Kangaroo Island

Perennial Pastures Project

AGKI AGRICULTURE KANGAROO ISLAND

LANDSCAPE SOUTH AUSTRALIA KANGAROO ISLAND

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An initiative between the Kangaroo Island Landscape Board and Agriculture Kangaroo Island as a way of capturing the experiences and insights of farmers growing perennial pastures across Kangaroo Island.

The authors

This fact sheet was prepared by Jenny Stanton and Lyn Dohle, and edited by Tim Prance.

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Overview

Perennial pastures are able to boost productivity and improve livestock performance by extending the growing season and thus reducing the need for supplementary feeding. They also enhance climate and soil resilience by:

- maintaining a greater level of year-round ground cover
- reducing the potential for soil erosion
- reducing groundwater recharge
- limiting weed establishment
- reducing the rate of soil acidification.

However, farmers on KI have not always realised these benefits with establishment failure or short-term persistence resulting in pasture renovation becoming a costly exercise.

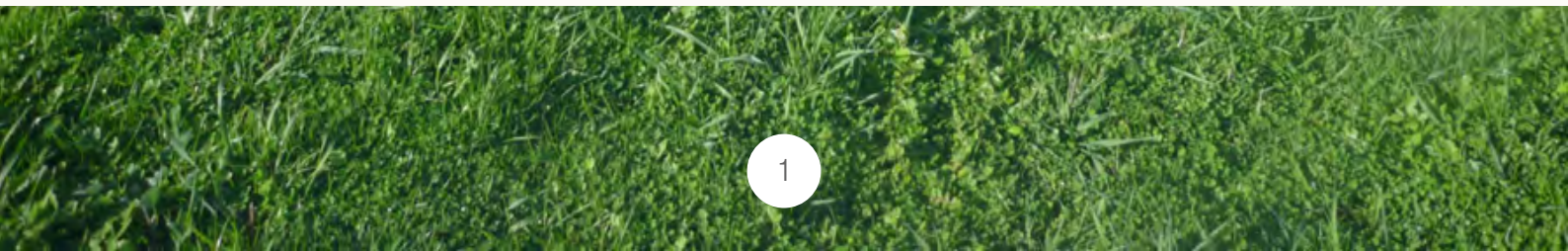
After conducting thirty interviews with the Island farming community, the opportunities, challenges and practical on-ground aspects of establishing and maintaining perennial pasture systems on Kangaroo Island have been brought together in this publication.

During the course of the interviews, it became apparent that each farmer's appetite for perennial pastures was guided by life experiences. Some of the more seasoned farmers were happy with the annual system that was afforded them. Others, typically the younger generation, were keen to lift production and hence eager to try out new perennial pastures. And some were a bit 'once bitten, twice shy' and were not interested in trying perennials again, mainly due to the cost of establishment.

This publication concentrates on eight recurring plant species or groupings that arose from the interviews – cocksfoot, tall fescue, phalaris, perennial ryegrass, kikuyu, lucerne, herbs and saltland species. Each of the grass perennial species thrive in companionship with the king of KI pasture – subterranean clover with its nitrogen fixing capabilities.

How to use this guide

- If you are looking for **what species to grow where,** in a simple format, head to **Section 1, Table 1 on page 3** to determine the best option for the chosen paddock.
- Once you have your short-listed species, **head onto the corresponding fact sheet in Section 2** to learn more about the species.
- Read on in Section 1 to discover the **best way to set up a paddock for success**. This also includes a section on the economics of sowing perennials.



Section 1
Getting the basics right

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Introduction

Perennial pastures work best as part of a whole-farm system, and no single species suits every soil or situation.

Each one comes with its own strengths and challenges.

Before investing, it's important to understand the key factors that drive success and choose the species that are the best fit for your conditions.

