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Which species: where and why?

Grasses, Legumes & Herbs

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Why?

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Benefits

Potential benefits from utilising multispecies pastures

1

Soils & Plants

- Reduced reliance on N fertiliser
- Shoulder season productivity
- Contribute to healthy soils

2

Grazing Animals

- Improved milk production
- Reduced CH_4 emissions
- Improved animal health

3

Business

- Reduced risk
- Financial gain

4

Environment

- Reduced N_20 production
- Ecosystem services
- Sustainability
- Resilience to climate change

Source: Thomson & Albornoz (2023)

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Challenges

Some challenges for adoption of multispecies pastures

1

Soils & Plants

- Seed mixture design
- Establishment & Agronomy
- Monitoring & Measurement

2

Business

- Shift in thinking & Knowledge

3

Animals

- Complex grazing management
- Lower feed value?
- Species loss due to gazing
- Reduced yields when grazed?

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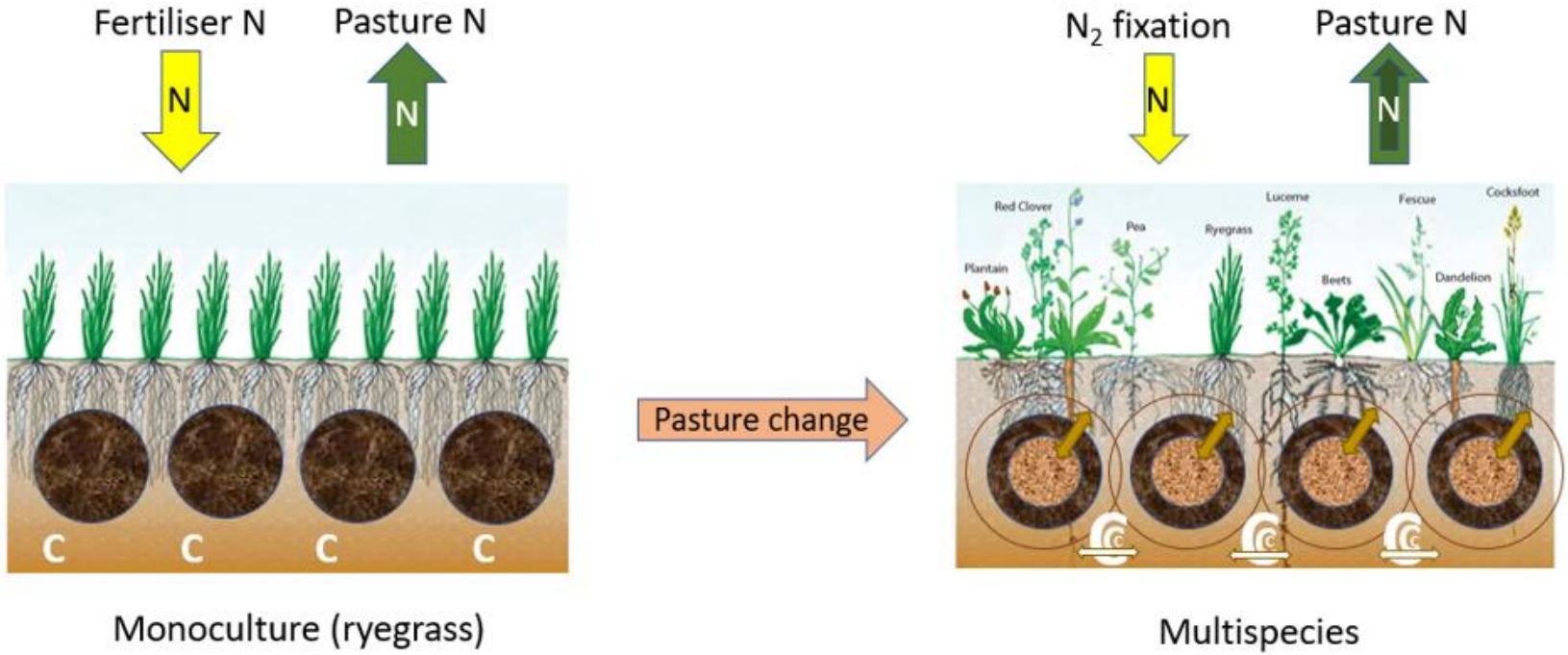
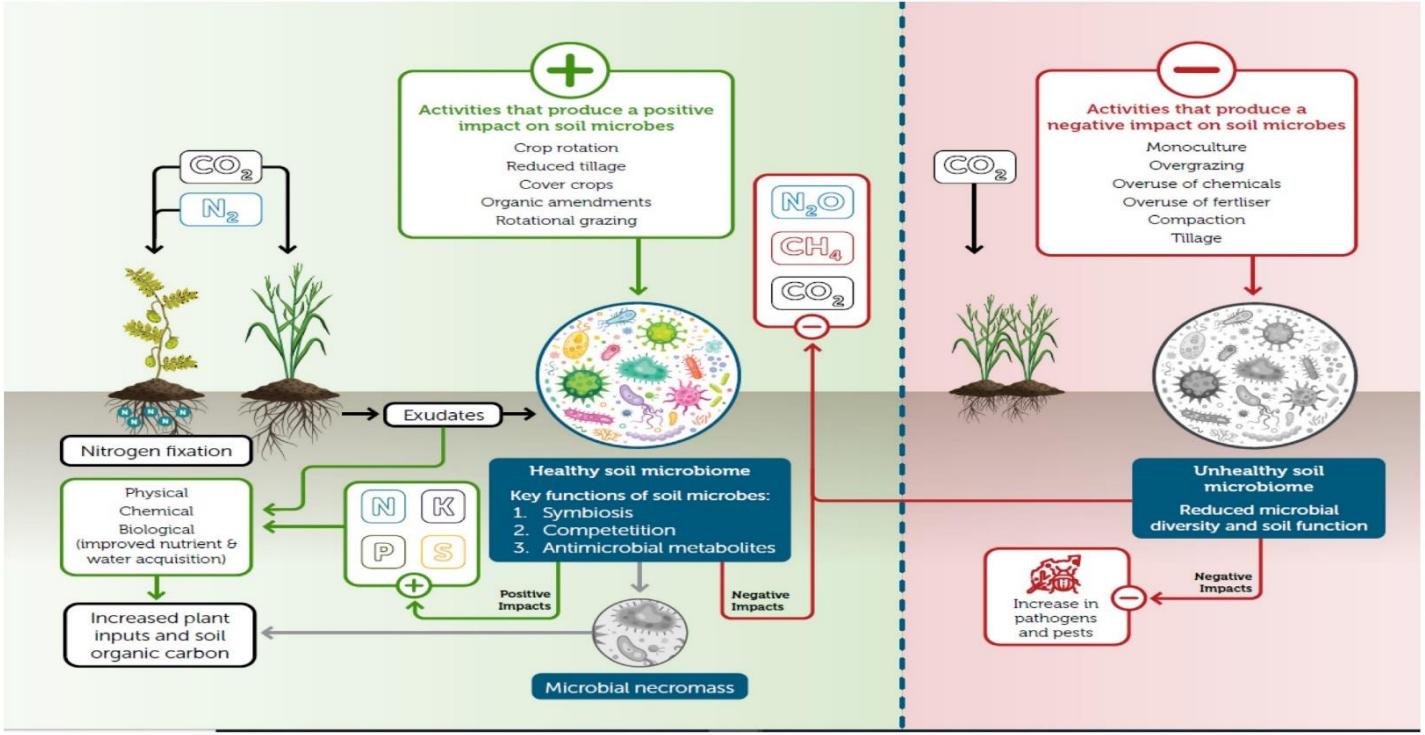
Source: Thomson & Albornoz (2023)

With diversity comes complexity



Impacts of pasture species composition and nitrogen management on soil organic matter and carbon stores, long-term nutrient availability and pasture productivity are unknown (Paustian *et al.* 2019).

