How do I successfully establish a new pasture?

The issue:	Optimum feedbase production is essential to retaining and expanding a profitable global and domestic Australian red meat industry.
The impact:	Red meat production potential is not being achieved and opportunities to improve climate, environmental and financial resilience are being missed.
The opportunity:	Through investment in the feedbase and improved pasture management, producers can achieve sustainable and resilient production of red meat.

The feedbase – perennial, annual and native pastures and forage and dual-purpose crops – is the powerhouse of Australia's red meat, dairy and wool industries. MLA's Feedbase Investment Plan identified a potential gain of $25 million annually in on-farm returns from improvements in the southern feedbase. This gain would result from investment in new and existing pastures, better management and utilisation of the feedbase and the delivery of new, high-performing varieties.

A well-managed feedbase:

- underpins livestock productivity
- provides ground cover for soil protection and moisture retention
- improves long-term soil health
- increases resilience to climatic events
- enhances the ability of other factors in a livestock enterprise to reach optimum levels, such as genetics, animal health, market compliance and reproductive efficiency
- reduces livestock carbon emissions via efficient digestion and faster weight gain and turn-off
- reduces the impact of weed infestation.

Investment in new pastures is driven by the need to improve livestock productivity, lift environmental outcomes, increase climate resilience and, in mixed farming operations, manage long-term paddock rotations.

There are three approaches to deliver an improved feedbase: sowing a pasture in a bare landscape after a cropping phase; removal and replacement of original pasture or renovating existing pastures.

During the decision-making process on how pastures are to be improved, these factors need to be considered:

- why new pastures are needed and what their purpose will be
- whether the required inputs (financial, agronomic, human and machinery) are available
- which pasture types best suit the environment, soil type and livestock production system
- the capacity to utilise and manage pastures once established.

TOP TIP

Check out the Pasture Trial Network (PTN) variety selection tool. This MLA-funded and supported online tool allows you to assess and compare the performance of different pasture varieties by region and species, helping to ensure the greatest chance of success with your selection decision for your enterprise mix. Go to tools.mla.com.au/ptn/.

Don't forget to seek advice and support on pasture varieties from local agronomists, agriculture department staff, resellers, seed companies, livestock and animal health advisors, and neighbours.

Optimising establishment

Growing new pastures or improving existing pastures requires significant investment of time and money. Maximise the return on that investment by considering:

- the condition and constraints of the soil in the selected paddocks, using soil tests to establish nutrient deficiencies
- correct rates and application methods for fertiliser and nutrients prior to, during and post-sowing
- paddock preparation including fallow management, weed and pest control, and moisture retention
- seeding techniques according to machinery availability and rate, depth, row spacings and seed and fertiliser placement
- short and long-term seasonal climatic forecasts which support key dates for activities
- pre and post-emergent weed and pest control
- initial and subsequent grazing management.

How do I know if my pastures are not performing?

Start by monitoring and assessing dry matter (DM) production of existing pastures. Pasture mass and feed on offer (FOO) are both terms used to describe how much pasture is present in a paddock. Pasture mass typically assumes 300kg DM (0.5cm) is unavailable to livestock, while FOO includes all above-ground plant material. Thus, estimates of pasture mass are lower than the same estimate of FOO.

How do I measure DM?

Here are some tools:

Pasture rulers or 'sticks' that measure green pasture height are simple, cheap and easy to use. Heights are easily converted to an estimate of kilograms of green dry matter/ha via guides and tables. Download the MLA Tips & Tools: *Improving pasture use with the MLA Pasture Ruler* at publications.mla.com.au.

Rising plate meters measure total pasture mass, green and dry standing feed, and are based on a plate that rises up a probe depending on the amount of compressed pasture material between the plate and ground.

Electronic pasture probes measure dry matter of green material only. They are quick, easy to use and usually fully automated, including possessing the capacity to directly download readings into computers or apps.

Photo standards for pastures are available and give a good guide to the amount of FOO in a paddock. Photo standards are available through the Lifetime Ewe online manual.

Satellite imaging of pasture growth by annual pastures can be found at pasturesfromspace.csiro.au at either the shire level (free) or paddock scale (by subscription).

Producers are encouraged to learn how to establish DM/ha by taking samples of feed from across a paddock and bagging and weighing them. This allows production targets to be set according to the feedbase.