CATEGORY	PBI	CRITICAL COLWELL P
Very low	35-70	30
Low	70-140	35
Moderate	140-280	40

Getting the basics right: Soil

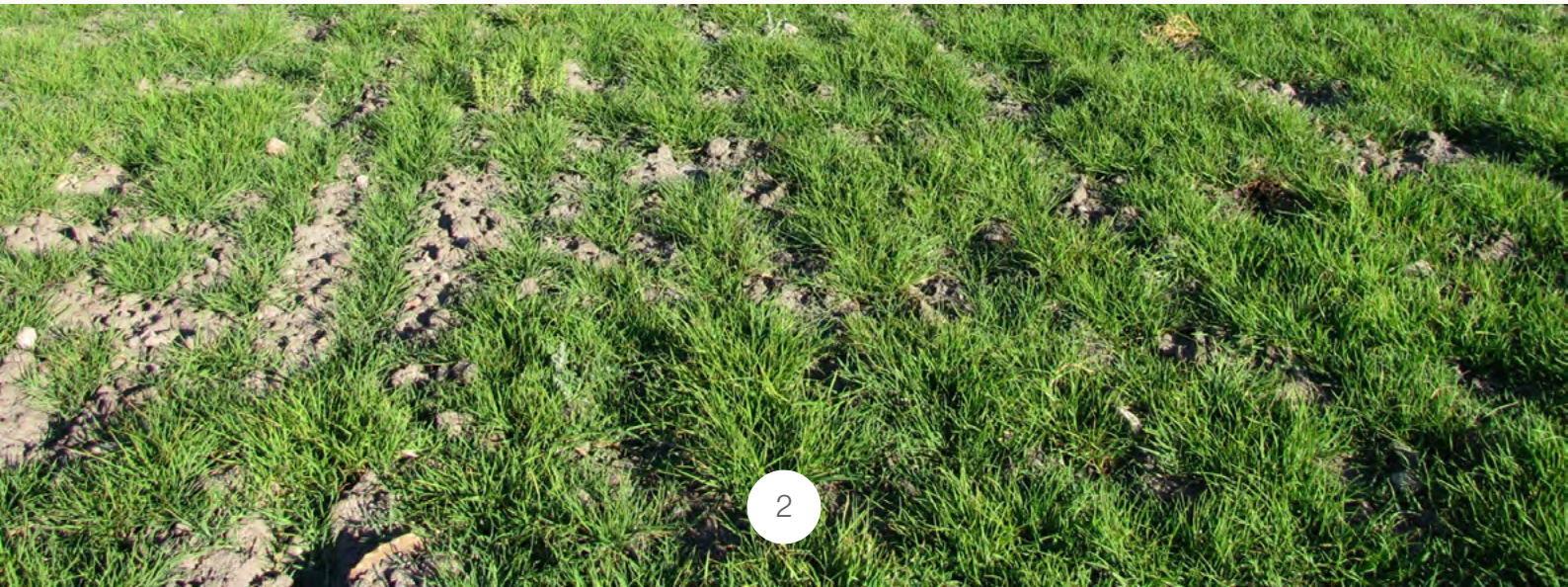
Much like building a house, the foundations must be in order before investing in a perennial pasture and it starts with the soil.

A soil test is the first step in determining if the soil has adequate fertility to support the proposed perennial species. If the soil is not suited to the intended pasture species, plant species that are better suited such as weeds will outcompete the perennial species and the longevity of the pasture will be compromised.

The usual depth for a soil test is 10cm. For perennials it is also important to determine soil constraints to root growth at between 30 and 50cm depth. A soil test is recommended at this depth focussing on pH and other soil constraints such as salinity.

The following are critical values or rules of thumb to achieve 90% potential maximum production:

1. pH >4.8 $_{CaCl2}$. Aluminium should be <10% exchangeable cations for sensitive species such as phalaris and lucerne or 20% exchangeable cations for acid tolerant plants.
2. Colwell P level is adequate based on the soils phosphorous buffering index (PBI) as per the **chart (right)**. This means that once the soil gets to the critical Colwell P, clover growth is not limited.
3. Colwell K > 120ppm
4. Sulphur >6mg/kg
5. Trace elements – zinc, copper, manganese, molybdenum, cobalt, selenium. Molybdenum in particular in acidic soils needs to be adequate to ensure optimum nitrogen fixation by rhizobia in the clover nodules. Trace element levels are best determined from young sub clover leaf samples collected in winter.



Getting the basics right: The right place in the landscape

Just like Goldilocks wanted her porridge just right, pasture species also have their preferred environmental conditions. For ease of understanding, this has been simplified in Table 1.