Building a healthy soil



Source: Khangura R, *et al.* (2023)

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Multispecies Research

European agro-diversity project (Finn *et al*. 2016 and others).

Investigating if multispecies increase yield & drought resilience, with lower nitrogen inputs.

Other results to date inconsistent within & between multispecies mixtures.

A multitude of factors determine the success of a multispecies sward:

- Soil type and fertility
- Species choice
- Proportion of functional groups
- Grazing management practices
- Fertiliser regimes

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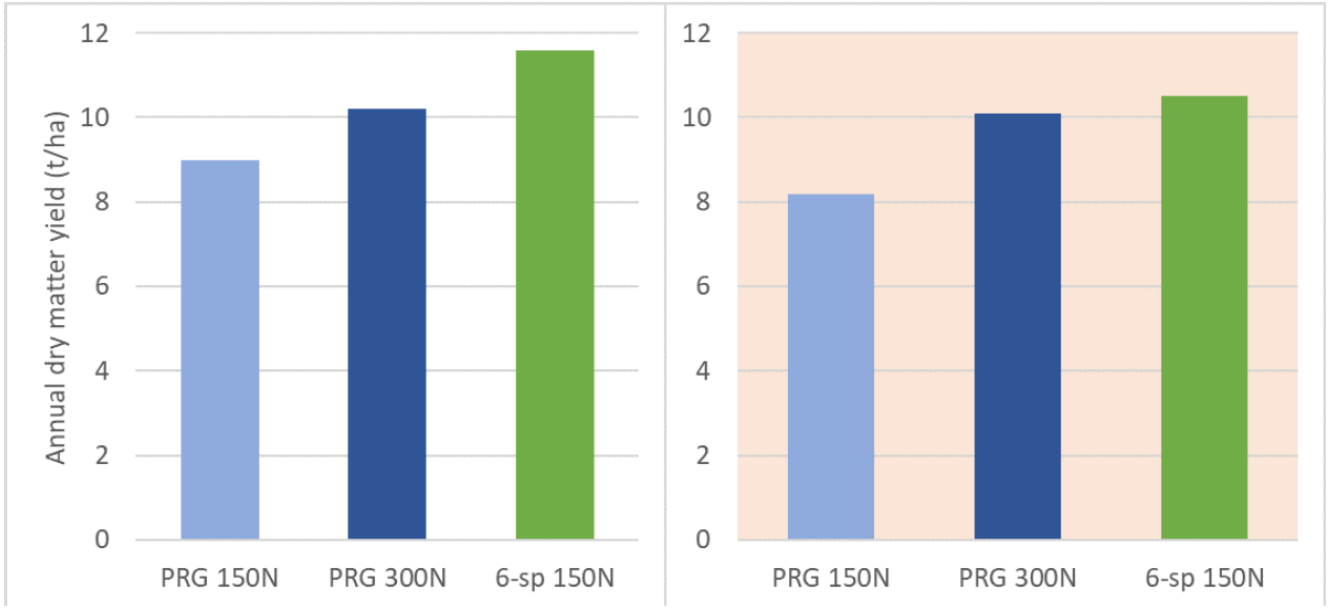
Dry matter production