For example, if you have a 450kg steer (one animal equivalent [AE]) eating an average of 2% of his body weight a day, on average over a year he will eat 9kg/day. He'll eat a higher percentage of body weight when pasture nutrition is of high quality and less when pasture quality is low.

MLA's More Beef from Pastures program demonstrates how to take DM samples to estimate available FOO and suggests, after measuring the dry matter production, pasture composition is assessed by counting the plants in a set area at numerous locations across a site.

Pasture composition – for optimum production

- Legume component in pastures as companion to introduced grass species – minimum of 20%, maximum of 30% unless paddock is to be used specifically for high animal production (growth rates), in which case a higher maximum legume content may be desirable (up to 40%). Take precautions to avoid bloat in cattle when legume content is towards maximum limits.
- Legume content in native pastures – maximum of 20%.
- Productive and perennial grasses – minimum of 60%, maximum of 80%.
- Annual grass and broadleaf weeds – maximum of 10%.
- Bare ground – maximum of 10%.
- Noxious weeds must not be included in pasture composition.

Pasture composition – number and proportion of desirable perennial grass species

The most appropriate number and relative proportion of desirable perennial grass species within the total perennial grass component of a pasture will vary with the genetic capacity for growth and quality of each species and the objectives set for that pasture zone. The limits stated in the following are a guide only:

- High-input grass-based pastures – maximum limit of two desirable grass species (difficulty of grazing management increases with number of species), with combined minimum composition of 90% of total grass component of pasture mix.
- General purpose pasture zones (native, introduced or a mix) – minimum of two desirable grass species with the dominant species a maximum of 60% of total desirable grass component.
- Special purpose pastures – limits will be defined by purpose (e.g. one species, such as tetraploid ryegrass, may be used in a short-term, high-performance pasture).

Coming up ...

MLA's Feedbase Investment Plan supported research into improving DM measurement using NDVI (normalised difference vegetation index), which involves satellites delivering a map of vegetation. The aim was to offer a tool which overcomes the challenges of traditional DM measurement (time consuming and low accuracy). The project found:

- an Android-compatible mobile device application provides a simple tool users can employ to enter NDVI and pasture height values, select a calibration and obtain a reasonably accurate feed estimate
- NDVI from affordable active optical sensors (AOS) has the potential to provide pasture biomass estimates
- in many pastures, the inclusion of height measures improves the outcome.

Preparation

Start with the soil

Undertake a full assessment of the soil and its nutrient levels through visual examination, looking into paddock history and soil testing. Soils which are acid, sodic, saline, nitrate deficient or too high in aluminium will limit the productivity of new and improved pastures. Applications of lime are beneficial if soils have a pHCa below 4.6.

Nutrients essential for pasture growth include:

- nitrogen – available from urea and ammonium fertilisers or via legume-based species
- phosphorus – a frequently limited nutrient in Australian soils, applied as superphosphate and can be broadcast on existing pastures and placed in the soil during the sowing of new pastures
- potassium – a common deficiency in soils with a history of cropping or hay removal and is available as murate of potash
- sulfur – can be applied in single superphosphate and gypsum, and supplies sulfur and calcium
- calcium – important to soil structure and is a component of lime, dolomite and gypsum
- magnesium – deficiency is seen in acid sandy soils and impacts animal health; can be rectified with dolomite or dolomite/lime mixtures.

What is inoculation and is it necessary?

Rhizobium is a soil bacterium which fixes nitrogen inside the root nodules of legumes and, in turn, supports the plant to produce nitrogen which is returned to the soil.

Unless the roots are nodulated by effective strains of rhizobia, the plant will source its nitrogen from the soil and deplete soil reserves. When rhizobia are not present in high numbers in the soil, they must be introduced via a process called seed inoculation.

Inoculated seed can also be pelleted to provide a protective layer of fine lime to improve rhizobia survival.

Nitrogen increases via legume pastures have benefits for companion grasses as the nitrogen cycles over time and grain yield and quality is improved in cereal crops.

Inoculation of seed is considered cheap insurance.

When deciding on inoculation, producers need to consider the following:

1. The paddock history – have well-nodulated plants of the same species or those which require the same inoculant group been present, or is the legume new to the paddock?
2. What is the length of the previous pasture rotation?
3. Can an ideal environment for optimum rhizobia survival be guaranteed (soil moisture, temperature and pH)?