	TOLERANT OF:					
SPECIES	**Hot, dry summer**	**Prolonged waterlogging**	**Soil acidity (high Al)**	**Low soil fertility**	**High salinity**	**Preferred soil type**
Cocksfoot	Yes	No	Yes	Yes	No	Sand, Sandy loam
Phalaris	Yes	Yes	No	Yes	No	Sand, Sandy loam, Loam, Clay
Tall fescue	Yes	Yes	Yes	Yes	Moderate	Sandy loam, Loam
Perennial Ryegrass	No	Yes	Yes	No	No	Sandy loam, Loam
Kikuyu	Yes	Yes	Yes	Yes	Moderate	Deep sand, Sand, Sandy loam
Lucerne	Yes	No	No	Yes	No	Deep sand, Sand, Sandy loam, Loam
Plantain	No	Moderate	Moderate	Yes	No	Sand, Sandy loam, Loam
Chicory	Yes	Moderate	Yes	Yes	No	Deep sand, Sand
Puccinella	Yes	Yes	Moderate	Yes	Yes	Duplex soils with sodic subsoil, clays
Tall Wheatgrass	Yes	Yes	No	Moderate	Yes	Duplex soils, Clay loams to heavy clays

Getting the basics right: Pasture establishment

Insufficient weed control prior to sowing was the greatest cause of establishment failure in perennial grass-based pastures. For some species, such as the herbs plantain and chicory, there are limited registered broadleaf control options so getting the weeds under control is a must. Ideally there should be 3 attacks at the weed seed bank.

The general plan of attack for temperate pasture species:

Year 1:

Hay freeze in the spring with either glyphosate (controls everything) or paraquat (grasses only). Alternatively, knockdown with glyphosate and spring sow a fodder brassica. Leafy fodder brassicas will produce some pasture feed the following winter.

Year 2:

Knockdown before sowing hay or silage. Once baled, spray regrowth with glyphosate or paraquat to control regrowth for another 100% weed control.

Or knockdown before sowing a short-term cereal/annual ryegrass for winter feed before spraying it out in late winter for a spring pasture sowing.

Year 3:

Autumn – knockdown before sowing the pasture.

Obviously kikuyu, being a summer active species, needs to be sown in late winter/early spring as it requires soil temperatures above 15°C to germinate. Some interviewees, particularly those out west of the Island, also sowed the temperate species in spring with results heavily dependent on spring rainfall.

The advantages of spring sowing perennials are:

- No loss of grazing during the tight winter feed gap. This is particularly important if you have a late break to the season or running at full carrying capacity. It also means the new pasture can be grazed the following season.
- The warming soil conditions and longer daylength mean the pasture species can jump out of the ground and grow vigorously.
- Less slugs and snails since the conditions are drying off (season dependent).
- WARNING: For a select few farmers who were opportunistic and didn't have weed control down pat, a spring sowing disfavours the emergence of capeweed meaning there was less competition from this weed that would otherwise have occurred over the winter months. But there can still be a LOT of grasses that emerge in this situation. So be very, very careful.

If spring sowing into soil with good moisture holding capacity before August 15th, it is possible to include 2-3kg/ha sub clover. Alternatively, direct drill these early the following autumn as being an annual species with shallow root systems they can run into moisture stress quickly in spring.

When selecting pasture species, don't sow fast growing annuals such as annual ryegrass and balansa clover with slow growing perennial grasses. Perennial grasses invest heavily in roots in their first year and vigorous annuals will outcompete the perennials. Reserve the fast-growing species for hay mixes.

The interviewees commented that an earlier break to the season and hence earlier sowing gave better establishment.

Seeding depth and seed-soil contact are also imperative in ensuring the best strike especially for the very small seeds.

Getting the basics right: Grazing management

It is important to spell perennial pastures after grazing to allow the plants to fully recharge their root reserves.

In phalaris and cocksfoot, allow regrowth of four leaves and three leaves for perennial ryegrass. Lucerne is typically ready for grazing after it reaches the bud or early flowering stage. The rate of regrowth is dictated by soil moisture and temperature with warm temperature and adequate moisture maximising leaf emergence.

If unable to rotationally graze, there are some species and/or even cultivars that tolerate set stocking.