Average Season

Summer drought

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Source: Finn *et al*. 2016

Where

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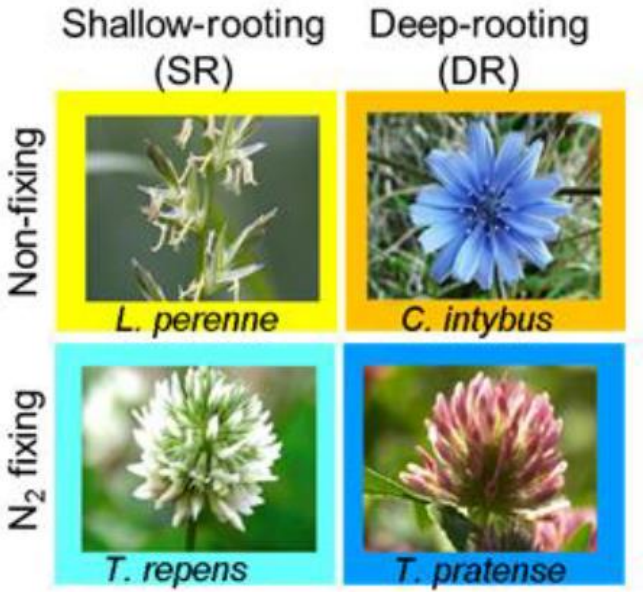
Species selection



Pasture species selection is crucial to ensure optimal production for animal requirements:

- Species from each functional group
- Suited to the specific growing conditions
- Consider climate, soil type, rainfall distribution, and grazing requirements
- Maximise dry matter yield, feed quality and animal health
- Improve ecosystem services and minimise environmental impact.

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Features & Attributes

Suitable varieties should be selected on the basis of attributes such as:

- Performance:
  - Seek local trial results (e.g., PTN or FVI) for seasonal yields, feed quality and persistence
- Maturity:
  - Choose an earlier-maturing variety if in the drier part of a species' zone of adaptation
- Dormancy:
  - Many pasture species exhibit a dormancy mechanism.
- Plant habit:
  - Prostrate or erect
- Grazing tolerance
- Seedling vigour
- Tolerance to pests and disease.

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Climate

Temperature:

Different grasses, legumes and herbs tolerate varying temperature ranges, selecting species adapted to local conditions is essential.

Rainfall:

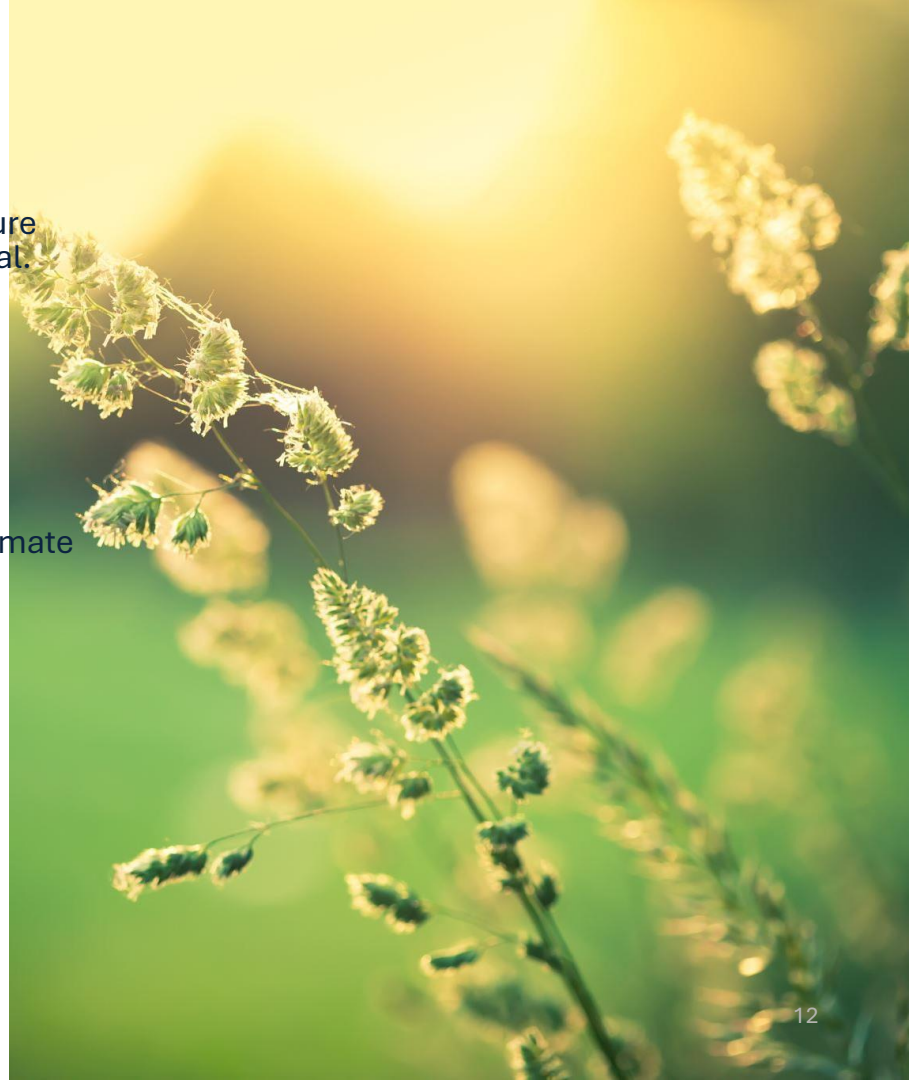
Areas with higher rainfall might benefit from different species compared to drier regions.

