Native grasses - how they stack up.

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Abstract

Native grass is a general term for the 1300 or so grasses that occurred naturally in Australia before European settlement. Whether it is a native or introduced species is less important, having the appropriate species for sustainable landscape function is more important. Increasing perenniality in the landscape is the key. Native pastures tend to persist in areas where introduced species either do not persist well or it is uneconomic to establish them.

Recognition of species is the key to managing native pastures. Some native grass species, in particular wallaby grass and weeping grass, respond to increases in soil fertility. Native pastures are no different to any other pasture as they benefit from rotational grazing. Further research on the management of native grass pastures is being conducted as part of the EverGraze project.

Introduction

In this paper I will define the term 'native pasture' to mean any pasture in which native grasses are the main perennial species (Crosthwaite and Malcolm, 2001). It can be applied to situations where native grasses are the dominant species but also where they are sub-dominant or even infrequent, as long as they are the main *perennial* species.

The focus of this paper will be the high rainfall zone (>600 mm/year) in the permanent pasture areas of southern Australia.

Native grass is a general term for the 1300 or so grasses that occurred naturally in Australia before European settlement. They vary considerably in morphology, growth habit and agronomic characteristics.

In most native pastures a range of species exist. The major species found in pastures in south eastern Australia include *Austrodanthonia* spp. (wallaby grasses, white top), *Bothriochloa macra* (red grass), *Chloris truncata* (windmill grass), *Elymus scaber* (common wheat grass), *Microlaena stipoides* (weeping grass), *Austrostipa* spp. (spear grasses) and *Themeda triandra* (kangaroo grass).

In large areas along the dividing range the only perennial plant species left in many pastures are native grasses. The lack of perennials in these regions has lead to environmental challenges including dryland salinity, wind and water erosion due to low ground cover, and declining water quality and biodiversity. Large areas of this landscape will never be sown to introduced pasture species due to it's non-arable nature and the high costs involved; e.g. herbicides, fertilisers and lime. Therefore we need to be able to manage these native pastures for productivity and sustainability.

Native versus introduced species

Arguments about the relative value of native versus introduced grasses often create a good deal of excitement and passion. However, direct comparisons are not valid as they are normally confounded on the basis of land class capability and provide little insight into how both production systems can be integrated on a whole farm basis (e.g. Langford *et al.*, 2004).

Complementarity on a whole farm basis rather than comparisons should be our aim. The ideal farm landscape is one that has native pasture on the shallow, low fertility non-arable hill country, with highly-productive introduced pasture species on the fertilised deeper soils of the arable valley floors.

Not all native grasses are palatable; in some instances, the productivity of the system comes from the annual grasses and legumes, but the native grasses provide the stability in the system, in terms of prevention of erosion by providing ground cover throughout the year. Some native grasses have reasonable levels of crude protein and digestibility. Table 1 presents crude protein and digestibility values of a range of native grasses. In a native pasture there is considerable genetic diversity. Over the last eight to 36 million years they have adapted to the harsh and varying climate.

Introduced species have undergone considerable selection and breeding and have the potential to significantly lift productivity with high inputs of fertiliser, weed and pest control, and better grazing management practices.

Table 1. Seasonal range of crude protein and digestibility values (%) for a selection of native grasses (Mitchell, 2001).

Common name	Scientific name	Crude protein (%)	Digestibility (%)
Cane wire grass	*Aristida ramosa*	< 3	22 - 55
Wallaby grass	*Austrodanthonia* spp.	10 - 25	45 - 82
Spear Grass	*Austrostipa* spp.	3 - 17	< 60
Red grass	*Bothriochloa macra*	4 - 15	48 - 59
Windmill grass	*Chloris truncata*	7 - 12	35 - 68
Common wheat grass	*Elymus scaber*	10 - 36	53 - 90
Curly windmill grass	*Enteropogon acicularis*	5 - 13	46 - 62
Weeping grass	*Microlaena stipoides*	10 - 27	55 – 80
Tussock grass	*Poa labillardierei*	4 - 12	42 – 65
Snow grass	*Poa sieberiana*	4 - 12	61 – 69
Kangaroo grass	*Themeda triandra*	5 - 17	54 - 75

There have been very limited selection programs for native grasses. Over 20 selections of native grasses have been identified and progressed to the stage of commercial release (Cole and Johnston, 2006). In these selection programs seed production has been a major limitation (Lodge, 1996; Smith and Whalley, 2002). Domestication of native grasses may require decades of work before the successful release of a cultivar.

Where do native pastures occur?

Native grass-based pastures play an important role in the lamb, wool and beef industries of southern Australia.

Based on estimates made by experienced pasture scientists across the state (Mitchell, 1991) I estimated that native species covered 1.7 million ha or 13% of total agricultural land.

Hill *et al.* (1999) used satellite imagery to divide the high rainfall zone (>600 mm) into northern and southern regions based on rainfall distribution; predominantly summer-dominant in the north and winter-dominant in the south. Native pastures were estimated to occupy around 22% of agricultural land in the high rainfall southern zone (Table 2).

Table 2. Total area (m ha) of vegetation types in the high rainfall southern agricultural zone (Hill *et al.*, 1999).

