortage, can be very beneficial for the timely turn off of livestock and maintaining animal growth rates. However, most assessments conclude that it will not be profitable to plough up a good pasture to put in a fodder crop. They should only be grown as part of normal pasture renovations or crop rotations.

Brassicas can be sown from September onwards providing moisture is available, but productive potential declines when planted after mid February. Species and cultivar choice is a significant factor in determining when the fodder will be available for use. This can be from early summer to late winter. Brassicas have small seeds. For a high yielding crop, a fine, firm seedbed with adequate moisture for germination, establishment and early growth, is necessary. Some brassicas can tolerate dry periods once established, but like any other crop, they will not be productive without moisture. Brassica fodder crops have poor tolerance to waterlogging.

Brassicas perform better on soils with a pH of more than 5.5. A low soil pH may have contributed to the failure of a previous pasture. If that is the case, an ideal time to incorporate lime into the soil will be before sowing a brassica fodder crop, so as to improve both the fodder crop and future pastures.

The yields of brassica forage crops vary enormously depending on the cultivar choice and paddock conditions. The level of fertiliser input needs to relate to the expected yield of the crop. Modern cultivars have much higher yields than traditional cultivars. Together with better moisture levels through irrigation or optimising planting times in spring, much higher yields can be achieved, providing there is adequate fertility.

There needs to be adequate nitrogen, phosphorus and potassium available so the growth of the crop is not restricted. Look to soil testing, paddock history and the anticipated yield of the crop when determining the level of fertiliser input. A low level of nitrogen can be applied at sowing. Higher rates can be applied a few weeks after germination. Use nitrogen early, rather than later, in

the growing season. Although good levels of nitrogen and some sulphur are part of growing a high yielding and high quality crop, animal health problems can occur if correct growing and feeding procedures are not followed. See feeding hazards section below.

Trace elements, molybdenum and boron, are critical. Brassicas are susceptible to cabbage white butterflies and diamond back moths. Red-legged earth mite and lucerne flea can be a threat at seedling stage. Slugs can decimate seedlings in direct drilled crops.

### Hazards when feeding brassicas to livestock

- Stock not used to eating brassicas need to be introduced slowly, over at least 10 days.
- A source of high fibre, alternative feed such as hay or a nearby pasture should be available to stock grazing brassicas. This alternative feed will greatly reduce risks from disorders such as nitrate poisoning, anaemia and iodine deficiency. A diet that consists only of brassicas can also result in scouring and lower growth rates.
- Iodine deficiency can occur in animals on a brassica only diet for a long period. Lower conception and birth rates in sheep and cattle; and lambs born with enlarged thyroid glands may result.
- Vaccinate stock for pulpy kidney before grazing brassicas.
- Tainting of milk has been associated with feeding brassicas to dairy cows. Grazing can be managed to avoid this.
- High intake of some species of brassicas, particularly when they are fast growing and immature, can induce a photosensitive reaction on the faces and ears of animals, particularly lambs. Commonly referred to as rape scald.
- Small bulbs present a choking hazard.

### Nitrate poisoning – causes

- Brassica crops that are flowering. Also a cause of anaemia associated with S-methyl cysteine sulphoxide (SMCO).
- Grazing immature crops of some species of brassicas. Recent applications of nitrogen increase this risk.
- Crops that have grown slowly, particularly under dry conditions or overcast and rainy conditions or other stress, can accumulate excess nitrogen. Recent applications of nitrogen increase this risk further.
- A deficiency of molybdenum can restrict nitrate metabolism in brassicas and increase the risk of nitrate poisoning.

If unsure of nitrate levels, then get the feed tested. Grass or cereal fodder crops also need to be managed to avoid the risk of nitrate poisoning.

## **Turnips (*Brassica rapa var. rapa*)**

---

Turnips produce both leaves and bulbs. The bulbs will store nutrients in the paddock much longer than non-bulb fodder crops. This allows greater flexibility in grazing times. Many varieties are suited to grazing of the leaves first and the bulbs at a later time.

Turnips are adaptable to a range of soils. They have often been used as a pioneer crop in virgin soils and on rough seedbeds. However, for a high yielding crop, a fine, firm seedbed with adequate moisture for germination, establishment and early growth, is necessary. They can also be direct drilled providing the soil is reasonably friable.

Turnips can be sown from late September to mid summer. They have no ripening requirement so can be grazed quite early (January) but with different management and/or cultivar choices turnips can be kept through to late winter. They are often established with rainfall in mid spring, survive dry periods and grow again in response to rain later in the season. However, like every other crop, they will not grow in summer without moisture.

*Stock must have sound teeth to properly utilise brassica bulbs. Old ewes and young stock getting their permanent incisors may have problems.*

*Dense sowings will increase early growth and leaf to bulb ratio while reducing bulb size.*

### **Turnips are -**

- Flexible in terms of grazing time.
- Tolerant of dry periods during establishment and growth.
- Highly variable in yield.
- Susceptible to red-legged earth mites as seedlings.
- A choking risk, particularly with small bulbs.

*Seeding rates vary from half a kg/ha when good bulb production is the goal to as high as two kg/ha when rapid early growth and a high leaf ratio is desired.*

### **Choice points for selecting turnip cultivars -**

- Grazing characteristics of the bulbs. Some varieties have bulbs that store well in the paddock because they sit low in the ground. This also makes it difficult for the stock to pull the bulbs so the tops can be grazed and

the bulbs left for use later. The bulbs of other cultivars are easily pulled to provide a quick fodder crop with good utilisation from a one off grazing. The paddock is then available for re-sowing earlier.

- Regrowth of the leaves from the bulb, after grazing, varies between cultivars.
- The ratio of leaf to bulb varies.
- Cultivars vary in their tolerance to lower fertility soils. Some new cultivars need better attention to fertiliser requirements, including nitrogen, than some of the traditional cultivars, in order to achieve their higher productive potential.
- Early, mid and late maturing cultivars. The early cultivars are ready for grazing in 8 to 12 weeks.

### **Seeding rate -**

0.5 to 2.0 kg/ha

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## **Swedes (*Brassica napus ssp. napobrassica*)**

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Swedes produce bulbs like turnips. They are slow maturing and have traditionally been associated with cooler, higher rainfall areas. Swedes need plenty of moisture to express their potential.

Swedes are usually sown in mid to late spring and grow through summer. The cost of seed can be high. The bulbs keep well in the ground to provide feed during winter. Cultivars vary in the time they take to reach maturity but 20 weeks is typical.

Turnips are generally found to be more productive than swedes, although given time to mature, swede crops have produced up to 20 tonnes per hectare. Their nutritive value is high. Stock must have sound teeth to properly utilise brassica bulbs. Old ewes and young stock getting their permanent incisors may have problems.

*Good winter feed - bulbs keep well in the ground.*

### **Swedes are -**

- Slow maturing.
- Very palatable and nutritious.
- Tolerant of cold.
- Not very tolerant of waterlogging.
- Susceptible to deficiencies of molybdenum and boron.

*For maximum keeping of bulbs into winter, manage the grazing of leaves so as to avoid damaging the tops of the bulbs. Damaged bulbs are more likely to rot in the ground.*

### **Choice points for swede cultivars -**

- Time to maturity.
- Planned time of grazing.
- Keeping quality of the bulbs.
- Potential yields differ between cultivars.
- Disease and aphid resistance. Disease resistance is more critical if planting a second crop in the same ground.

### **Seeding rate -**

0.8 to 2 kg/ha



## Leafy turnips (Turnip x chinese cabbage etc) eg Cultivar *Pasja*

Brassica hybrids of this type are described as 'non-bulb producing, leafy turnips'. *Pasja* and hybrids like it are often called turnip-rape, but are not in fact crossed with rape. Rather, they are crossed with asiatic vegetables like chinese cabbage or pak choy. There are crosses with rape and other brassicas available but cultivar *Pasja*, at the time of writing, is very prominent in Tasmania and will be the focus of the notes provided here.

While it may be sown from spring to early autumn, growing *Pasja* during spring may have limited benefits. *Pasja* matures quickly and its palatability is reduced if left un-grazed. It needs to be fed off as soon as it is ready. If this is the end of spring, there is likely to be plenty of other feed available.

Unless there is a particular feed gap at this time, consider planting alternative brassicas that can be held longer until there is a feed gap that needs to be filled. Planted in late spring, summer or early autumn in wetter areas or under irrigation, *Pasja* provides a good bulk of feed quickly, re-grows following grazing better than other brassicas and has good cold tolerance, so is capable of providing feed into winter.

*Pasja* can be eaten off at any time during its growth, but will become very unpalatable if held beyond its time of maturity. Good production levels are attained at 10 to 12 weeks. If grazed at 6 to 8 weeks after sowing, maximum palatability and regrowth are attained.

*Must be utilised when ready - forage cannot be held in reserve.*

### ***Pasja* is -**

- A vigorous seedling and fast growing.
- Capable of good regrowth after being grazed.
- More tolerant to insect pests than other brassicas.
- Susceptible to drought.
- Able to be grazed at any time up to maturity.