Growing season length:

Choosing species with a suitable growing period for the local climate ensures consistent feed availability.

Other important factors which influence growing conditions include:

- Soil profile and water holding capacity
- Elevation and day/night temperature variation
- Slope and aspect



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Soil-Plant Interactions

Uptake of multispecies influenced by the capacity of the soil to support growth

- Soil acidity (pH) and legume activity & N-fixation
- Fertiliser and liming for different functional groups (e.g. P requirements for grasses v legumes)
- Micronutrient requirements for complex plant communities?
- Potential inhibition of nitrification by plantain?
- Improvement in soil structure, water holding capacity and SOC
- Increased potential for more microbial activity and nutrient turnover

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Soil conditions

Texture:

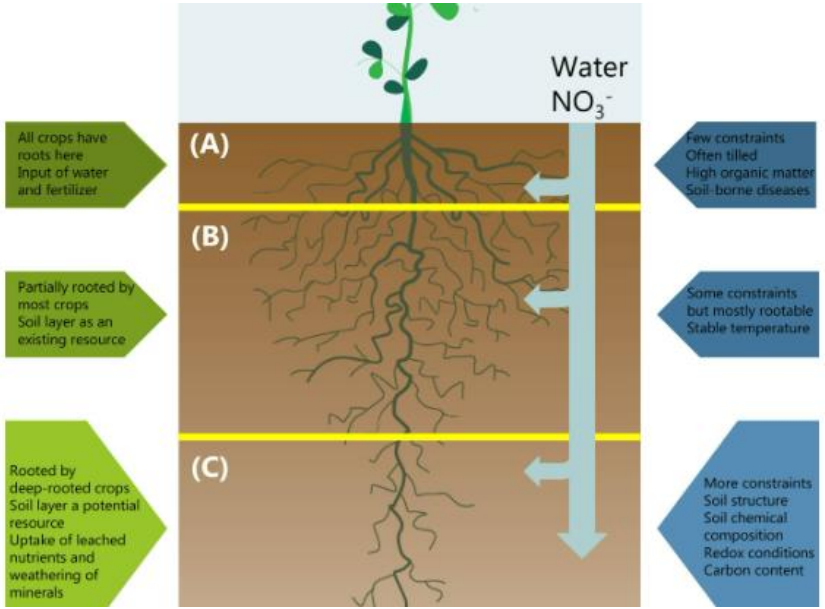
Soil type impacts water holding capacity and nutrient availability, influencing the suitability of certain species.

Soil pH:

Adjusting soil pH through liming may be necessary to support specific pasture plants.

