

Rejuvenating perennial pastures

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Introduction

A degraded pasture has low productivity usually as a result of a low proportion of desirable species. In NSW many perennial pastures, both introduced and native, are degraded for various reasons, e.g. drought, overgrazing, lack of fertility or inappropriate choice of species at sowing. (**See the final note under 'Pasture improvement cautions' relating to native species.) The cost of re-sowing these pastures has recently increased dramatically and can be in excess of \$300/ha. Often it can be difficult to recoup these costs within a reasonable time frame. Deciding whether to replace or attempt pasture species manipulation or rejuvenation becomes a very important decision. In order to decide what to do you need to be able to:

- assess the species currently there;
- understand the contribution of each species to the pasture system and the agronomic attributes for effective management;
- understand the techniques available to manipulate pastures; and
- develop a plan to improve the pasture composition to more desirable species.

The following information will provide you with help to assess your pasture and gain a better understanding of how the options available can manipulate pastures.

Assessing the pasture

Before you commence any program to improve or thicken-up degraded perennial pastures, first ask:

- Why has the pasture degraded?
- How much of the paddock has degraded?
- What is the proportion or percentage of desirable pasture species currently present?
- What other issues (e.g. weeds, ground cover) also need to be managed?

Answers to these questions will help you to decide how good your perennial pasture is and whether you need to take some action to rejuvenate or improve the pasture.

Possible reasons for pasture degradation or low productivity are falling soil fertility levels, drought, overgrazing, limited soil depth, harsh aspect, inappropriate species choice, pest damage and weed invasion, to name a few. Whatever your plan for improvement is, you need to be sure that future management is aimed at maintaining the improved pasture. In some circumstances it may be necessary to treat only some parts of the paddock.

Two key factors in assessing pastures are determining species composition and determining pasture variability across the paddock.

Determining species composition

- Learn to identify/recognise the species present in your paddock.
- Use a technique to assess the groundcover and proportion of desirable pasture species present across the whole paddock. Appendix 1 details a number of methods for measuring botanical composition and groundcover. Appendix 2 provides a template pasture composition recording sheet.

Determining pasture variability across the paddock

- This may be caused by aspect, shallow soils, wet gullies, uneven grazing, particularly by sheep, and competition from weeds, e.g. thistles on sheep camps.
- You need to determine the proportion of the paddock that is degraded and determine whether the desirable species are present in all



parts of the paddock. This will help you to decide if you treat the paddock as a whole or in sections.

There are other things that also contribute to the productivity of a pasture. Some of the following questions raise issues that need to be considered when thinking of the value of the pasture in relation to the whole farm.

- How does the paddock fit within the system? Do I need it for lambing due to location? Is it part of a bigger grazing rotation? Do I need winter feed for ewe carrying capacity or summer feed for finishing?
- If I have large areas of degraded pasture is it more economic to run less stock but not have the expense of pasture sowing?
- Can it be just as productive as an annual dominant pasture?
- If it is sown to new pasture it may not be profitable on a simple paddock analysis but it may add significant value to the system by the nature of its feed supply, e.g. a lucerne paddock to fatten lambs.

If you are not happy with your current pasture composition then there are many techniques that can be used to attempt to improve or replace it and your assessment of the pasture is important in determining the suitability of the various techniques you can use. If required contact a NSW DPI Agronomist to help with the assessment of your pasture.

Techniques to improve pasture composition

There are various levels of action that can be taken to improve the desirable pasture species composition and productivity. These range from simple and less expensive non-sowing management options to over-sowing or introducing new species into the existing pasture or finally total replacement of the existing pasture. The non-sowing management options may take several years to achieve a significant change in pasture composition but they may result in the greatest change for each dollar spent. Various options and combinations of these are often used to improve pasture composition and productivity sufficiently to avoid the need for costly pasture re-sowing.

1. Non-sowing management options

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 winter cleaning technique to remove annual grasses.

- **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 your existing stocking rate). 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 certain herbicides (e.g. glyphosate or paraquat) applied after head emergence on annual grass weeds to prevent the formation of viable seed and to reduce the density of these annual grasses in the following year.

Fertiliser

- Fertilising to address nutrient deficiencies will ensure that desirable pasture species grow to their potential. In low fertility situations useful pasture species tend to decline and low production weed species (e.g. vulpia, cat's ear, sorrel) can invade and dominate.
- Deficiencies of nitrogen (N), phosphorous (P), sulphur (S) and molybdenum (Mo) are common in many pastures. It is important to have a healthy legume component to improve feed quality and to provide nitrogen to the grass component. Legumes have a higher fertility requirement for P, S and Mo than grasses and without legumes grasses will require N fertilisers in order to persist and produce.