*For successful regrowth, grazing of *Pasja* must be quick and controlled so as not cause to the crowns to be eaten off. While the crowns are quite low and as such have some defence against being eaten, there are reports of livestock showing preference for the crown over the leaf.*

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### **Choice points for leafy-turnip cultivars -**

- These hybrids are marketed by their cultivar name so it is necessary to refer to the breeders and other information about the specific cultivar. The above information is based on experience with the well known cultivar *Pasja*. Seek information about alternative hybrids and cultivars if other characteristics are required.

### **Seeding rate -**

3 to 5 kg/ha

## **Rape - fodder (*Brassica napus var. napus*)**

Fodder rape produces only leaves and stems, not bulbs. It is commonly used for lamb finishing in summer. However, by selecting the correct cultivar (i.e. for frost resistance) and time of sowing, rape is also an option for improving the supply of quality autumn and winter feed. It is also suited to cattle.

Rape can make effective use of irrigation. It has a deep taproot. Recovery from grazing is variable, depending on cultivar, soil moisture, fertility and grazing system. Compared to bulb producing crops (turnips or swedes) rape is not good for carrying forage over as the leaves deteriorate if left un-grazed.

Sow October to January and start grazing when the recommended maturity has been reached. With most cultivars, the majority of the feed is available for grazing at 12 to 16 weeks after germination. Some cultivars are faster maturing.

*Grazing before maturity is an animal health risk.\**

### **Fodder rape is -**

- A leaf only forage crop, no bulb.
- More tolerant of low fertility than some other fodder crops.
- Sensitive to molybdenum and boron deficiency.
- Not usually affected by diseases, some cultivars very susceptible to aphids.
- Very susceptible to cabbage white butterfly and diamond back moth.

*It is dangerous to use nitrogen on kales or rape that have not been fertilised with molybdenum, as an excessive amount of nitrogen can accumulate in the plant and result in nitrate poisoning of livestock.*

### **Choice points for fodder rape cultivars -**

- Suitability for late or early sowing.
- Time to maturity.
- Cold season regrowth.
- Hardiness, vigour and resistance to cabbage aphid.
- Forage quality and palatability.

### **Seeding rate -**

2.5 to 5 kg/ha

\* See "Hazards of feeding brassicas to livestock" on the brassica overview page.

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## **Kale (Chou moellier) (*Brassica oleracea*)**

Kale is a large, slow maturing, leaf based forage crop that needs to be sown in mid-spring to early summer to provide feed from autumn through to late winter. Kale matures at 18 to 26 weeks. However, it has no ripening requirement and can be fed at any time before flowering. Grazing flowering crops is an animal health risk.

Kale is described as a gross feeder, requiring good fertility and moisture levels to succeed as a crop. Kale is very susceptible to deficiencies of molybdenum and boron.

*Slow maturing. Suited to providing winter feed.*

### **Kale is -**

- Best suited to high rainfall areas.
- Tolerant of dry periods.
- Tolerant of cold conditions.
- Very high yielding for late autumn/winter feed.
- Intolerant of waterlogging.
- Resistant to diseases.
- Sensitive to the cabbage white moth and diamond back moth.

*There may be problems with the re-use of the paddocks as the large stems are not readily grazed because they are low in protein and less palatable than the leaves. The length of stem remaining can usually be reduced through strip grazing the crop. Increasing the sowing rate can reduce the stem size and make them more palatable.*

### **Choice points for kale cultivars -**

- Cultivars are differentiated as either short, intermediate or tall. These types have varying characteristics including the characteristics of the stems. Shorter, “marrow stem” types are more attractive to livestock and more suitable for sheep, while the taller, higher producing “giant” types have less palatable stems and are more suited to cattle grazing.
- Cultivars vary in their time of flowering.

### **Seeding rate -**

3 to 5 kg/ha

## **Cereals for fodder production – overview**

Cereals are one of the most versatile crops, having the potential to be a cash crop and a forage crop.

Cereals such as wheat and oats can not only provide grain, but can be grazed through their growing season to provide additional green forage for livestock.

Barley is mainly grown for grain and generally not used as a fodder crop.

Triticale, a cross between rye and wheat was developed as a feed grain alternative to wheat, with some dual-purpose varieties available.

Forage cereal varieties can be grazed when the plants have reached tillering stage (multiple shoots produced). This usually occurs at 6 to 8 weeks after emergence depending on variety and growing conditions.

Grazing should be stopped before the growing point is removed by stock, otherwise the hay or grain yield can be severely reduced.

Grazed cereals will require more fertiliser than a grain only crop.

The major animal health issue with grazing cereals is nitrate toxicity. This can arise in green cereals from excessive nitrogen application, drought or frost. Nitrate toxicity can also occur in hay that is baled when it is too wet so that it heats up or becomes rotten.

### **To help prevent nitrate poisoning -**

- Supply a source of roughage.
- Allow for 7 to 14 days after a frost or prolonged dry spell before grazing.
- Get feed tested for nitrate concentration.

Set stocking or rotational grazing can be used.

Rotational grazing can extend the life of the crop as well as allow the crop to withstand high stocking densities. However set stocking will achieve a higher animal performance provided stocking rate is balanced with crop growth. Stock will choose the best feed on offer with set stocking, however trampling and wastage will occur.

Other grazing options include strip grazing and sowing more than one forage cereal crop, so that a rotation can be set up between crops.

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## **Points to consider when choosing different cultivars/varieties for forage -**

- Dual purpose cultivars should be considered where growers want the benefit of a forage crop, as well as the cash or feed grain crop.
- When selecting wheat, barley or triticale cultivars for forage, whether as a grazing crop or for hay or silage, varieties with awns should be avoided as they can cause mouth injuries.
- Plant height is a consideration when grazing. Prostrate oat cultivars are better suited to grazing, due to slower earlier growth and good recovery. The more erect oat cultivars are better suited to grazing by cattle.
- Determine when the feed is required and choose a cultivar to suit.

Additional cultivar advice can be found for oats and wheat on the following pages.

See cash crop pages for information on grain production.

## ***Wheat (Triticum aestivum)***

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Winter wheats are the most suited to grazing due to a longer vegetative growth stage than spring wheats. Spring wheat can have limited grazing if sown early, but take care not to damage the growing point.

Both winter and spring wheats can be affected by leaf rust, *Septoria nodorum*, smut, stripe rust, powdery mildew and sometimes by BYDV and scald.

### **When grazing wheat -**

Consider splitting nitrogen applications to help aid recovery after grazing. Apply at sowing and post grazing.

Add a source of roughage to help prevent scouring and extend the grazing life of the crop.

### **Seeding rate -**

90-120 kg/ha. Use higher rates when grazing.

See cash crop pages for further information on grain production from wheat.

## **Oats (*Avena sativa*)**

Oats are the most commonly grown dual-purpose cereal crop in Tasmania. They can provide a large quantity of dry matter for grazing in autumn/winter as well as a grain, hay or silage crop. Good grazing material can be available at around 8 to 10 weeks after sowing. Autumn sown oats (February to May) can be dual-purpose crops (grazing and grain) due to the longer growing season, which allows the crop to recover sufficiently. They can also be used for hay or silage instead of feed grain, which is particularly beneficial if the crop has suffered frost damage. Spring (August to early October) sown cereals will only be able to be used for one purpose, either forage or grain production.

*For optimum grain and grazing potential sow in early autumn.*

### **Oats are -**

- Able to provide a bulk of feed quickly.
- Sometimes sown in spring, but spring sown crops are only single purpose, grazing or grain.
- More affected by waterlogging than short term ryegrasses.
- Can be a cover crop in areas where wind erosion is a problem or used as a green manure crop.

*As for any cereal crop to be grazed - always check the height of the growing point. Stop grazing before the growing point is removed.*

### **Seeding rate -**

100 – 150 kg/ha

See cash crop pages for further information on grain production from oats.

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## **Annual and short-lived ryegrasses** **(*Lolium multiflorum*)**

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See the grasses section of this book for more information to separate out the differences between species and types of ryegrasses. Annual and short-lived ryegrasses are being used increasingly as a replacement for brassicas to fill winter feed gaps and where there is irrigation, for summer feed. They have significantly less problems with insect pests than brassicas.

They are less tolerant of poor seedbeds than oats and are not usually as productive as oats during early winter, but have better recovery from grazing and are more productive in spring. They are more tolerant of wet soils than oats and produce better silage and hay. Annual and short term ryegrasses establish quickly and respond well to nitrogen. While they are capable of causing nitrate poisoning, most annual and short-lived ryegrass cultivars do not cause ryegrass staggers.

As part of a cropping rotation, these grasses are effective in protecting soil from erosion, providing a disease break, aiding weed control, rebuilding soil organic matter levels and generating income by providing high quality feed to finish livestock. Annual ryegrasses must be sown in early/mid autumn (providing there is irrigation or early rain) to ensure maximum productivity in a single growing season. Generally, annuals will not persist beyond the end of spring in the first year. Production and persistence of short-lived ryegrasses is dependent upon soil fertility, particularly nitrogen, adequate soil moisture, grazing or cutting to control seed set and reduced summer grazing intensity. Productivity declines over time and DPIWE research shows no animal production advantage from using short-lived species, rather than perennial species, if the intention is to maintain the pasture for two years or longer.