Drainage:

Well-drained areas might require different species compared to poorly drained ones.



Source: Thorup-Kristensen *et al.*

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Grazing requirements

Animal type:

Different livestock classes have varying nutritional requirements, dictating the choice of pasture species.

Production goals:

Whether aiming for high milk production, weight gain, or maintaining animal health will influence pasture selection.

Grazing season:

Selecting species with diverse maturity times can provide consistent feed throughout the year.

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Grazing Management

- Success under grazing depends on initial species selection, fertility management and grazing intensity
- Studies comparing the effects of defoliation on multispecies composition are variable
- Grace *et al*. (2019) observed a yield reduction of 1.9 t/ha in grazed swards compared to cut.
- No difference between defoliation method in the perennial ryegrass control
- A key aspect of any grazed pasture is its nutrition profile (i.e., protein, digestibility, fibre content, and metabolizable energy)
- Loges *et al*. (2020) found that an 8-spp. mix had, on average lower ME & crude protein compared to a Lp/Tr mix
- However, Loges *et al*. (2020) also observed that cattle preferred more diverse swards resulting in better utilisation (9.0 t DM/ha versus 8.4 t DM/ha).

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Sowing

Use certified seed.

- Sowing time is influenced by seasonal conditions.
- Some species require a minimum soil temperature for good germination.
- Adjust sowing rates to suit rainfall.
- Lower seed rate for mixtures to avoid competition (especially between grasses).

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Pastures with Purpose

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Different objectives




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Purpose

Have a clear objective!

What are you trying to achieve?

- Improving soil health (biological, physical, chemical)
- Quality fast feed for autumn and winter
- Bulk feed with silage and hay opportunities
- Specific fodder options
- Ongoing feed for longer-term
- Persistent perennial grazing system

Choosing the right species

Category	Some types	Examples/Species	Typical features	Some Purposes
Improved Pastures	Annual / Seasonal 6-12 mths	• Forage cereals • Forage brassicas • Forage sorghum • Annual clover HDLs • Vetch • Medics • Annual / Italian ryes	• Feed at key times • Rapid growth • High yield • Good quality • Single variety • or simple mixes	• Cover a feed gap • Pasture renovation • Silage/hay crops • Cropping break • Weed/Pest control
	Short Term 2-5 years	• Italian / hybrid ryes • HWA Lucerne • Chicory • Large White clover • Red clover • Sub-clover HDL	• High performance • Responsive to inputs • Yield at key times • Rapid paddock turn-over anticipated	• Cropping break • Mixed farming • High intensity operations / finishing • Specialised seasonal production
	Perennial 5 years +	• PRG / white clover • Phalaris / sub clover • Fescue / strawberry • Cocksfoot / sub • Lucerne 5, 6 ,7's • Kikuyu	• Perennial grasses • Perennial or self-regenerating legumes • Resilient & reliable • Often multiple varieties / species	• Back-bone of grazing operations. • Long pasture phase / Cropping break • Fodder production
Semi-improved	Run-down / neglected pastures	High % weedy annual grasses, low producing perennial grasses. Capeweed, thistles etc. Often low fertility & poor production.		
	Partially improved native pastures	Some % introduced species e.g. medics, subs, cocksfoot. Some fertiliser history. Often good wool / beef extensive pasture country.		
Un-improved	Native Pastures	Some well managed. Often danthonia, themeda, microleana. Useful beef / sheep country of a seasonal nature.		
	Bush runs / rangelands	Hill & highland grazing, semi-arid open woodland, savannah. Often good seasonal grazing for wool & beef operations.		

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Functional Groups

01

Grasses

Ryegrass, Cocksfoot, Fescue, Prairie grass, Timothy, Oats, Barley, Phalaris, Kikuyu, Rhodes, Paspalum

02

Legumes

White clover, Red clover, subterranean Clover, Landino clover, Lucerne, Burr medic, Black-spotted medic,

Crimson clover, Berseem clover, Balansa clover, Shatal clover , Strawberry clover, Aliske clover, Vetch, Sainfoin

03

Herbs & Forbs

Chicory, Plantain, Burnet, Yarrow, Sheep parsley and brassica species.