Grazing Management

Strategic grazing of pastures involves a combination of spelling and hard grazing. This can be used to manipulate the pasture to favour the persistence and productivity of the desirable species. The timing of rest or heavy grazing must coincide with particular stages of plant growth, for example a heavy grazing to target non-desirable species and a rest to allow desirable species to set seed. The 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 pastures need to be grazed reasonably hard in late spring to reduce shading and competition from annuals to avoid their decline, e.g. redgrass and wallaby grass.
- Heavy grazing is also useful to reduce bulky dry matter over summer in preparation for allowing pastures to respond to an autumn break. It can also be useful to heavily graze some paddocks in late winter/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. Also if a paddock has had excess growth for one or more seasons it may be a priority at times to do this to keep clover in the system. However, ensure that adequate ground cover is maintained over the summer period.

- Spelling or light grazing of a pasture can allow desirable plants to set seed for recruitment, e.g. ryegrass/cocksfoot in late spring and most native grasses in late spring/summer.
- With temperate pastures 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. Allowing new seedlings to successfully establish after germination requires a spell from grazing, particularly with sheep.

Some examples of successful grazing management for maintaining pastures are set out below.

- Spelling of pastures after the autumn break is highly advantageous in allowing the desirable plants to build leaf area and re-establish.
- Paddocks should be de-stocked during extended dry spells or droughts. It is important to maintain groundcover for soil protection and maintain sufficient biomass to protect perennial grasses from desiccation over summer.
- Paddocks containing a number of aspects should not be continuously stocked as this can result in selective grazing and may degrade parts of the paddock – for example north facing slopes with grazing sheep. Fencing on aspect will overcome this problem if appropriate.
- Continuous grazing may kill the more desirable species in the paddock, e.g. continuous grazing of summer active species such as perennial ryegrass and lucerne.
- Rotational grazing at higher stocking rates reduces the level of selectivity.
- Rest allows perennial plants to accumulate leaf area and root reserves. This can be achieved by carefully planned rotational grazing or periods of set stocking. It depends on how the system is planned.
- Set stocking (continual defoliation) in late summer/autumn when useful perennial plants are often under moisture stress may lead to their death, whereas continual defoliation in spring may cause no harm. A light grazing under moisture stressed conditions can reduce leaf area and assist in the survival of summer active pasture species, e.g. lucerne and chicory.

Results from various experiments and observations have shown that a run of good seasons will often result in an increase in the valuable perennial grass component of pastures. This improvement can be greatly increased where management techniques

such as strategic grazing, fertiliser use and weed control are targeted at improving pasture composition and production.

2. Over-sowing an existing pasture

Degraded pastures can be improved or rejuvenated by sowing new pasture species into the existing pasture. This non-destructive addition to the pasture may be necessary because there is an insufficient quantity of legume or useful perennial grasses in the existing pasture but you do not want to completely destroy the pasture to re-sow with a new pasture.

As stated earlier, complete re-sowing of new pastures is very expensive and if done properly may take the paddock out of production for around 18 months. Over-sowing strategies can range from relatively cheap, e.g. just 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, 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. The eight key steps in the Pasture Establishment Checklist (see section 3) remain a useful guide to follow when over-sowing into an existing pasture to help minimise risk factors.

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 some situations a lower establishment can result from broadcasting legume seed compared to drilling the seed into the soil.

Using an appropriate herbicide and herbicide rate to selectively remove unwanted species or retard useful pastures and direct drilling new species into the existing pasture. Some examples include:

- Using herbicides such as paraquat or low rates of glyphosate in mid to late winter following germination of all annual grasses and then direct drilling more perennial grasses.
- Using a selective broadleaf herbicide (e.g. MCPA or 2,4-D amine) with grazing in autumn/winter for thistles and paterson's curse control, and then direct drilling more useful species into the pasture.

In order for these over-sowing techniques to work you must ensure that it is done at the right time for both the species to be over sown and for the germination of weeds. Choose species or cultivars suited to the situation, ensure insect or mite controls are in place and apply fertilisers and/or lime to ensure successful establishment.

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 not be done until it is sufficiently well established (well anchored) or has in some circumstances set seed. For example, over-sown perennial grasses in late autumn/winter may need to be rested until late summer or early autumn.

3. Total replacement or re-sowing of pastures

If your assessment shows that there are minimal or insufficient useful species left in the paddock then starting again with a new pasture might be the only option. This is expensive and also will remove the area from grazing for a longer period but it may return the paddock to a highly productive improved pasture in the shortest time. In order to ensure success, pasture establishment needs to be fully planned, in some cases up to 2 to 3 years prior to sowing. This pasture establishment process may be done using conventional cultivation, direct drilling following herbicide applications or cropping in the year(s) prior to pasture establishment.

Pasture establishment eight step checklist

Following the pasture establishment eight step checklist as follows will maximise your chances of success.

1. Assess, select and plan early (1–2 years before).

Key check: Assess existing pasture, weeds, pests and soil fertility.

2. Control of weed and pests in planning years.

Key check: Prevent weeds and pests from seeding/reproducing.