*Don't plant these vigorous, short term grasses  
with long term pastures.*

### **Annual and short-lived ryegrasses are -**

- Not perennial and thus more akin to a forage crop.
- Not at all drought tolerant.
- Less affected by insect pests than brassicas.
- Better than oats in some ways and not so good in others.
- Capable of causing nitrate poisoning, but most cultivars not staggers risk.

*Annual and short-lived ryegrasses have very vigorous seedlings capable of imposing severe competitive pressure on companion perennial grasses and legumes. It is therefore recommended not to include these cultivars in a perennial pasture mix.*



## Choice points for selecting annual or short-lived ryegrass cultivars -

- There are a wide range of cultivars available. Some aspects of the cultivars on offer are explained below. More detail on types of ryegrass can be found in the grasses section.
- Make sure you want an annual or short-lived forage type ryegrass, not a perennial.
- Annual types are productive for at most one year, short-lived 2 to 4 years.
- Annuals types usually have larger seeds and establish quicker than short-lived types.
- Ryegrasses are normally diploid (2 sets of chromosomes). Diploids generally have finer leaves, produce a more dense sward and are more tolerant of harder, closer grazing than tetraploids.
- Tetraploid, means it has four sets of chromosomes. These plants have much larger seeds, (2 to 3 times heavier), their tillers are larger and fewer. They have improved palatability and stock intake because they have larger cells with a higher soluble carbohydrate (sugar) content compared to diploid cultivars.
- Diploids are regarded as being more persistent because of their growth habit, but recent research has demonstrated greater persistence of a tetraploid over its diploid parent.

## Seeding rates -

Vary from 15 kg/ha for diploid annual or short-lived species alone to 25 or 30 kg/ha for some of the tetraploid annuals (very large seeds).

## Pasture legumes as forage crops

### Persian clover

(*Trifolium resupinatum* – sub species *majus*)

Providing it is established early in autumn, Persian clover can provide high quality forage for winter and spring and with irrigation or good summer rainfall will continue producing into summer. Can be used in a mix with oats or short term grasses.

There are two Persian clover sub species available. Sub species *majus* is the best choice for an annual forage crop.

**Arrotas**<sup>Ⓛ</sup> arrowleaf clover is an ideal spring and summer forage crop.

**Lucerne** is a perennial forage crop suited to grazing and conservation.

See legume section for more options and information.

## **Maize (*Zea mays*)**

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Maize is widely used for grain and forage production throughout the world. In Tasmania it is sometimes used for forage and silage. It is frost sensitive and needs warm weather to grow.

A soil temperature of 13° C is required for satisfactory germination and seedling vigour. Therefore, it can't be sown before mid to late spring.

Crops can be grown without irrigation in favourable areas, but as maize is grown at the driest time of year and is expensive to grow, the risks would be high.

It is fast growing and has a high demand for nutrients and water. Irrigated maize is capable of growing in excess of 20 tonnes/ha dry matter of high-energy forage in four to five months.

Specialist machinery is usually needed to plant and harvest maize. Strip grazing has been used for harvesting, but it is not a popular practice. Maize ensiles well or can be fed fresh as green chop.

Weed control is essential and expensive. Residual herbicides may delay planting the next crop or pasture.

*Fresh forage from maize is only available during a limited period.*

### **Maize is -**

- Fast growing.
- High energy (10 to 11 mj/kg DM), low protein (7%).
- Suited as a supplement to grass/legume pasture as quality pasture usually has good protein levels.
- Able to have its protein level increased by the addition of urea (with care) at ensiling.
- Frost sensitive
- Expected to suffer yield losses if harvested other than at its time of maturity.
- Nearly 50% grain if harvested when mature.

*For maximum yields of silage, maize should be harvested when it has reached physiological maturity. i.e the kernels are fully dented. At this point dry matter content should be up to 35 %.*

*Not only will yield be lost if harvested earlier, but nutrients will be lost through seepage. If harvested too dry, field losses and compaction problems occur. At 35% dry matter, maize must be finely chopped for successful ensiling.*

### **Choice points for selecting maize cultivars -**

- Days to maturity. Select cultivars which can reach maturity with the heat units available in your district between spring and autumn frosts.
- Cultivars are now available which are claimed to have some frost resistance and to be better suited to cool climates like Tasmania's.

### **Seeding rate -**

Calculated as plants per hectare.

Depends on row spacing, cultivar, time to maturity and growing conditions.

Obtain information from the seed company.

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## **Millet - Japanese (*Echinochloa utilis*)**

---

Millet is a fast growing, warm season, annual grass crop that has a high demand for nutrients. It can provide quality, leafy forage in early to mid summer and with irrigation regrow to supply feed later in summer.

Millet needs a higher soil temperature than maize to germinate (15° C) but is simpler to establish in as much as it can be drilled or broadcast and doesn't need specialist equipment.

Unlike forage sorghum, millet poses no prussic acid risk to livestock and it has better feed value. It can be used for grazing, silage or hay. Tasmanian research results show millet to have yields that are generally less than 50% of maize.

*Unlike maize, millet doesn't need specialist equipment and is easy to graze.*

### **Millet is -**

- A warm season crop.
- Dependent on summer rainfall or irrigation.
- Very responsive to repeat applications of nitrogen.
- Not at all tolerant of frost.
- Palatable to sheep and cattle.
- Not commonly used in Tasmania.
- Slow to dry for hay and should be conditioned.

*Millet must be regularly grazed or harvested to prevent it running to seed.*

### **Choice points when selecting a millet cultivar -**

- *Echinochloa* or Japanese millet should not be confused with *Pennisetum* millet. The latter is a tropical species and not suitable for Tasmanian conditions.

### **Seeding rate -**

20 to 25 kg/ha for irrigated crops.

# Cash crops

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## Cash crop comparison table - cereals

Species	Barley ( <i>Hordeum vulgare</i> )	Oats ( <i>Avena sativa</i> )	Triticale (Triticum x Secale)	Wheat ( <i>Triticum aestivum</i> ) winter wheats	Wheat ( <i>Triticum tivum</i> ) springwheats**
Attribute					
Length of life	annual	annual	annual	annual	annual
Recovery from grazing	no	5	no	4	no
Hay/chaff suitability	1	3	1	1	1
Grain production after grazing (Dual Purpose)	no grazing	good	varies	good	limited grazing
Minimum Rainfall (mm)	300	300	300	300	300
Sowing times	April to August (in some cases spring)	Spring extending to autumn	May to June	February to June (depends on purpose)	May to July
Sowing rates (kg/ha)*	70-130	90-130	100-150	90 -120	100-120
				Use higher sowing rate for grazing or late sowing	
Fungicide seed treatment recommended	yes	no	yes	yes	yes
Maturity-autumn sown	Dec - Jan	Nov - Dec	Jan	Dec - Jan	Dec - Jan
Maturity-spring sown	Feb - Apr	Feb - Apr	N/A	N/A	Dec - Jan
Potential yield response to Irrigation***	5	4	3	4	4
Waterlogging tolerance	1	1	3	2	2
Acid soil tolerance	1	2	3	2	2
Salinity tolerance	2	1	1	1	1
Frost tolerance	3	3	1	2	2

\* Low sowing rates refer to early sowing and good soil and fertility, high sowing rate refer to late sowing and poorer soil and fertility

\*\* The following cultivars are considered to be spring wheat varieties in Tasmania (Kellelac, Wedgetail<sup>(1)</sup>, Chara<sup>(1)</sup>, Rosella and Maroombi)

\*\*\* There will be a response, but it may or may not be economical.

Key -

1 - poor	2 - fair	3 - good	4 - very good	5 - excellent
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## **Cereals - overview**

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Cereals are one of the most widely grown crops in the world, providing grain for human and stock consumption.

High yielding cereals can be a good cash crop for growers, but good planning and crop management is required. Cereals are useful in a cropping rotation as a “clean up crop”, because of the use of selective herbicides to control broadleaf weeds.

There are a number of insect pests (red-legged earth mite, armyworms and aphids) and diseases (rust, scald, etc) that can affect cereals in Tasmania. Monitoring of crops from emergence to harvest is important for early detection and control of pests and diseases. Use pulses, pasture legumes or oilseeds to help lengthen the rotation and reduce the incidence of carry-over of disease.

For guaranteed high quality seed, buy certified seed each year. Even if not buying certified seed, always ask for a statement of seed analysis before purchase. This will help to avoid problems with weed contamination and ensure a good germination percentage, which can be used to determine sowing rate and target population density.

Remember, it is a lot cheaper to clean the seed, than to re-sow a paddock or spend time and money controlling weeds.

