

## Rejuvenation of run-down perennial pastures

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**Abstract:** *Persistence of productive, high quality perennial pastures remains one of the greater challenges in our grazing systems. Pasture decline can be the result of several causal factors, including overgrazing, lack of soil fertility, drought or poor species selection. An assessment of existing pastures is required before embarking on any renovation program, to determine the most appropriate course of action. In many cases, complete pasture re-sowing is not required and less expensive pasture manipulation techniques can be used to rejuvenate these paddocks into highly productive perennial pastures. Techniques including non-sowing management options as well as over-sowing of existing stands are discussed in detail.*

**Key words:** degraded, management, over-sowing.

### Introduction

Run-down perennial pastures lead to lower productivity usually as a result of a low proportion of desirable species. Perennial pastures, both introduced and native, can become degraded for various reasons including, overgrazing, lack of fertility, drought and inappropriate choice of species at sowing. The cost to establish new pastures is significant and can be in excess of \$450/ha. With variable seasons and market fluctuations, often it can be difficult to recoup these costs within a reasonable time frame (Leech *et al.* 2009). It is not uncommon to find it may take at least 7 years to get a return on investment when establishing new pastures and if one or more seasons are very dry the payback period will be even longer. The decision to either replace or attempt pasture species manipulation or rejuvenation should involve (Leech *et al.* 2009):

- assessment of the current species present;
- understanding the contribution of each species to the pasture system and their agronomic requirements;
- understanding techniques available to manipulate pastures; and
- development and implementation of a plan to progress pasture composition to more desirable species.

A summary of pasture assessment strategies and pasture manipulation techniques are discussed including both non-sowing management options as well as over-sowing an existing run-

down pasture.

### Assessing the pasture

Don't be too quick to condemn an existing run-down pasture. Before commencing any program to rejuvenate a degraded perennial pastures, it is important to consider the following questions (Leech *et al.* 2009):

- Why has the pasture degraded?
- How much of the paddock has degraded?
- What is the proportion or percentage of desirable pasture species still present?
  - if perennial cover is limited (<5 perennial plants/m<sup>2</sup>) consider re-sowing pasture;
  - if >5 perennial plants/m<sup>2</sup>, consider techniques to thicken pasture. This would be species specific.
  - Note these figures are only a guide and not based on field research.
- What other issues (e.g. pest animal grazing, weeds, ground cover and erosion) need to be managed? If aggressive weeds (e.g. serrated tussock, fireweed, African lovegrass, Paterson's curse, vulpia) are present there may be no choice but to clean the paddock up by cropping for a few years to deplete weed seed banks, followed then by re-sowing of a new pasture. If kangaroo numbers are high an exclusion fence may need to be erected as the first part of the plan.

Addressing these questions will help to decide the state of the existing perennial pasture and whether action is required to rejuvenate or improve the pasture.

There are many factors that can lead to pasture degradation and lower productivity but some of the more common ones include declining soil fertility levels, overgrazing, drought, limited soil depth, harsh aspect, inappropriate species choice at sowing, pest damage and weed invasion. If strategies are taken to thicken-up a run-down pasture it is important that future management be aimed at maintaining the improved pasture and recognise this may require a change in management (Leech *et al.* 2009).

Key factors in assessing run-down pastures include:

- Determining species composition: learn to identify/recognise the species present and their contribution to the production system during the year;
- Consideration of ground cover throughout the year;
- Determining pasture variability across the paddock due to aspect, changes in soil type, wet gullies, uneven grazing and competition from weeds. This will help to decide if it is best to treat the paddock as a whole or in sections. Re-fencing of the paddock maybe a consideration;
- How does the paddock fit within the system? Is it used for lambing due to location? Is it part of a bigger grazing rotation? Does it help provide winter feed for ewe carrying capacity or summer feed for finishing?
- If there are large areas of degraded pasture, is it more economic to run less stock but not have the expense of pasture sowing?
- Soil testing: phosphorus (P) and sulphur (S) are key drivers of productivity in grazing systems. If P and S levels are low these nutrients may need addressing as a priority. Soil pH must also be monitored and attention given to increasing soil pH where more acid sensitive species are present or are to be sown.
- Can it be just as productive as an annual species dominant pasture for the current enterprises?
- Prioritise works: it is rarely possible to achieve perfect pastures in every paddock.
- Mapping and colour coding different treat-

ment areas may be an important part of your plan.