For example, kikuyu will tolerate set stocking. Likewise phalaris has growing points located below ground which protects from grazing damage compared with other species. Holdfast GT, where the 'GT' stands for grazing tolerance, has been bred to tolerate continuous grazing. However, keep in mind continuous grazing will considerably reduce the productivity of perennial grasses by up to 50-100%

Another important consideration is grazing over the dry season particularly in response to out of season rainfall. Some species may tolerate grazing for a short period followed by a long rest. This is where uncontrolled vermin can be problematic. Perennial ryegrass and cocksfoot can green up after summer rainfall and be vulnerable to overgrazing unless its regrown its full complement of live leaves; 3 or 4 respectively. The temptation to graze fresh phalaris shoots from out of season rain is tempered by the risk of staggers and sudden death.

Economics: Investing in pastures

The cheapest feed is the feed you grow on your own farm. But what is the real cost and is it a worthwhile investment?

Better pastures can lift production and create a range of extra benefits, but the investment needs to make financial sense. Working out the real value of investing in pastures can be tricky, and different people often come up with different figures. Putting a price on the extra feed grown by perennials is subjective and varies according to the management practices of the farmer.

There were two key thoughts in determining the extra value offered by perennials.

Thought 1:

There was no more extra feed with perennials over the calendar year but it grew at times when it was worth a lot more – i.e., it stretched the season. The perennials grew extra feed with out of season rain and had faster growth at the break of the season. The perennial grasses also gave an extension of around two weeks in the spring compared with an annual pasture. This additional growth was increased in a shut off spring offset followed by a late November rain, allowing the perennials to get going again, whereas the annuals were finished. In this situation, the value of the extra grown feed could be valued based on the going silage ~$300/ tonne dry matter.

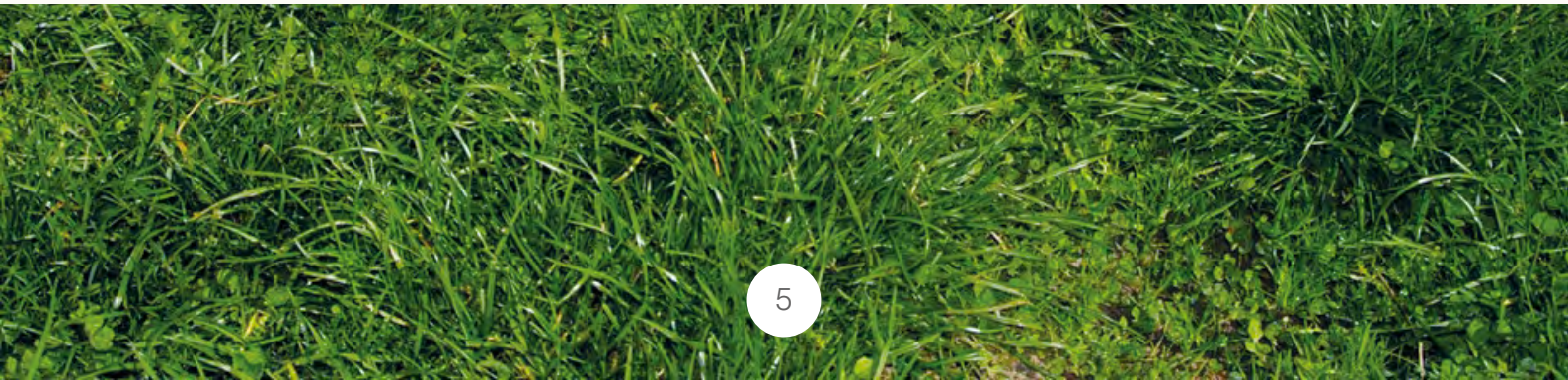
As a comparison, the cost per tonne of annual pasture is around $100/ tonne dry matter. Using the annual average growth of an annual pasture at Parndana of 6.5 tonne per hectare with a residual feed of 1 tonne leaves 5.5t/ha dry matter grown. Assume it costs $550/ha to grow including fertilizer and overheads (council rates, insurance, fuel) comes to $100/t DM for feed grown during the growing season.

Thought 2:

Lift in carrying capacity from pasture renovation.

Farmers commented that the best bang for buck was in soils that have high fertility and sown with the correct species. The interviewees were in agreeance that you wouldn't put kikuyu on your best soil as there were other species that would perform better and deliver a better return on investment.