Testing is also recommended for homegrown seed, but send the sample at least 3 or 4 weeks before sowing. To ensure yield potential is maintained, buy fresh seed every second year to avoid any problems associated with genetic deterioration. To help maintain seed quality store in a cool, dry area.

Frost at flowering causes seed abortion, so it is advisable to select a sowing time to try to avoid flowering during high risk periods. Avoid areas that are particularly frost prone (eg. valleys, river flats etc). If frosts are unavoidable, then the two most tolerant cereals to use are oats and barley. Late maturing, awnless cultivars are preferable. Alternatively, risk can be reduced by using a combination of cultivars of differing maturity or by staggering sowing times. Water stress before head emergence should also be avoided, to prevent pinched, small grains.

Sowing depth for cereal seed should be 25-40mm to ensure even germination and vigorous seedlings. Depth will be dependent on moisture and soil type. Generally for clay soils, sow at a shallower depth (ie 25-30mm) than for sandy soils (ie 30-40mm).

Sowing rates should be lower for earlier sowings and higher for later sowings, because early sowing times give the crop a longer growing season



in which to produce more tillers. With early sowings, at a high sowing rate, the plants become too dense leading to a reduction in grain size and an increased incidence of disease. If sowing in spring use higher sowing rates to compensate for the reduced tillering potential of the crop.

### **Points to consider when choosing different cultivars -**

While your local agronomist can provide advice on which cultivars are available, always seek information on how they may perform in your local area. This can be through your local farmer discussion group, through local trial results (eg. TIAR, Southern Farming Systems) or chatting to your next door neighbour. Try to choose a cultivar that has had at least two years evaluation in Tasmania, so disease and yield claims can be validated. Ask your seed dealer for a product description (eg. maturity, disease resistance, grazing suitability etc).

Before choosing a cultivar consider what you want it for. Is it for on farm seed production, hay, silage, feed grain market, forage crop or as a dual purpose crop for grain and grazing purposes?

Many of the cultivars are bred on the mainland. There are some Tasmanian bred cultivars (eg. Franklin<sup>Ⓛ</sup> Barley, Targa<sup>Ⓛ</sup> Oats), but with the climatic differences between regions in Tasmania, always check whether they will be suited to your particular situation.

Disease tolerant cultivars provide a useful tool in preventing disease. They will generally be more expensive than other varieties, but time and money will be saved in the long run through a reduction in spraying and lost yield potential.

The majority of wheat cultivars available in Tasmania are for feed grain production, with only one cultivar used for bread making. Contracts for bread production are quite limited in Tasmania.

Where frost is an issue at flowering, growers should choose a cultivar with a strong winter habit. They can be sown early, as head initiation requires a period of cold temperature (vernalisation). Once these requirements have been met, head emergence begins as warmer temperatures and increasing day length occurs. The degree of winter habit will depend on the genetics of the cultivars. Cultivars described as semi winter types need a shorter cold temperature exposure to initiate heading.

Choose the maturity that best suits your growing season. Early maturing cultivars have vigorous early growth and suit a short growing season. The benefit of early maturing cultivars is that they can be sown late in the season if soil conditions have been unsuitable. Generally early maturing cultivars do not have a winter habit.

Late maturing cultivars can take advantage of a long growing season, but

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have slow initial growth. The benefit of late maturing cultivars is that they can be sown in late summer/early autumn without the risk of running to head too early, while early maturing cultivars risk this if sown before April (especially if they are not grazed). Late maturing types can have a winter habit. Those without a winter habit and also sown early, initiate heads quickly and will need to be grazed before tillering to retard early growth and head emergence. Late maturing types suit areas where there is good residual soil moisture into summer and temperatures do not exceed 18°C at flowering.

There are also mid season cultivars that have slower early growth than early maturing varieties, but have less chance of running to head if sown early.

If waterlogging is an issue, then an early maturing cultivar sown in spring is an option to consider.

When choosing a cultivar for making hay, make sure the maturity coincides with the preferred time of cutting. Make sure that it is an awnless variety, especially if the hay is for livestock and that it is not prone to lodging.

Sowing a malting barley cultivar cannot guarantee that it will be accepted as the protein and quality will depend on management and the weather.

## **Barley (*Hordeum vulgare*)**

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Barley is mainly produced for feed grain in Tasmania, the majority used in the dairy and feedlot industry. If protein levels are suitable it may be used to produce malt for beer production.

- If aiming for a malting barley crop, apply nitrogen at sowing only. If aiming for grain, nitrogen can be applied at a later growth stage, as this will increase protein levels.
- Where crop lodging is an issue, application of a registered growth regulator may help.
- In low rainfall areas, sow from April to June. Where frosts at flowering are an issue, sow in May or June.
- Can be sown in July-August, if ground is well-drained and until the end of September on waterlogged sites.
- Irrigation can substantially increase barley yields, especially in spring-sown crops.

***Never sow barley after barley in the same paddock!!***

Barley is not tolerant of waterlogging or low pH (less than 5.6). Diseases such as leaf rust and scald need to be kept under control by crop rotation, seed treatment, foliar sprays and elimination of volunteer host plants. For control of Barley Yellow Dwarf Virus (BYDV), use resistant varieties.

Barley is susceptible to damage by the Southern Armyworm, which can attack in the warmer months as the crop reaches maturity.

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## **Oats (*Avena sativa*)**

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Oats are the most commonly grown dual-purpose cereal crop in Tasmania. They can provide a large quantity of dry matter for grazing (provided moisture is adequate) in autumn/winter as well as a grain or hay crop. Good grazing material can be available at around 8 to 10 weeks after sowing.

Oats are tolerant of most soil types, but will perform poorly on waterlogged soils. Generally, oats are more tolerant of disease than other cereals. However, watch out for smut (dark spores on heads) and root diseases that could affect yields.

Autumn sown oats (February to May) can be dual purpose crops (grazing and grain) due to longer growing season which allows the crop to recover sufficiently.

Spring (August to early October) sown cereals will only be able to be used for one purpose, either grazing, hay, silage or grain production.

*For optimum grain and grazing potential sow in early autumn.*

### **Oats are -**

- More frost tolerant than other cereals.
- Generally more tolerant of disease than other cereals.
- Not well suited to waterlogged soils.
- Spring sown oats are single purpose crops only.

## ***Triticale (Triticum x Secale)***

---

Triticale, was developed as a cross between wheat and rye as an alternative feed grain to wheat.

- It is not suited to grazing\*.
- It is more tolerant of acid soils, waterlogging and low fertility than other cereals.
- Sow anytime from May to June for optimum yields, but can be sown until late August.
- It is more resistant to disease than wheat.

*Do not sow in areas prone to frost when the crop is flowering.*

As with all cereals, watch out for root diseases. Leaf rust has been found on triticale in recent years, so monitoring for any signs is a must.

\* Dual purpose triticale varieties have recently become available.

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## **Wheat ( *Triticum aestivum* )**

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Wheats can be divided into two categories; spring and winter wheats. Winter wheats require a period of vernalisation (i.e. chilling) in order to initiate flowering, whilst spring wheats require no vernalisation.

Winter wheats tend to have a longer vegetative growth stage, which allows not only for sowing time flexibility, but provides growers the opportunity to graze without detrimentally affecting the final grain yield.

Spring wheat can have limited grazing if sown early. There are awnless varieties now available that can be cut for hay or silage.

Both winter and spring wheats can be affected by leaf rust, *Septoria tritici* & *S. nodorum*, smut, stripe rust and sometimes by BYDV.

Wheat is slightly more tolerant of acid soils and waterlogging than barley.

*Where crop lodging is an issue, application of a registered growth regulator may help.*

### **When growing wheat -**

- Best yields are achieved when pH is above 5.6.
- Never sow wheat after wheat in the same paddock.
- Sow disease resistant varieties.
- Sow dual-purpose winter wheats early, from February to April, for a grazing/grain production crop.
- For grain only, sow winter wheats anytime from February to July.
- In areas subject to late spring frosts, delay sowing of winter wheats until June.
- Spring wheats can be sown from April to June. However sowing later in autumn can help to avoid frost damage at ear emergence.

## Cash crop comparison table - legumes

Species	Chickpeas ( <i>Cicer arietinum</i> )	Field Peas ( <i>Pisum sativum</i> ) (Incl. blue, maple & marrowfat peas)	Faba Beans ( <i>Vicia faba</i> )	Lentils ( <i>Lens culinaris</i> )	Lupins - Albus broad leaf ( <i>Lupinus albus</i> ) Incl. Lupini beans	Lupins narrow leaf ( <i>Lupinus angustifolius</i> )
Attribute						
Length of life	annual	annual	annual	annual	annual	annual
Minimum rainfall	400	350	400mm	400mm	350	300mm
Optimal sowing times	spring	winter-spring	autumn	spring (mostly)	autumn	autumn
Sowing rates (kg/ha)*	200-300	150-225	200-250	70-125	150-200 (Albus) 300-350 (Lupini)	100-125
Seed dressing recommended	yes	yes	no	yes	yes	yes
Seed inoculum	Group N	Group E	Group F	Group F	Group G	Group G
Harvest time	Feb - Mar	Jan	Jan	Jan	Feb - Mar	Jan
Waterlogging tolerance	1	2	3	1	1	2
Salinity tolerance	1	1	1	1	1	1
Frost tolerance	1	1	3	1	2	2
Tolerance to pH < 5	1	1	1	1	2	3
Pest resistance	1	3	3	1	2	3
Disease resistance	3	2	1	3	2	2
Animal health issues (eg. when grazing stubble)	no	no	no	no	Lupinosis	Lupinosis

\* Low sowing rates refer to early sowing and good soil and fertility, high sowing rate refer to late sowing, poor soil and fertility (large variation due to differences in seed size).