## Methods to improve pasture composition

Various techniques can be employed to improve the composition of desirable pasture species and the resulting productivity. Often simple and less expensive non-sowing management options can be very successful. Where there is more severe pasture degradation, over-sowing and introducing new species into the existing pasture may be a better option.

### 1. Non-sowing management options

Non-sowing management options can take several years to achieve a significant change in pasture composition, but they may prove to be the most cost-effective. It is important to recognise that often several options may be required to sufficiently improve pasture composition and productivity in order to avoid the need for costly pasture re-sowing (Leech *et al.* 2009). The following discussion highlights the key non-sowing management options available.

### Herbicides

- *Selective spraying* to kill specific broadleaf or grass weeds to reduce competition and allow the desirable species to grow and dominate the pasture (e.g. the technique of ‘winter cleaning’ with simazine to remove some annual grasses and spraying broadleaf weeds with selective herbicides).
- *Spray grazing* involves the selective removal of broadleaf weeds using sub-lethal rates of hormone herbicides combined with heavy grazing (sheep only, using at least double normal stocking rates). This technique results in no permanent damage to established pasture legume, has no effect on grasses and is inexpensive due to the use of low rates of herbicide.
- *Spray topping* involves the application of low rates of specific herbicides (e.g. glyphosate or paraquat) applied after head emergence of the annual grass weeds and some other broadleaf weeds, e.g. capeweed. This technique prevents the formation of viable seed and reduces

the density of the weeds in question in the following years.

### Fertiliser

- Fertilising to address key nutrient deficiencies will help desirable pasture species to remain productive. Under low fertility, useful pasture species tend to decline, and low production weed species (e.g. vulpia, flatweed, sorrel) can invade and dominate.
- Deficiencies of nitrogen (N), phosphorous (P), sulphur (S) and molybdenum (Mo) are common in many pastures. A healthy legume component in the pasture is crucial to improve feed quality and to provide nitrogen to the grass component. Legumes have a higher requirement for P, S and Mo than grasses and without legumes grasses will require N fertilisers to persist and produce.

### Grazing Management

Strategic grazing can be used to manipulate the pasture to favour the persistence and productivity of the desirable species. This involves a combination of spelling and hard grazing where the timing of rest or heavy grazing must coincide with particular stages of plant growth. Following are some examples of strategic grazing management techniques:

- Heavy grazing of annual grass and broadleaf weeds at flowering time can be used to reduce the seed set of these less desirable species.
- Some native perennial grass pastures need to be grazed reasonably hard in spring to reduce annual grasses and broadleaf species from shading and outcompeting the desirable natives, e.g. redgrass and wallaby grass.
- In paddocks with large amounts of dry matter present, heavy grazing in summer is useful to reduce the bulk, in preparation for allowing pastures to respond to an autumn break. It can also be useful to heavily graze some paddocks in late winter/early spring to avoid excess biomass accumulation, especially where it is logistically difficult to graze down prior to autumn, e.g. paddocks that have no secure water over summer;
- Spelling or light grazing of a pasture can allow desirable plants to set seed for recruitment,

e.g. ryegrass/ocksfoot in late spring and most native grasses in late spring/summer.

- For temperate pastures (e.g. cocksfoot) that have been allowed to seed in spring, a heavy autumn grazing may help recruitment of useful species by reducing trash and trampling seeds into the ground. It is important to note that allowing new seedlings to successfully establish after germination will require a spell from grazing, particularly with sheep.
- Continuous vs rotational grazing: continuous grazing over an extended period of time may damage some desirable species in the paddock (e.g. perennial ryegrass and lucerne), compared to rotational grazing (particularly at higher stocking rates).
- During extended dry conditions, drought lot feeding is a useful tool to spell and preserve desirable perennial pastures.