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Knowledge & Information

Regenerator

Southern Cool Season

400mm+

pH 5.2–8.0

Most soil types

Sowing rates:

High rainfall / irrigation	50-60 kg/ha
Good dryland	40-50 kg/ha
Marginal dryland	30-40 kg/ha
Oversowing	25-30 kg/ha

Variety	% weight	kg/ha @ 50kg/ha sowing rate	
Arise Italian ryegrass	10.00	5.00	Grasses and cereals for energy, bulk feed and fast establishment to provide ground cover and stability
Express forage oats	10.00	5.00	
Ryecorn	6.25	3.13	
Magnate forage barley	10.00	5.00	
Laser or Shaftal clover	6.25	3.13	Cool-season forage legumes improve feed protein and help fix nitrogen once established
Morava or Volga Vetch	10.00	5.00	
Tic bean (faba)	20.00	10.00	
Morgan field pea	15.00	7.50	
Leafmore rape	2.50	1.25	Tap-rooted annuals that improve animal feed quality, speed to first grazing and add diversity with prospect for attracting spring pollinators.
Commander chicory	3.75	1.87	
Captain Plan-tain	3.75	1.87	
Phacelia	2.50	1.25	

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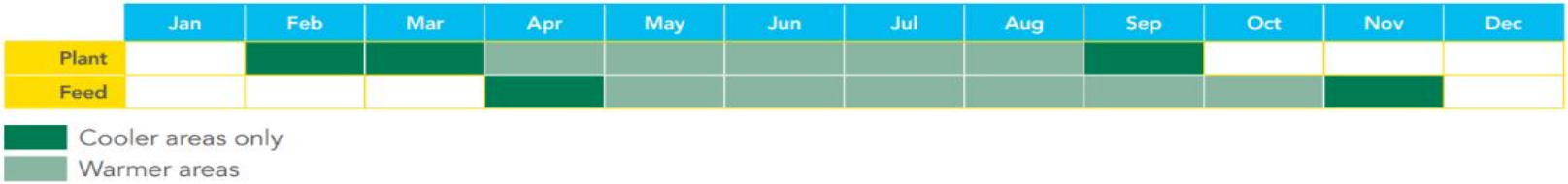
Fit & Use Pattern

Fit & use pattern

- Suits autumn sowing generally or late winter in southern Australia.
- Day-time temperatures should be reliably below 25°C
- Beef and lamb finishing or dairy forage, proving robust volumes of quality feed.
- Suitable for sowing as a specific crop or, for oversowing and improving summer forage prosects in a tired pasture.
- Potential for silage making in spring
- May be used as a cool-season green manure to improve soil attributes.
- If allowed to flower, may be used to attract beneficial insects in early spring.
- Suitable for grazing in 8-10 weeks after emergence.
- May offer 2-3 seasonal grazing opportunities under well managed rotational grazing, or used as a one-off standing feed crop.
- Follow-up crop or pasture required when grazing concludes in late spring or early summer.
- Offered as bare, untreated seed for sowing.

Sowing & grazing window



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Multispecies swards

Multispecies benefits:

Greater functional diversity

- Equates to greater productivity (?)

High levels of productivity

- More productivity @ lower N rates

More resilient to seasonal variability

- Adaptation to moisture stress

Environmentally positive

- Social license

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Summary

Many potential benefits from using multispecies

- Less reliance on N fertiliser, improved animal health, resilience to climate variability

Some challenges to adoption remain and more information required

- Design of appropriate species mixtures
- Establishment and agronomy
- More complex grazing management
- Change in thinking and knowledge

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Thank you

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