Key -

1 - poor	2 - fair	3 - good	4 - very good	5 - excellent
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## **Grain legumes - overview**

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Pulses or grain legumes play a valuable role in crop rotations through fixation of nitrogen and acting as a break crop for disease and weed management.

As a result of research by TIAR, a number of grain legume varieties have been introduced into Tasmania. Peas and albus lupins are the most widely grown of the grain legumes. Other grain legumes sown in Tasmania include, narrow leaf lupins, chickpeas, faba beans and lentils.

### **Tips for growing pulse crops -**

- Choose paddocks wisely to avoid waterlogging and low pH soils.
- Raised beds are preferred as it reduces the risk of crop damage through waterlogging.
- Where autumn sowing is recommended, sow early to give the crop time to establish a reasonable root system, before it gets too cold.
- Make sure the seed is inoculated properly with the appropriate rhizobia, and the seed is free from disease (always ask for a Statement of Seed Analysis).
- Use fungicidal seed dressings where appropriate being sure not to choose those harmful to rhizobia.
- Make sure that broadleaf weed control starts in the paddock the year before as herbicide options are generally limited.
- Ensure there is a market in place or contracts available.

Pulse crops can be a high risk venture, but if managed well can be profitable as well as beneficial to your long term cropping rotation.

When trying a new crop, talk to current grain legume growers and then start with a small area first to gain experience. Agribusiness will be able to provide advice as well as seed.

### **Points to consider when choosing a grain legume cultivar -**

The bottom line when choosing grain legume cultivars is knowing the market requirements.

For higher value grain legumes, grain quality is often critical. To achieve premium prices cultivars producing higher quality grain should be selected.

In nearly all grain legumes used for human consumption, a large seed size is important. Some varieties produce larger seed than others eg. Lupini beans (Supa lupe); Chickpeas (Bumper<sup>(b)</sup>); Marrowfat peas (Midichi).



Colour is another factor. Midichi, a marrowfat pea variety, has been selected for bleach tolerance (ie. a bluer colour compared with other varieties).

For grain produced for general stock feed markets, grain quality is not so important. The grower should concentrate on maximising yield. Some cultivars have a high yield potential. This may be a function of better disease resistance (eg. Farah<sup>Ⓛ</sup> Faba beans (*Ascochyta* spp), less pod shattering (eg. Kasper<sup>Ⓛ</sup> field peas) or better adaptation (eg. Jindalee<sup>Ⓛ</sup> narrow leaf lupins).

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## **Chickpeas (*Cicer arietinum*)**

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Chickpeas are a high value crop used entirely for human consumption.

- Only use local Tasmanian seed, which is free of the disease Ascochyta. Also watch out for Grey Mould (*Botrytis cinera*).
- Control broad-leafed weeds as they can greatly reduce yields. Use a pre-emergent herbicide.
- Sow in spring up to 5cm deep.

***Use clean seed and treat with an appropriate fungicidal seed dressing.***

Chickpeas are not tolerant of waterlogging or acid soils. Chickpeas prefer well-drained clay loams. They are best grown on the better, deeper wheat growing soils with higher water holding capacity. Chickpeas do not grow well with cooler temperatures. To ensure a good seed set, planting should be delayed until spring.

## Field peas (*Pisum sativum*)

Field peas can be used for both stock feed and human consumption. Peas do not tolerate grazing, but can be a useful source of protein when used in a conserved forage mix (eg. silage or hay). There are four main types of peas grown in Tasmania; maple, marrowfat, blue and dun peas. Maple and dun peas are grown for stockfeed, marrowfat and blue peas for human consumption.

- pH needs to be above 5.5.
- Peas are very prone to frost damage at flowering and early pod-filling.
- Sow up to 5cm in depth.
- Irrigation will ensure good yields for marrowfat peas.

*Leave at least 2 years between pea crops in the same paddock to minimise disease.*

Avoid autumn sowing in areas prone to frost at flowering, by sowing in late winter or spring. In the south-east of Tasmania, peas are commonly sown in late autumn.

Peas require a well-drained seedbed that does not suffer from crusting. Peas can be grown on a wide range of soil types. They will tolerate heavy soils, but not acid soils. Stony soils should be avoided due to the damage it can cause to pea harvesters. They can be grown on sandy soils, but care must be taken to reduce erosion (e.g. stubble retention).

Peas are prone to powdery mildew so spraying or sowing resistant varieties is advisable.

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## **Faba beans ( *Vicia faba* )**

---

Faba beans are a low value crop grown for local stock feed.

Timely disease control will most likely make the difference between a good and a bad crop. Watch for Ascochyta and Chocolate spot and spray when necessary. Generally two or three applications will be necessary.

- Ensure that levels of phosphorus and potassium are optimum.
- Sow early in autumn to ensure adequate growth before the chances of waterlogging and growth retardation occurs.
- Sow at up to a 5cm sowing depth.
- Ensure good inoculation with rhizobia (Group F).

Faba beans do not tolerate soils prone to crusting and are not suited to light sandy soils. Faba beans are more tolerant than other grain legumes to frost, but do not tolerate high temperatures and hot drying winds at flowering. They are the most tolerant of the grain legumes to waterlogging.

## **Lentils ( *Lens culinaris* )**

---

Lentils are a medium value legume produced for human consumption.

Lentils are well known as a 'health food' and are used as an alternative protein source to meat.

- Good weed control is critical to achieve good yields. Control broad leaf weeds in the previous year's crop for best results or avoid paddocks with an overburden of broadleaf weeds.
- Monitor for Ascochyta (a foliar disease) and only use clean, good quality seed.
- Lentils require a well-drained soil. They will not tolerate light or acid soils and especially not soils prone to waterlogging.
- Sow at up to a 5cm sowing depth.
- Ensure good inoculation with rhizobia (Group F).

Sowing times for lentils depend on the variety.

## Lupins

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Includes - albus lupins - also known as broad leaf lupins or lupini beans (*Lupinus albus*) and narrow leaf lupins (*Lupinus angustifolius*).

This crop can be used for animal feed with low alkaloid varieties available (eg narrow leaf lupins). Lupins can also be used for human consumption, with lupini beans, a favourite snack in many middle-eastern countries.

- Best suited to areas with rainfall up to 700mm.
- Irrigation is recommended for lupini beans.
- Sow in autumn, preferably on raised beds.
- Seed can be sown down to a depth of 50mm.
- Lupins are best sown after a cereal crop. The cereal will act as a disease break crop and provide an opportunity to reduce broadleaf weeds.
- Use a higher sowing rate if sowing into a dry seedbed, low fertility soil or when seed size is larger than usual (size is variety dependent).

***Prevent anthracnose - buy disease free seed!!***

Albus lupins do not tolerate waterlogging well and need to be sown early in autumn so that they can develop a reasonable root system before it gets too cold and wet.

A significant feature of narrow leaf lupins is that they are more tolerant of low pH or sandy soils of low fertility compared to other grain legumes.

Although the disease anthracnose is not currently present in Tasmania, growers should check for this disease. Symptoms include bending and twisting of stems at flowering, with possible lesions on stems. If you suspect the presence of this disease, notify DPIWE immediately.

Any seed bought from the mainland MUST pass quarantine and be tested for anthracnose.

This is a low to medium value crop depending on its end use. Sweet albus and narrowleaf lupins are of lower value and used in stock feed markets. Lupini beans are of medium to high value due to being used for human consumption.

However the benefit of having a nitrogen fixing crop in a rotation is enormous.

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## **Canola (*Brassica napus*)**

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**Canola is an oilseed crop - not a grain legume.**

Canola has been grown in Tasmania since the early 1990s for oil and seed. The State's comparatively mild finishing conditions allow for a longer flowering period, better seed set and higher oil content relative to mainland growing areas.

Markets for locally grown seed include crushing for oil and whole grain for stockfeed.

Only non-genetically modified (GM) canola cultivars can be grown in Tasmania.

Most growers are using canola as a rotation crop in cereal cropping systems. Not only does it allow use of a different range of chemicals to control grass weeds; it has a bio-fumigation effect on soil and stubble born pathogens of cereals and many other crops. Results from mainland Australia show that cereals following canola can yield 20% to 40% higher than if following cereals.

Canola has a long tap-root, which can help to improve soil structure and help break up heavier soils.