3. Pre-sowing activities.

Key check: Remove excess plant material before sowing.

4. Absolute weed and pest control.

Key checks: Allow full weed germination after rain then graze to keep weeds small until moisture in the profile is right for sowing.

5. Adequate soil moisture.

Key checks: 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.

Key check: 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.

Key check: Look for pests and weed seedlings every 10–14 days after sowing.

8. Grazing.

Key check: 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.

If you are going to the expense of re-sowing areas you will need to change the management of the paddock in order to maintain the pasture. For example, soil fertility may need to increase, pasture spelling may be required, or a more persistent or hardier species may need to be sown.

If you are currently not adequately fertilising/or managing existing sown pastures that you have assessed as good then there is no point in sowing or re-sowing any further pastures.

Summary

Over time a perennial based pasture will stabilise out to a mix of species which can comfortably exist year in year out. This level is different for different soil types, rainfall zones, aspect, etc. It is common for annual grasses and weeds to fill in some of the gaps during the key growing periods. When these less desirable species become dominant it is critical that you employ the strategies outlined in this publication. Note, however, that it can be important to use some of the non-sowing management options on an on-going basis to ensure the persistence of desirable species. If required seek the advice of a NSW DPI Agronomist to help with pasture assessment and an appropriate pasture rejuvenation program.

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References

NSW DPI Agfact P2.2.6 First edition 2002. *Eight steps to successful perennial pasture establishment*, W McDonald and M Keys.

PROGRAZE – Profitable, sustainable grazing, manual, 7th Edition 2006. NSW DPI.

Sustainable land management practices for graziers – best management practices for grazing in the Tablelands and Southern Highlands of NSW. 2009. NSW DPI and Sydney Catchment Authority.

Pasture improvement cautions

Pasture improvement may be associated with an increase in the incidence of certain livestock health disorders. Livestock and production losses from some disorders are possible. Management may need to be modified to minimise risk. Consult your veterinarian or adviser when planning pasture improvement.

**The *Native Vegetation Act 2003* restricts some pasture improvement practices where existing pasture contains native species. Inquire through your local office of the Department of Environment and Climate Change or Catchment Management Authority for further details.

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Appendix 1. Botanical composition and groundcover measurements

Two methods for measuring the botanical composition and/or groundcover percentage of your pasture are the step point method and the pointed stick method

- **Step point method**

This method involves making observations along a straight path at specified intervals and recording plant species. Make a mark on the toe of each of your boots. You then need to step for 100 equally spaced steps throughout the pasture along a fixed bearing or towards a landmark to ensure a straight line. At each point look at what the mark on your boot is touching and record desirable perennial plants, legumes, annual grasses, weeds, litter, bare ground or other. A Pasture Composition Recording Sheet is provided in Appendix 2.



- **Pointed stick method**

The method is undertaken using a 1 cm thick dowel about 30 cm long with pointed ends – or a nail can be driven into each end of the stick. It is randomly thrown across the paddock and the plants that are nearest the ends of the stick are recorded. The process is repeated 50–100 times throughout the paddock. Fifty observations of a double ended stick will give you 100 observations (hits) and the composition can be calculated as a percentage. The total hits for each pasture component, divided by the total number of hits, indicate the percentage of each species in the pasture.



Visual assessment method for measuring groundcover

Another method for measuring groundcover only is by visual assessment. Groundcover levels will vary across a paddock so representative areas must be selected. Visual assessment is a simple method involving the visual assessment of a square, say 0.5 x 0.5 m (18" x 18") in front of your feet and looking vertically into the pasture to estimate the percentage of the area that is covered with plant material and litter. Do this ten times in a paddock and average out the results. Figure 1 shows some relative groundcover percentages in a pasture.



30% groundcover



80% groundcover



90% groundcover



100% groundcover

Source: *Sustainable land management practices for graziers – Best management practices for grazing in the Tablelands and Southern Highlands of NSW*. 2009. NSW DPI and Sydney Catchment Authority.

Appendix 2. Pasture composition recording sheet

Below is an example of a recording sheet to determine pasture composition. The number of times each plant species is encountered is recorded by making a mark next to the appropriate category.

SPECIES										TOTAL
Perennial grass (e.g. cocksfoot, phalaris, kangaroo grass, microlaena, etc.)										44
										44%
Legume: clover or medic										22
										22%
Annual grass										14
										14%
Weeds										16
										16%
Litter										
Bare ground										4
										4%

Blank recording sheet to determine pasture composition

You may want to categorise species or look at them individually. For example, all undesirable species may be called 'weeds', all perennial grasses (introduced and native species) grouped together, annual grasses together, etc.

SPECIES											TOTAL
Perennial grass (e.g. cocksfoot, phalaris, kangaroo grass, microlaena, etc.)											
Legume: (clover or medic)											
Annual grass											
Weed											
Litter											
Bare ground											