Nonetheless, a low fertility deep sand can also be transformed into



something respectable with the right species, e.g. kikuyu, in this environment. Caleb Pratt, Stokes Bay reported a doubling of stocking rate from 5 DSE/ha growing silvergrass, pussytails and capeweed to 10 DSE/ha with kikuyu plus the added benefits offered with erosion control and a green pick with vitamins A, D and E over summer.

An example of the costs in establishing a perennial pasture (using contractor rates) is:

Year 1: Spring hay freeze. $10 spray costs +$20 application cost = $30/ha

Year 2: Spring hay freeze $30/ha

Year 3: Knockdown + insecticide $30/ha

Seed costs ~$120/ha plus sowing contractor $90/ha = $210/ha

TOTAL cash investment $300/ha over 3 years.

There is lost production in the establishment phase which could be valued at $200/ha so the total cost comes to $500/ha.

Further Assumptions:

Additional carrying capacity after establishment is 5 DSE/ha (from 5 DSE/ha to 10 DSE/ha)

The cost to buy extra stock at $100/DSE = $500/ha. Assume the stock have the same residual value at the end.

DSE = Dry Stock Equivalent: the energy requirement of a 45kg wether

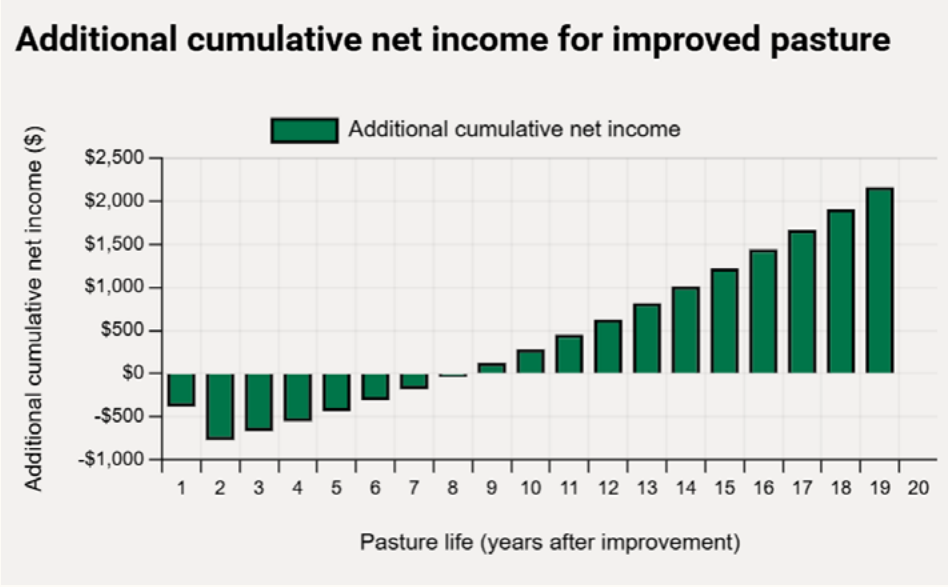
Profit per DSE is $20/ha before renovation and $25/DSE post due to dilution of overheads

Pasture is still at maximum productivity in 20 years

Interest of borrowed funds 7%

Is it a worthwhile investment?

Using the MLA Pasture Improvement Calculator provides the following...



Right: The graph shows the cumulative additional net income after interest and tax earned as a result of improving the pasture. Any value above zero therefore indicates the investment has generated more money at that particular time in the investment period than would have been the case had the pasture not been improved, while any value below zero indicates that the investore is worse off at the same point in time than they would have bene if they had not invested in pasture improvement.