*Canola is an excellent weed reduction and disease suppression crop.*

### **Agronomic considerations for canola -**

- Requires 350mm rainfall and above.
- Ideally sow mid April to end of June. Later sowings reduce yield potential due to hot weather at flowering causing flower abortion and dry weather causing moisture stress.
- Can be grown on most soil types provided pH is above 5.5 (in water) to minimise chance of manganese and aluminium toxicity, particularly on some sandy soils.
- Waterlogging tolerance is poor, especially at the seedling stage. However, older plants can tolerate short periods of waterlogging.
- Canola should only be grown once in four years in the same paddock to ensure there is no disease carryover.
- Canola has a high nitrogen requirement.

- Pests to watch for include red-legged earth mites, lucerne flea, cutworms, cabbage moths and slugs, especially prior to and at plant emergence. Large numbers at this time can devastate crops.
- Windrowing prior to harvesting is the best harvesting method. To determine windrowing timing, it is important to look at the seed and not pods as the key indicator. The optimum time to windrow is when between 40% to 60% of the seed has changed colour from green to brown or black.

For uniform establishment, canola is best sown no deeper than 3 cm into a firm fine seedbed.

### **Cultivar selection -**

Three following types of canola are available:

- Conventional cultivars are highest yielding, but do not have tolerance to many chemicals. For this reason they should not be sown in areas with major weed problems, especially brassica weeds such as wild radish and wild turnip.
- Triazine tolerant (TT)\* cultivars are lower yielding than conventional cultivars. However the weed control spectrum offered with the triazine chemicals is substantial. TT cultivars should be used in situations of high weed burden.
- Clearfield canola cultivars\*, like the TT's, do not yield as well as conventional cultivars, but are tolerant to the herbicide Onduty. The weed control is not as broad spectrum as that provided by the triazine herbicides used on TT cultivars.

\* *Clearfield and TT are non-genetically modified (non-GM) cultivars.*

### **Seeding rates -**

Generally 4 - 6 kg/ha.

Lower rates in good sowing situations, higher rates in poor seedbeds and with TT cultivars, as they have reduced seedling vigour.

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# Perennial herbs

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## **Chicory (*Cichorium intybus*)**

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Chicory is a perennial, broad-leafed herb. It is dormant and prostrate in winter. As the weather warms up, large numbers of erect, dandelion like leaves are produced from the crown. Chicory grows actively from September to April/May if moisture is available.

It has a deep taproot and can access moisture and nutrients down to a metre if the soil is deep and free draining. Good summer rainfall or irrigation is necessary for success with this summer active plant. It performs best at pH 5.5 to 6.0 but is tolerant of more acid soils. Adequate phosphorous is essential.

Chicory has a crown that can be damaged by trampling and over grazing. It is particularly vulnerable in the winter when the soil is wet and the plants are dormant. Weed invasion is also a problem when chicory is dormant during winter and herbicide options are limited. During late spring and summer, grazing pressure must be maintained to prevent chicory becoming stalky. When planted as part of a grass/legume based pasture mix, conflicts can occur between the grazing needs of the chicory and other pasture plants. Sowing is most successful in August/September into a weed free seedbed.

*Well suited as a perennial summer fodder crop.*

### **Chicory is -**

- A short-lived perennial. Up to five years.
- Not a legume so can't make its own nitrogen.
- Not a bloat risk on its own. Possible companion for lucerne to reduce bloat risk.
- Not suited to making into hay but can be made into silage.
- Very suited to finishing stock, particularly lambs.
- Very palatable and digestible. Very high weight gains recorded.
- Susceptible to the rot disease, *Sclerotinia*, in cool moist climates.

*Chicory is not a legume. If it is to be productive, chicory needs to be provided with nitrogen either through fertiliser applications or by being grown with companion legumes. Often sown with red or white clover.*

### **Choice points for selecting chicory cultivars -**

- Persistence. Cultivars may be either longer term (Up to five years) or be bred only to last one or two seasons. Characteristics separating these types include the longer term cultivars having low protected crowns, while the shorter lived cultivars have higher crowns and a more erect growth habit. The latter can be more easily damaged by grazing.
- Resistance to disease, particularly to the rot disease, *Sclerotinia*.
- Winter activity. This is not important as cold Tasmanian winters limit growth, whatever the cultivar characteristic.

### **Seeding rate -**

3 to 5 kg per ha in a mixture with legumes.

0.5 to 2 kg/ha in a pasture mix.

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## ***Plantain (Plantago lanceolata)***

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Narrow leaf plantain is normally a weed of pastures. More vigorous and erect varieties have been cultivated to be used as a component in pasture mixes. Plantain is a perennial herb with a deep taproot. It has good heat, drought and pest tolerance and will survive in low fertility situations. It requires soils that its taproot can penetrate, to perform well.

Like its weedy counterpart, cultivated plantain will be pushed out of a vigorous pasture sward. It is recommended as a companion to cocksfoot and tall fescue, as they have less vigorous seedlings. Ryegrass seedlings are too vigorous.

More information on the effect of shading the legume content of the pasture should be known before it can be recommended in Tasmania. Plantain does not produce nitrogen as legumes do.

*Has not been proven as a valuable pasture species in Tasmania.*

### **Plantain is -**

- A persistent, perennial herb with a tap root.
- Not a legume. Doesn't supply nitrogen to the pasture.
- A potential threat to the legume component of a pasture through shading.
- Suited to low fertility and acid soils.
- Tolerant of drought and pests.
- Better suited to being a component of a pasture mix than being sown alone.

*Plantain should not be allowed to develop seed-heads. Over mature forage has little feed value.*

### **Choice points for selecting plantain cultivars -**

- Two cultivars were available at the time of writing. One has greater leaf size, winter production and overall production while the other is more prostrate and tolerant of close grazing.

### **Seeding rate -**

1 to 4 kg/ha in pasture mixes.

8 kg/ha with red or white clover only.

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## **Terms and Definitions**

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### **Defining persistent, permanent pastures**

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Defining 'permanent pasture' as a pasture lasting 20 years or more, makes sense. A 20 year minimum life span implies that in order to keep all pastures on a property at acceptable production levels, at least five percent of the pasture must be replaced each year. Furthermore, the cost of renovating a pasture usually demands a long life span to achieve a profitable outcome.

When managing for 'permanent pastures', decisions made throughout the life of the pasture must reflect an intention to maintain the desired botanical composition and productivity for the long term. Choice of species and cultivar needs to focus on proven persistence. The decision maker must not be distracted by unverifiable claims of or minor improvements in productivity or palatability.

Establishment methods, plant nutrition, grazing management and pest and weed control all need to be focussed on the long term, at all times throughout the life of the pasture.

### **Defining high, medium and low rainfall**

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High rainfall areas are those receiving an average annual rainfall of more than 875mm; medium rainfall 575mm - 875mm; low rainfall areas have less than 575mm.

### **Highland areas**

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Highland areas are those with an altitude of greater than 600 metres.

### **pH is 'in water'**

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All pH figures in this book refer to the pH 'in water' method. The 'in water' figure is usually the larger if data from both the water and calcium chloride pH testing methods are available for the same sample.

Eg. 5.4 'in water' will equate to about 4.5 'in calcium chloride' but there is no universal conversion factor between the two scales.

### **Cultivar v. Variety**

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The term 'cultivar' is used in this document rather than 'variety'. It is an abbreviation for 'cultivated variety', whereas 'variety' is a strictly botanical term.

## **Plant Breeders Rights (PBR)**

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This symbol (D) indicates that a plant cultivar is protected under the Plant Breeders Rights Act of 1994. It is a type of copyright protection that can be applied to new and uniquely different plant varieties. Seed of varieties protected by PBR legislation cannot be multiplied or traded without permission from the breeder or their agent.

For more information contact the Plant Breeders Rights Office on their web address at [www.ipaustralia.gov.au/pbr/index](http://www.ipaustralia.gov.au/pbr/index)

## **Short-lived ryegrasses**

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In this publication the term 'short-lived' is applied to cultivars of the species *Lolium multiflorum* that are capable of persisting for two to five years.

It can be interchanged with the terms 'short rotation' or 'short-term'.

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## **Steps to Success**

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**Ask the right questions of the paddock you are sowing and the business you run.**

### **For pastures**

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- Why did the previous pasture fail?
- Do my plans ensure success of the legume component?
- Does it need re-sowing or would the existing plants improve with fertiliser inputs?
- What is your rainfall and are you going to irrigate?
- Levels of fertility?
- What are the limitations in your paddock (eg. salinity, acidity, waterlogging)?
- Light soil? Heavy soil?
- Weed problems?
- Potential pests?
- How long does the pasture need to last?
- Grazing systems? Harvesting Plans?
- Stock type eating the pasture?
- Finance to maintain improved pastures?
- Ability to increase livestock profit from an increase in pasture production?

### **For forage crops**

---

- Will the crop produce more forage than the pasture it is replacing?
- Weed problems. Can you control them in the crop?
- If a break crop, will it grow more weed seeds than it gets rid of?
- Do you need a break crop between old and new pastures?
- What is your rainfall and are you going to irrigate?
- What is the risk of a dry season causing complete failure?
- Which month do you wish to plant the crop?
- When do you need the feed?
- Stock type?