In run-down pastures a combination of grazing management techniques can often be used to successfully increase the perennial pasture species population. There is no one size fits all, but an example of a grazing plan is as follows:

- Rotational grazing from autumn through to late winter, involving a resting period of 10-12 weeks between grazing events, will allow perennial plants to recover and accumulate leaf area/root reserves;
- Following the above with conservative set stocking in early spring/summer to encourage good seed set of the perennial plants.

An example of how grazing management can affect pasture density was shown by Ward (2008) on a Gunnedah property where pasture decline was a key issue during the late 1990's. A change in grazing management from set stocking to rotational grazing in 1998 resulted in a decrease in the amount of bare ground from 85% in January 1998 to 15% by March 2006. Plants of all types increased ground cover from 3% to 57%, and the average distance between perennial plants decreased from 37 cm in 1998 to 3 cm in 2006 (Figure 1). This was despite some very dry periods where the farm received around half its average annual rainfall in 1999, 2000 and 2002 (average rainfall was 500–600 mm and summer dominant). Initially paddocks were dominated by tap-rooted weeds, such as saffron thistle and

poppies, but this gradually changed over time with more grasses dominating the sward.

## 2. Over-sowing new species into an existing pasture

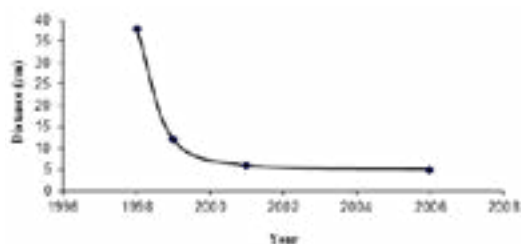
Sowing new pasture species into an existing pasture is termed over-sowing and can be an effective tool to thicken-up degraded pastures. This over-sowing method is non-destructive to the existing pasture sward and may be considered when there is an insufficient quantity of legume or when levels of desirable perennial pasture species are low and require topping up (Leech *et al.* 2009). Note that in heavily degraded perennial pastures i.e. nil or minimal desirable perennial species left, it is advised that a complete re-sowing of new pasture should occur. Complete re-sowing of new pastures is expensive and may take the paddock out of production for 12–18 months to ensure good establishment of the newly sown species. Over-sowing strategies can range from relatively cheap (e.g. broadcasting legume seed) to almost as expensive as complete re-sowing (e.g. removing weeds and direct drilling perennial grasses).

In any pasture establishment program there can be a high level of risk involved. Success will depend on many factors such as rainfall, stored soil moisture, weed competition, suitability of pasture species being sown and the time of year. Each of these factors should be considered to give some context as to where and under what circumstances this strategy will work and allow for an economic comparison of options (Leech *et al.* 2009). The 'NSW DPI Eight Steps to Successful Perennial Pasture Establishment' (Ayres *et al.* 2016) is a useful guide to follow

when over-sowing into an existing pasture to help minimise risk factors. These steps are outlined as follows:

1. *Assess, select and plan early (1–2 years before):* Assess existing pasture, weeds, pests and soil fertility.
2. *Control of weed and pests in planning years:* Prevent weeds and pests from seeding/reproducing.
3. *Pre-sowing activities:* Remove excess plant material before sowing.
4. *Absolute weed and pest control:* Allow full weed germination after rain then graze to keep weeds small until moisture in the profile is right for sowing. Use appropriate herbicides just prior to sowing to control all grass and broadleaf weeds present.
5. *Adequate soil moisture:* Temperate species: do not dry sow – ensure a moist profile from the surface to 200 mm. Tropical species: ensure 1 m stored soil moisture and soil temperature >18°C at 9 am for 3 consecutive days.
6. *Accurate seed placement:* Aim for 5 mm of tilth over the seed. Direct drill rule of thumb: 5% of seed and/or fertiliser still visible in the furrow.
7. *Monitor weeds and pests:* Look for pests and weed seedlings every 10–14 days after sowing.
8. *Grazing:* Temperate species – do not graze unless plants are well anchored, soil is moist and plant height is a minimum of 150 mm. Preferably graze with younger stock. Tropical species – do not graze until plants have seeded down.