MLA Pasture Improvement Calculator

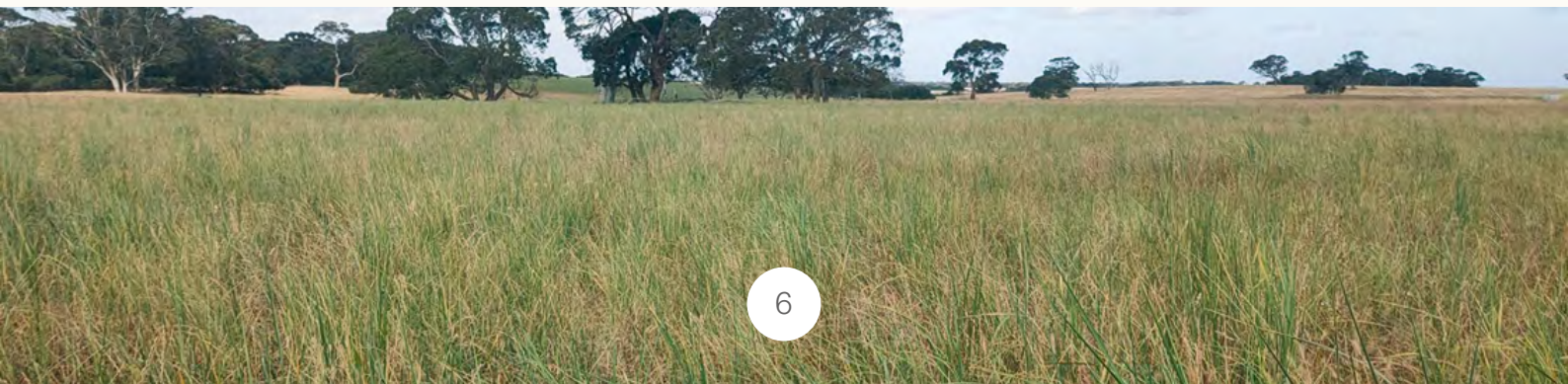
https://etools.mla.com.au/tools/pic/v230/#/

Using the above assumptions, it takes 8 years to break even investing in a kikuyu pasture assuming it doubles the stocking rate, maintains its productivity for 20 years and the producer consistently returns a profit of $25/DSE post renovation ($20/DSE prior). This factors in the costs of purchasing additional stock, and the interest of borrowing funds at 7%. These numbers reinforce the message that if you are going to invest in perennial pastures, **make sure you do it properly**. Changing the numbers changes the results, hence why it is important for each individual to input their own data.

More detailed information on the economics of pasture renovation can be found here:

EverGraze: Investing in pasture improvement

https://www.evergraze.com.au/library-content/investing-in-pasture-improvement/index.html



Summary

Perennial pastures can strengthen Kangaroo Island grazing systems by improving feed reliability, extending the growing season and increasing resilience, but only when species are well matched to soil type, landscape and management capacity. The project's farmer interviews show there is no universally superior species—each has distinct benefits and limitations. Establishment success requires multi-season weed control, addressing soil constraints, choosing the right sowing window, and protecting young plants from grazing and vermin. Long-term performance hinges on deliberate grazing management, including spelling to rebuild reserves and avoiding overgrazing after summer rain.

Economically, perennials are most valuable when they provide feed at critical times of year, reduce supplementary feeding costs, or lift carrying capacity on suitable soils or improve pasture composition in winter (less capeweed, silvergrass, geranium etc). Many growers found the financial return comes less from producing more total feed but more from producing feed when it is scarce—particularly in autumn or late spring. However, establishment costs and lost production during renovation mean perennials only pay their way when the system is set up to manage them well. When these fundamentals are in place, perennial pastures can be a profitable and durable part of KI livestock businesses, contributing to both productivity and long-term system resilience.

Rules of thumb

for successful perennial pasture establishment and persistence:

- Choose species based on its **likelihood to survive in the particular landscape** considering waterlogging and drought effects (Section 1, Table 1).
- **Assess soil fertility** via soil test and amend accordingly via fertiliser and liming.
- **Assess soil constraints** to root growth at 30-50cm depth
- **Aim for 100% weed control for 2 years before sowing**
- If surrounded by **high vermin pressure** – erect **exclusion fencing** or choose a more **continuous grazing tolerant species** or cultivar.
- Once sown, **ensure insect pests are controlled** (Red Legged Earth Mite, slugs, snails, cutworm etc.). This could be included in the knockdown spray or post sowing pre-emergent.
- **Practice rotational grazing** based on leaf emergence during the green season (grasses) or time and height for lucerne and herbs.
- **Keep stock off vulnerable species during the dry season.** Confinement or sacrificial paddocks may be necessary.
- **Consider if investing in perennial pastures is right for you** by crunching your own numbers.

Special thanks

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