- Cultivation, planting and harvesting equipment available?
- Levels of fertility?
- What are the limitations in your paddock (eg. salinity, acidity, waterlogging)?
- Light soil? Heavy soil?
- Potential pests?

### **For cash crops**

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- Is there an established market for the product?
- Do you require a contract to guarantee a final market?
- Is there a premium offered for higher quality produce that meets certain specifications?
- Does it require irrigation? If so, how much and when will the critical watering be required?
- Is it going for animal or human consumption? If going for human consumption, are there any diseases that need to be prevented (eg. ergot in wheat)?
- Do the potential weeds in the paddock pose a risk to the quality of the final yield?
- Are there any specialist requirements (eg. specific harvesting, windrowing, etc)?
- What is the risk of the crop failing?
- What are the limitations in your paddock (eg. salinity, acidity, waterlogging, fertility, soil type etc)
- Will there be any residual chemicals from previous crops that could affect the growing of the current crop?
- What pests and diseases are usually associated with this crop?
- Is there any risk of disease carryover from previous crops to this one (eg. rust or root diseases can transfer between species)

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## **Purchasing seed**

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...Know what you are getting.

Certified Seed should be bought whenever possible as this ensures you are planting the species and cultivar you paid for.

Legislation dictates that every buyer of seed is entitled to receive a copy of the Statement of Seed Analysis for the seedlots they purchase. This gives information on germination and purity, including a listing of all other seeds present (including weed seeds).

Sowing rates quoted assume a germination of 100%. Use the seed analysis certificate to determine the actual germination % and adjust the sowing rate accordingly.

## **Consider endophytes**

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Endophytes are fungi that live entirely within grass plants, transferring to new plants only through seed, not through the open environment, and so can be exclusive to individual cultivars.

Endophytes are capable of producing toxins that both protect the grass from insect attack and cause animal health problems.

It is possible to remove the endophytes (Nil endophyte) to avoid the animal health problems, but in many districts this will substantially reduce pasture persistence.

Safer endophytes (Novel endophytes) have been developed recently that will provide some protection from insect attack, while not causing the animal health problems. The endophyte level in seed reduces as seed storage time increases.

## **Legumes must be effectively inoculated**

This is a critical success factor. All plants need nitrogen. Legumes convert nitrogen from the air through an association with rhizobia bacteria that live on their roots. The nitrogen produced by legumes is critical for grass growth in most Tasmanian pastures.

Effectively inoculated legume plants have growths or rhizobia nodules on their roots. The emerging roots from the legume seed must come into contact with rhizobia bacteria and the best way to do that is to coat the seed with a peat based inoculant. These bacteria are living organisms and thus must still be alive to infect the roots when the seed germinates. The survival period will be maximised if the inoculated seed is stored in a cool, dry place, out of the sunlight and sown into a moist seed bed.

## **Long-life inoculated legume seed**

Legume seed can be inoculated immediately before planting by the farmer or local merchant or it can be purchased with a long-life inoculant already applied. The Australian Legume Inoculants Research Unit recommends the following shelf life for inoculant on pre inoculated seed.

Species	Innoculation
Medics – including lucerne	6 months
Sub clover	6 weeks
All other clovers – including White, Red, Strawberry, Arrowleaf and Caucasian.	2 weeks

*The date the seed was inoculated is on the bag. Inoculate your own seed unless the time of planting into moist soil is within these limits.*

Seed purchased as pre-inoculated, can be re-inoculated by following the same process as for un-inoculated seed.

## How to inoculate legume seed

The most commonly used process involves sticking the rhizobium contained in a peat base on to the seed and applying a thin coat of fine lime to protect it.

### Quantities of materials for inoculating and lime pelleting legume seed

	Seed	Peat Inoculant	Adhesive	Lime coating	Water
Small seed eg. White, balansa & arrowleaf clovers	1 kg	10 gms	3.6 gms	500 gms	60 mls
Medium seed eg. sub clover, lucerne	1 kg	5 gms	1.8 gms	250 gms	30 mls

### Ingredients

- **Inoculant**  
Rhizobia bacteria contained in peat. See inoculant packaging for correct inoculant for your specific legume. As this product has a limited shelf life most rural suppliers are not carrying large stocks. Pre-order by 3 or 4 days to give your supplier time to make sure they have the correct inoculant, and it is within the “use by” date. Keep refrigerated.
- **Adhesive**  
Available where inoculant is sold. Pre-order by 3-4 days.
- **Lime Microfine - not slaked, hydrated lime or limil.**  
Mole Creek Lime (AGLIME) markets this in bags describing it as “Fine Ground Limestone”. This is the normal lime that is put on paddocks, except it is ground much finer. Many rural suppliers have this in stock.
- **Water**  
Must be clean and non-chlorinated.

### Preparation and pelleting

1. Prepare adhesive mixture by dissolving calculated amount of adhesive product in half of the required water, which should be near boiling. When the adhesive is dispersed add the remaining water (cold).
2. Allow adhesive to cool .
3. Add calculated amount of peat inoculant to the cooled adhesive and mix thoroughly (this should be done just prior to use.)

4. Pour inoculant/adhesive mixture over the seed and mix until all seeds have an even coating of the mix. (The most practical method of mixing seed is in a cement mixer, on a large tarpaulin or in a wheel barrow).
5. Add the required amount of lime coating material and continue to mix rapidly until all seeds are evenly coated (do not continue mixing after pellets have formed).
6. Sow as soon as possible after inoculation (preferably within 24 hours into a moist seed bed).

### **Precautions**

Do not work in direct sunlight as this could kill the rhizobia.

Do not mix pesticides other than Thiram with the seed as this could kill the rhizobia.

The weight of lime on the pelleted seed should be taken into account when working out sowing rates after pelleting.

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## **Understand sowing rates**

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The first thing to understand about sowing rates is the effect of seed size as demonstrated by the following example.

*There are about 1.6 million seeds per kilogram of white clover but only 80,000 to 200,000 seeds per kilogram of sub clover. That is why, to establish an adequate population of plants, a typical sowing rate for white clover is around 1 kg/ha while up to 10kg/ha is needed for sub clover. It is the plants per hectare that matters.*

Once seed size is allowed for, correct sowing rates are determined by the need to optimise plant spacing and competition between plants and species. If the overall quantity of plants per square metre is too high, increased competition for nutrients, moisture and sunlight may result in individual plants being too small and having poorly developed roots. This may result in a high incidence of plant death during dry periods. On the other hand, if the quantity of plants per square metre is too low, weed invasion and lower productivity in the first year is likely to result.

Dry-land and low fertility conditions will support a lower population of plants than high rainfall, irrigated and high fertility conditions.

The seeding rates recommended in this book are generally expressed as a range of poor to good site conditions respectively. The seeding rate will also need to be adjusted to account for mixtures of multiple species.

Soil conditions when sowing will affect the percentage of seeds that successfully establish as plants. Recommended rates are usually based on sowing into a firm, moist seed-bed, at a depth of 10 to 20mm and using a precision drill. In other words, ideal conditions. Rough seedbeds, poor moisture conditions, or other impediments to successful germination may justify changing sowing rates, but these conditions are increasing the risk of poor pasture establishment, irrespective of seeding rate.

Unless otherwise stated, the suggested rates are for use when the species listed is the only grass or the only legume to be sown. For mixtures containing more than one grass or legume, adjust the sowing rates of the individual species to give the proportion of each grass or legume wanted in the pasture.

For mixtures containing more than one cultivar of the same species, adjust the sowing rate so that the total quantity equates to the rate suggested when only using one cultivar for the species.

As previously stated, sowing rates quoted assume a germination of 100%. Use the seed analysis certificate to determine the actual germination % and adjust the sowing rate accordingly.

## Productive pastures from saline areas

---

Salinity generally originates from saline seeps and water tables that are too close to the surface. Most remedies involve lowering water tables so the salt no longer contaminates the root zones of pastures and crops.

Planting of trees, salt tolerant shrubs and grasses is used to control water-tables for the long term improvement of severely affected land. Salinity research, development and extension programs are ongoing. Get in touch with these programs to access the best strategies for the long-term development of salt affected land.

Salinity that is not obvious, can cause pasture failure. We often think of saline areas as being characterised by bare scalded ground encrusted with salt. While there are some such areas in Tasmania, this page is focused on the much more common circumstance of pastures that are unproductive due to low to moderate levels of salinity. These areas are characterised by the failure of normal pasture plants and the presence of salt tolerant weeds such as buck's horn plantain (*Plantago coronopus*) and sea barley grass (*Hordeum marinum*). There may be small areas of scalding. A positive aspect of these saline areas is that many remain moist in summer and pastures that are established on them can be valuable in providing summer feed.

Establishing salt tolerant pasture species on salt affected soils can be difficult. Drainage may improve the chance of success. With waterlogging and an historical absence of legumes there may very little nitrogen available to the new plants. A starter fertiliser that includes nitrogen will be required.