Figure 1. Effect of rotational grazing on perennial plant survival and density. Distance (cm) between perennial plants along a permanent transect on the property "Glenbrae", Gunnedah, NSW are shown.



Source: Ward 2008.

The following are some examples of the range of over-sowing techniques used in NSW.

- Addition of legume seed by broadcasting or direct drilling lime pelleted, inoculated legume seed into a native or legume deficient perennial grass dominant pasture. In most situations a lower establishment can result from broadcasting legume seed compared to drilling the seed into the soil.
- Using an appropriate herbicide and rate to selectively remove unwanted species or retard useful pastures and direct drilling new species

into the existing pasture (e.g. paraquat, low rates of glyphosate or a selective herbicide, such as MCPA, 2,4-D or dicamba). Take care not to use residual herbicides such as metsulfuron or dicamba too close to sowing (always refer to herbicide label plant back details).

Over-sowing may involve the whole paddock or may only be required in some parts of the paddock where the useful species have thinned out. Doing only part of the paddock will always be a cheaper option but may require either temporary or permanent re-fencing. This will enable the area not sown to still be grazed while the re-sown area can be established and then managed to prevent the loss of the newly sown species. Grazing of the newly sown pasture should only occur once the plants are sufficiently well established (well anchored) or in some circumstances has set seed. For example, perennial grasses over-sown into existing pasture in late autumn/winter may need to be rested until late summer or the following autumn.

### Successes, failures, traps

Be aware that there are no shortcuts when over-sowing pastures. A planned approach is essential for optimum results. There is no set recipe to follow, but some general principles to follow include:

#### **Year 1 – In the year before sowing:**

- Contain seed set of annual grasses and broadleaf weeds by using either the winter cleaning (selective herbicides used in winter to kill the annual grasses) or spray topping (herbicides used in spring to sterilise the annual grass seeds) techniques.
- It will be important to control earthmite numbers during establishment of new pasture species. The inclusion of an insecticide in the spring prior to establishment and also in the autumn at sowing is a recommended Integrated Pest Management (IPM) strategy. For the control of red-legged earth mite (RLEM) only it is important that this is done in conjunction with the Timerite® program (Ridsdill-Smith TJ and Pavri 2015).

- Soil test to correct fertility and soil acidity constraints. The 'Five Easy Steps' Phosphorus Tool is a useful resource to help guide graziers on fertiliser management (Simpson *et al.* 2009).

#### **Year 2 – In the year of sowing:**

- Wait for the annual weeds to germinate and then spray with either glyphosate or a mix of paraquat/diquat herbicides. The pasture can be grazed prior to spraying. The critical point is to keep annual weeds small to ensure they have a small root system. It is important to leave from 1–2.5 cm height of leaf on plants prior to spraying to allow the applied chemical to work effectively.
- Over-sow with additional perennial grasses/herbs suitable for the pastures intended purpose and soil/climatic constraints.

#### **Year 3 – Maintenance phase:**

- Maintain soil fertility by annual topdressing in accordance with soil test results and understanding of key critical soil nutrient thresholds (Simpson *et al.* 2009) and implement grazing strategies for persistence and production. PROGRAZE® offers landholders guidance for best practice management of perennial pastures for sustainable and profitable grazing systems (Graham 2017).

Failures typically occur when short cuts are taken. Each of the above steps is critical to the success of the pasture over-sowing technique. However, if a more opportunistic approach is taken (e.g. no annual grass control in the previous spring), the technique becomes a much riskier strategy. A more opportunistic approach may suffice as a short-term solution for run-down paddocks particularly if sowing species with good seedling vigour (e.g. perennial ryegrass).

### Conclusion

Degraded pastures can eventuate for a variety of reasons, including overgrazing, declining soil fertility, drought, or poor species selection. Before embarking on an expensive re-sowing program, always assess the current status of your pasture to determine the best course of

action. Once all factors have been considered, implement a planned approach to rejuvenate the pasture for optimum success. Finally, ensure management practices are employed to ensure ongoing survival and persistence of the rejuvenated pasture.

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