	Area (million ha)	Proportion of agricultural land (%)
Forest	3.38	
Annual pasture	2.40	17.2
Mixed pasture and cropping	2.33	16.7
Native pasture	**3.12**	**22.4**
Sown perennial pasture	6.11	43.8
Total Agricultural Area	13.95	
Total Area	17.34	

In these high rainfall native pastures, native grass species on average account for 33% of botanical composition (Virgona *et al.*, unpublished). The rest of these pastures are composed of annual species. A large range of native grass species are found in pastures. However, the main species in native pastures in Victoria are wallaby grass and weeping grass. The distribution of these species is not clearly related to historical grazing management, fertiliser history or soil chemistry.

Management of native pastures

One of the key principles to managing native grasses is being able to recognise them. Additionally, an understanding of their key characteristics such as season(s) of growth, seeding pattern, recruitment time, etc., is essential for appropriate management. Native grasses are most easily recognised when they have seed heads present, so spring and summer are the best times. It is often hard to recognise the grass when they are vegetative, but characteristics such as leaf colour and hairiness can be useful.

No two native pastures have the same species composition, soils, fertiliser history or aspect; therefore there is no one simple 'recipe' that can be applied to all native pastures. Each 'recipe' will be different and needs to be based on species present, the growth pattern of these species, your enterprise goals and how these pastures fit into your farming system.

As most native pastures occur on non-arable hill country there are many challenges associated with their grazing management. In an ideal situation, paddocks would be fenced to topography, aspect, and pasture condition. However, the division of large paddocks into smaller ones in hill country to better manage grazing pressures can be difficult.

All grasses, whether native or introduced, need some type of biomass reduction (grazing, burning or mowing) to remain healthy. Some native grass species are more susceptible to grazing than others. Pastures dominated by the cool-season growing C_3 native species, such as wallaby grass and weeping grass, are more stable under grazing than those dominated by warm-season growing C_4 species such as kangaroo grass and red grass.

Native grasses are well adapted to Australia's low fertility soils. In any grazing system, nutrients that are removed from pasture plants by livestock need to be replaced in the soil to maintain a balance between nutrient export and input. The relative responsiveness of native grasses to fertiliser varies with species (Table 3).

Table 3. Pastoral features of some native grass (Langford *et al.*, 2004).

Dominant Grass	Grazing History	Fertiliser Rates (kg P/dse/ha)	Carrying Capacity (dse/ha)	Herbage Quality
Kangaroo Grass	L-M	nil	1-3	L-M
Tussock Grass	L-M	0.5-1.0	1-3	L-H
Spear Grass	M-H	0.5-1.0	5-10	L-H
Red Grass	M-H	0.5-1.0	5-10	M-H
Wallaby Grass	M-H	1.0	Up to 12	M-H
Weeping Grass	M-H	1.0	Up to 12	M-H

L = Low: M = Medium; H = High; P = phosphorus

Care needs to be exercised with the application of fertilisers. Introduced annual grasses and legumes tend to respond well to increasing soil fertility and compete strongly with the native grasses in spring. Native pastures with a high content of cool-season perennial grasses, such as wallaby grass and weeping grass, can be managed with moderate fertiliser inputs (10–20 kg P/ha/yr) to provide valuable feed, while retaining the benefits of stability and sustainability.

The summer rainfall response of native pasture provides great opportunities on farm. In north east Victoria and southern NSW, this was particularly evident this year (2008). With the dry spring in 2007 there was limited carry-over pasture, and summer rainfall events provided much needed feed during the summer and early autumn.

EverGraze

EverGraze is a national project that is part of the Future Farm Industries CRC and funded by the CRC, Meat and Livestock Australia, Australian Wool Innovation and the partner organisations, including the Victorian and NSW Departments of Primary Industries and Charles Sturt University.

EverGraze aims to develop animal production systems that are more profitable than current systems while simultaneously improving environmental outcomes. Systems which are based on perennial species will increase overall production and/or extend the period when quality pasture is available. The focus is on using the right perennial species in the right place within the landscape. Both native and introduced perennial species can meet these goals. Three research sites are studying natives such as wallaby grass, weeping grass and spear grass that suit the shallow, acidic soils on slopes and hills. In more favourable soils and climates, three sites are evaluating the use of the summer-active perennials lucerne (*Medicago sativa*), tall fescue*(Festuca arundinacea),* kikuyu (*Pennisetum clandestinum)* and chicory (*Cichorium intybus)* to enhance drought resistance, reduce soil salinity and provide higher-quality herbage in summer and autumn than perennial ryegrass, phalaris or annual pastures. All pastures include sub clover and are grazed by Merino ewes mated to terminal sires for lamb production.

The native grass research component within EverGraze will investigate the effects of both grazing management and fertiliser inputs on pasture and animal productivity and natural resource management outcomes such as improved ground cover, perenniality and reduced groundwater recharge.

The project is exploring realistic grazing options that can be used to maximise production while making sure that perennial species, particularly native pastures, are protected. An economic analysis of sheep-based production systems that utilise the pasture assets, both introduced and native, within the farm will be undertaken.

Conclusion

There are many different native grass species that exist in our pastures and within native grasses there is great genetic diversity. We have some knowledge about a few of the more common ones. Currently research within the EverGraze project will give us a better understanding of how native pastures fit within our farming systems and how to better manage them.

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