Where legumes can't be established with the grasses, nitrogen must be applied regularly to get enough pasture growth to lower water tables.

Most of the salt tolerant grasses are slow to establish. Early grazing management needs to take this into account. Spring sowing is often recommended.

It is also important to manage grazing to maintain leaf area during summer so transpiration through grass plants will lower the water table, allowing the salt to be leached away from the root zone.

Salt tolerant species have the potential to be environmental weeds in saline wetlands.

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## Salt Tolerant Grass Species

- **Tall fescue** - Tolerates mild to moderate salinity and wet, acid soils. Summer active cultivars provide excellent summer grazing. See species page.
- **Tall wheat grass** (*Thinopyrum ponticum*) - Summer active perennial. Winter growth is poor. Frost tolerant. Like tall fescue it is deemed to have tolerance for low to moderate levels of salinity. However, its tolerance is higher than tall fescue. It tolerates winter waterlogging. It has harsh stiff leaves. New cultivars have been bred for increased leafiness and forage quality. Should not be grazed in the first year (until a strong crown has formed) and techniques such as crash grazing may be needed to maintain feed quality. Tall wheat grass has potential to become an environmental weed. It should be kept away from waterways, wetlands or coastal areas and used only in productive pastures. Not referred to elsewhere in this book.
- **Puccinellia** (*Puccinellia stricta*) - A winter growing perennial grass that is dormant during summer. Highly tolerant of waterlogging and salinity. Not tolerant of acid soils. Only for reclaiming salty soils by lowering water tables. Not very productive of quality summer feed. Very slow to establish. Not referred to elsewhere in this book.

## Legumes for saline areas.

- **Strawberry clover** - Perennial that tolerates drought, waterlogging and low levels of salinity. See species page.
- **Balansa clover** - An annual with a high tolerance to waterlogging. Tolerant of low levels of salinity. Excellent forage production. Regeneration in Tasmanian conditions can be poor. See species page.
- **Persian clover** - An annual that tolerates waterlogging and moderate salinity. Two different sub species vary in their level of hard-seeds and therefore their ability to regenerate. See species page.



## **New plants for release over the next 5 years**

TIAR and DPIWE's herbage plant development program -

### **GRASSES**

#### **Spanish cocksfoot - *Dactylis glomerata ssp. hispanica***

This is a highly drought tolerant, highly winter active, frost tolerant, quality forage with high protein levels suitable for low to medium rainfall areas.

Two cultivars for release, cv. Sendace, prostrate summer dormant and cv. Uplands, upright with some summer activity.

#### **Cocksfoot - *Dactylis glomerata***

This is a summer active, semi prostrate growth habit, high tiller density and highly palatable productive cocksfoot with excellent feed value. Suitable for dairy pastures. Suitable for medium to high rainfall areas, particularly areas receiving reliable summer rainfall. One cultivar for release, cv. Megatas.

#### **Coloured brome - *Bromus coloratus***

A new species of perennial grass. Perennial brome grass, summer active, semi erect growth habit, high tiller density and highly palatable productive grass with excellent feed value. Suitable for dairy pastures. Suitable for medium to high rainfall areas, particularly areas receiving reliable summer rainfall. One cultivar for release, cv. Exceltas.

### **PERENNIAL LEGUMES**

#### **Causasian or Kura clover - *Trifolium ambiguum***

A versatile drought tolerant perennial clover suited to all rainfall areas. Selected for improved seedling vigour, winter growth and seed production. One cultivar for release, cv. Kuratas.

#### **Red clover - *Trifolium pratense***

A dense, prostrate, stoloniferous line of red clover suited to low to medium rainfall areas. Has a deep taproot and can tolerate heavy grazing. Selected from plants that have survived extremely dry conditions. One cultivar for release. Not yet named.

#### **Talish clover - *Trifolium tumens***

A new species of perennial clover. Suitable for use in low to medium rainfall areas. Has a deep taproot, can tolerate heavy grazing and extremely dry conditions. One cultivar for release. Not yet named.

grasses

legumes

fodder crops

cash crops

perennial herbs

tips & tricks

## **Frequently asked questions**

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### **Will the correct choice of species or cultivar ensure a long-term pasture success?**

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No. Choosing the right species or cultivar for your region and site specific paddock is a great start to realising the opportunities that can arise from a highly productive and persistent pasture but it is not a silver bullet. In order that the species or cultivar can express its genetic potential all the factors affecting its growth and survival must be managed to ensure none become detrimental to it.

### **Is species more important than cultivar?**

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Sometimes. Work by DPIWE has shown production differences between species is often greater than between cultivars within a species. There are, however, big differences between cultivars, usually in relation to flowering time and persistence. As an example, Arrotas<sup>(b)</sup> arrowleaf clover flowers about a month later than all other cultivars so its potential production in Tasmania is much greater.

### **Can I improve pasture composition without re-sowing?**

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Sometimes. Controlling weed populations, using the correct fertiliser and adopting the best grazing strategy are all ways of increasing the quantity of desired species present in a pasture. Success really depends on the individual situation and so there is no general rule.

### **How long will a permanent perennial pasture last?**

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A pasture established and managed according to best practice should persist for at least twenty years.

### **Should I use perennial or short-lived ryegrass cultivars?**

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DPIWE work has shown greater animal production will result from using perennial cultivars, where the intention is to maintain the pasture for two years or longer.

### **Can I afford to re-sow?**

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The biggest driver of profitability for a newly sown pasture is the cost of extra stock to eat the increased production, together with the gross margin of the grazing enterprise. Depending upon these variables it can take between six and thirteen years to recoup the costs of re-sowing a pasture.

## **Should I choose between cultivars based on persistence or production?**

Both persistence and production are important characteristics of pasture species and cultivars. For a permanent pasture persistence is the most important. Production differences are generally small and often occur in spring when additional feed supply is of less importance.

## **Is palatability important when choosing a species or cultivar?**

Good palatability has a positive effect on animal intake of forage, which is positive for animal production. However, while there are palatability differences between species and cultivars, these differences can be both overstated and difficult to quantify. Animals learn to eat most available, improved cultivars. Consequently, palatability is significantly less important in species and cultivar selection than other aspects of forage production such as dry matter yield or persistence.

## **Is digestibility important when choosing a species or cultivar?**

Sometimes. But the biggest driver of digestibility is plant maturity at grazing rather than species or cultivar. Digestibility determines how much food an animal can process in a day.

## **Should I sow lots of species or cultivars as a “shotgun mix”?**

Species and cultivars usually differ in their ability to survive and thrive over a range of environmental and site characteristics. If a paddock is relatively uniform in its characteristics, then choose the species or cultivar of grass and legume most suited to those characteristics. Alternatively if the paddock is highly variable in its characteristics, and unable to be segregated into smaller units for sowing, then a mixture to provide a range of species and legumes to suit the various parts of the paddock, may be the best approach.

## **Are Tasmanian bred and selected cultivars better than those developed in other areas?**

Usually. This is because Tasmanian selected cultivars have been developed under the local environmental conditions. Therefore, they have the best chance of performing well in Tasmania. Tasmania is one of the few cool temperate regions of Australia, so breeders outside of Tasmania are unlikely to be selecting lines specifically adapted to such an environment.

## **Does a high seeding rate improve the chances of survival and increase production?**

No. Increasing the seeding rate above the recommended level results in a

larger number of smaller, weaker plants competing against each other for water, light and nutrients. If these essential inputs become limiting most of the small weaker plants are likely to die thereby significantly degrading the pasture.

### **Should an established pasture be sacrificed to produce an annual forage crop?**

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No. An established perennial pasture with the desired botanical composition will generally produce more dry matter in a year than a forage crop if the establishment and re-sowing times are taken into account.

### **Can forage and cash crops be used to reduce weed populations?**

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Yes. Provided the weeds are sufficiently different from the forage or cash crop, herbicides can be used to selectively control them. Some cash crops, such as herbicide tolerant canola, can be highly effective in “cleaning up” areas prior to re-sowing pasture or other cash crops.

Cultivation will destroy weeds. However, it can also bring additional weed seeds to the surface and induce their germination, thus creating a bigger problem.

The ability of a fodder crop to shade out weeds varies. Not all crops are particularly dense. Also, some weeds can germinate, grow and go to seed quicker than the crop. Animals may avoid eating the weeds where there is an abundance of highly palatable feed on offer.

### **Do I need a need a legume in my pasture?**

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Yes. Legumes are the engine rooms of pastures. They produce at least 100 kg/ha/year of nitrogen which is essential for the growth of all pasture plants.

### **Do I need to inoculate legume seed?**

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Yes. The latest strain of rhizobium inoculum should always be used. It is vital to use the strain of rhizobia specific to the legume species. Poorly inoculated legumes perform to about 10 percent of their potential.

### **Do I need to be able to identify species?**

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Yes. Accurate identification allows meaningful assessment of pasture composition and thus the success of pasture improvement strategies.