Sowing and seeding

Producers have three choices when planting a new pasture:

1. Conventional sowing. This technique involves preparation of the soil using cultivation and harrows and, provided weed control and nutrition is well managed, can deliver optimal establishment due to improved seed-to-soil contact and germination.
2. Minimum and no-till. A higher degree of management is needed to ensure successful soil-to-seed contact but, by using well set-up equipment and press wheels, the benefits are minimal soil disruption and reduced weed germination.
3. Broadcasting. This is an option in challenging or timbered terrain or across vast landscapes, and can be carried out by air or from a vehicle. Germination can be limited due to poor soil-to-seed contact and fertiliser placement.

Regardless of the sowing method, to ensure establishment success producers need to:

- source the freshest seed available
- sow in the optimum seeding window – autumn is considered ideal in southern systems for reducing the risk of failure from heat and moisture stress
- follow seed company and agronomic advice on seed inoculation and pest control
- ensure seeding equipment is correctly calibrated to meet the spacing and seed rates recommended for the species.

Even more options ...

MLA's Feedbase Investment Plan funded a project exploring how to increase feedbase production and quality of subtropical grass-based pastures. As a result, producers in northern inland and central west NSW can access information on incorporating temperate and tropical companion legumes into their tropical grass pastures to lift production.

Research revealed the following:

Desmanthus was found to be a productive companion legume which does not compete with Digit grass, is bloat resistant, sets large quantities of seed and has a high proportion of hard seed with a slow breakdown providing persistence.

Leucaena (grown widely in northern Australia) can persist in northern inland and central west NSW if good preparation is undertaken before seeding. While it is not as productive as lucerne and provides forage for a shorter growing season, it can be grazed from December to May and produces green forage during low rainfall. Currently considered an environmental weed in these regions, producers need to wait for the development of a sterile line.

Temperate legumes sown in autumn, either before or after a tropical grass, achieved the highest productivity.

Tropical grass pastures with a plant density of 4–9 plants/m^2 are optimum for herbage production and water use efficiency.

Lucerne is productive in mixed pastures with tropical grasses but is highly competitive with tropical grass, which could reduce lifetime productivity.

Tropical grass pastures have increased risk of failure in central west NSW due to low seasonal rainfall.

Pasture legumes in the mixed farming zones of WA and NSW: shifting the baseline

Research funded via the Feedbase Investment Plan also helped develop agronomy packages for hard-seeded annual pasture legumes such as serradella, arrowleaf clover, biserrula, bladder clover and gland clover.

The project found the following:

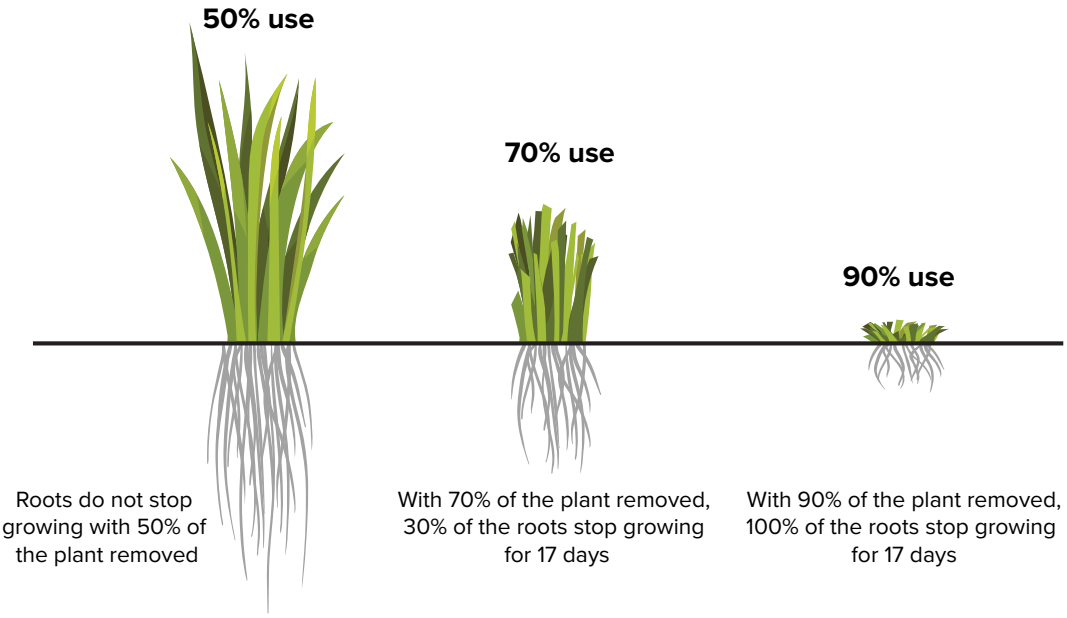
- In WA and NSW, these legumes can be established with summer dry sowing, as a standalone crop with autumn sowing or by twin-sowing with a cereal crop.
- They must be inoculated with rhizobia and protected from heat in the summer sowing operation to be successful and allow N fixation.
- If established well, the alternative legumes increase animal weight gain and carrying capacity on suitable soils.
- These legumes are resilient in the face of intensification of cropping activities, but care must be taken with herbicide application in the crop phase.
- Most of the alternative legumes have much smaller seed than sub-clover and annual medics.
- Smaller seed size enables a higher proportion of ingested seed to escape digestion.
- As with any new pasture sowing, first-year focus should be on establishing a large and resilient seedbank for subsequent years of regeneration.
- Low weed pressure is essential in the establishment year.
- Sowing time can have a significant impact on seed production, hence the project recommends sowing as early as possible in the season to take advantage of warm, wet conditions.
- Plant growth habit has an impact on seed production under grazing, but under normal stocking rates this is not a threat to long-term persistence of the feedbase.
- Plant residues need to be grazed to encourage hard seed breakdown.
- Producers should aim to allow moderate seed set for seed bank replenishment at least every three years.
- The new pastures are deeper rooted than clovers and medics and provide some protection against false breaks and dry periods in the winter months.

Pasture establishment checklist

Before grazing newly established pastures you need to ...

- manage weeds and pests
- ensure plants are well anchored
- make sure the soil has a good moisture profile
- have plants at 10–15cm high
- be prepared to manage the first grazing carefully
- plan ahead to rest the paddock for seed set in the first year.

Figure 1. The impact of grazing on root growth.



Managing the establishment phase

After the process of planning, selection and sowing of new pastures, good establishment results from post-emergent management. It is this period of management which can set up a persistent and productive pasture with a long lifetime.

This includes:

Zero tolerance of weeds and pests. Checks for pests and weed emergence at 10–14 day intervals after sowing. Insects are more likely to be present in direct drilled than conventionally sown pastures. If earth mites are found, treat pastures with the recommended pesticide immediately. Slugs can be a problem in warm, moist conditions and can be detected by leaving boards or wet paper at sites for monitoring. Slug bait can be used at sowing or soon after for effective results.

Weeds can be controlled with selective herbicides.

Let the grazing begin

If plants are 10–15cm tall and well anchored with good soil moisture, graze heavily and quickly down to 2.5cm and allow to rest. However, do not graze heavily if conditions are dry or pasture is slow to grow.

Allow seed set in the first year and avoid cutting for hay until the following year at the earliest.

Once the plants are well established, good pastures result from well managed grazing patterns – generally a combination of set stocking and rotational grazing.

More information

MLA's Pasture Tools including: *Feedbase Planning and Budgetting tool,* and *Phosphorus Tool* etools.mla.com.au/hub/

MLA's Tips & Tools at mla.com.au/publications including:

Making the most of phosphorus fertiliser applied to soils

Pasture tools for a profitable beef enterprise

Managing soils to keep them healthy and productive

MLA's R&D reports: *Increase feedbase production and quality of subtropical grass based pastures (NSW)* *mla.com.au/research-and-development/*

EverGraze: *On-farm Options: Selecting Pastures for Place and Purpose* fact sheet evergraze.com.au

NSW Department of Primary Industries:
Eight steps to successful perennial pasture establishment

Fertilisers for Pastures manual

The *EverGraze Pasture Improvement Calculator*: evergraze.com.au

Making More from Sheep's: *Grow More Pasture* module and *Pasture assessment techniques* tool makingmorefromsheep.com.au

More Beef from Pastures: *Pasture growth: Build and maintain soil nutrients* module and *Pasture utilisation* modules mbfp.mla.com.au

MEAT & LIVESTOCK AUSTRALIA

Meat & Livestock Australia
Level 1, 40 Mount Street
North Sydney NSW 2060
Ph: 02 9463 9333
mla.com.au