Increasing productivity and persistence of perennial native pastures: EverGraze Albury–Wodonga

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Abstract: *EverGraze is a national research project that is developing animal production systems based on perennial species to increase profitability and improve natural resource management. This paper reports on the Albury–Wodonga proof site. The site is based on native pastures and situated in north east Victoria. The experiment combines fertiliser use with grazing management. Despite poor seasonal conditions, conception rates and lamb marking percentages have been increased above district averages by utilising good livestock genetics combined with improved management of native pastures.*

Introduction

EverGraze is a national project that is developing animal production systems that are more profitable than current systems whilst simultaneously improving environmental outcomes. Systems are based on perennial species that increase overall production and/or extend the period when quality pasture is available. The focus is about using the right perennial species in the right place within the landscape. Both native and introduced perennial species can meet these goals. All pastures include subclover and are grazed by Merino ewes mated to terminal sires for lamb production.

Native pastures in the high rainfall zone (> 600 mm AAR) in northern Victoria and southern NSW are often dominated by annual species. These native pastures occupy a considerable proportion of the landscape, but are generally of low productivity, are mainly used in wool production, and only provide low returns per hectare.

Productivity of native pastures can be increased by using fertiliser, but this nearly always comes at the expense of the native perennial grasses (Garden & Bolger 2001; Garden *et al.* 2003; Lodge 1979). However, using a combination of fertiliser inputs and rotational grazing can provide increased productivity while maintaining the native perennial pasture base (Garden *et al.* 2003). Much of the hilly landscape is not suitable to introduced perennials, so maintaining and improving the current native perennial pasture base is essential for maintaining ground cover and meeting natural resource management targets (Virgona *et al.* 2003).

This paper describes research in EverGraze to test easy-to-implement management strategies that will improve the contribution of native grasses to profitability and NRM outcomes.

Methods

The Chiltern native pasture site is part of the Albury–Wodonga EverGraze Proof site. The site is located at Chiltern (S36°12', E146°35') in north-east Victoria. An 81 ha native pasture is being used for this study,with the main perennial components being weeping grass (*Microlaena stipoides*), wallaby grasses (*Austrodanthonia racemosa, A. auriculata*) and spear grasses (*Austrostipa densiflora*, *A. scabra*). A range of soil types exist across the site including Red Kurosol on the upper slopes, brown Kandosol on the mid slope and Grey Kurosol on the lower slopes (Isbell 1996). The soils across the site are acidic (pH 4.3 $CaCl_2$) and low in phosphorus (Olsen P 4 mg/kg).

The aim of the experiment is to investigate ways of increasing the productivity of native-dominated pastures whilst ensuring the persistence of native perennial grasses, by combining superphosphate application with appropriate grazing management. The experiment is the first to combine higher superphosphate use with

Table 1: Stocking rates for each treatment

Year	Stocking rate	Stocking rate (ewes/3 ha)	Grazing duration	DSE during the grazing period	Annual DSE (joining to joining)
2008	High	9	1/07/2008 –19/2/2009	5.2	3.2
	Low	6		3.5	2.2
2009	High	4	9/9/2009–4/1/2010	3.4	1.2
	Low	3		2.6	0.9
2010	High	4	8/2/2010	2.6	2.6
	Low	3		2.1	2.1

rotational grazing on native pastures. Rotational grazing or set stocking of native grass pastures are being compared with different fertiliser regimes in replicated 3 ha paddocks. The four different systems that are being evaluated are:

Low fertility (125 kg/ha single superphosphate applied every second year), set stock grazing system. This is seen as the current management practice that is used on many native grass pastures.

Higher fertility (250 kg/ha single superphosphate annually) system that is set stocked.

Higher fertility (250 kg/ha single superphosphate annually) system with rotational grazing. The rotation is a simple four paddock system with grazing occurring for two weeks, followed by six weeks rest before being re-grazed.

Higher fertility (250 kg/ha single superphosphate annually) system with rotational grazing. This is similar to treatment 3 with the exception that during the period from lambing to marking, the animals graze the whole plot area. This is because it is not always easy to undertake rotational grazing when there are lambs at foot.

The main role of superphosphate is to stimulate the growth of subclover, which provides an important feedbase for the livestock, but also provides nitrogen that stimulates the growth of both the native and annual grasses. This nitrogen improves the quality and quantity of the pasture. The aim of the fertiliser rates used, and the associated grazing management systems, is to ensure that the native species are not dominated or 'outcompeted' by the annual species.

CentrePlus Merino ewes mated to a terminal sire graze the site. Each treatment is grazed a 2 stocking rates, and these have varied due to the seasonal conditions (Table 1). Because of dry conditions in 2009, ewes were supplementary fed from 19th February to 9th September with pellets at 200 g/head/day.

Results and Discussion

The rainfall over the period of the experiment has been less than average – 485.6 mm and 602.4 mm were received in 2008 and in 2009 respectively. The median rainfall for the site is 682 mm (1889 to 2004 – long term average) (Figure 1) (Jeffrey *et al.* 2001).

The pasture growth data (Figure 2) shows the poor seasonal conditions of 2008 and most of 2009. In 2009, pasture feed on offer was low (<1000 kg/ha) for most of the year but improved in spring. Feed on offer in the first quarter of 2010 is much improved (>2000 kg/ha) due to good rainfall from summer storms (Figure 2).

In all three years of the experiment, good conception (95.7–98.5%), pregnancy rates (133.8–141.8%) and marking percentages (116.5–126.1%) have been achieved. Despite the poor seasonal conditions, good lamb growth rates (>230 g/hd/day) were achieved in both 2008 and 2009 (Table 2). Growth rates for single lambs were higher than for lambs of multiple births in both years (Table 2). There was no difference in weaning weight between male and female lambs for 2008 but, in 2009, the wether lambs finished on average 2 kg heavier than the ewe lambs.

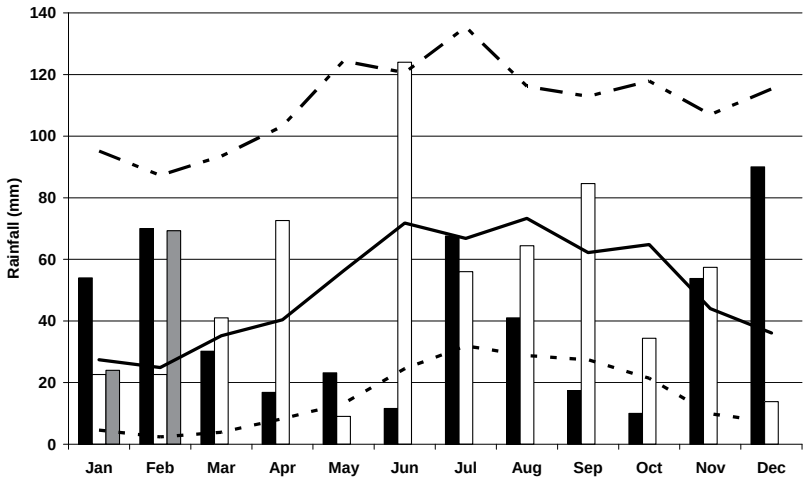

Figure 1. Rainfall (mm) for the Chiltern experiment (2008 – solid bars, 2009 – open bars, 2010 – hatched bars, median – solid line, 10th and 90th percentile – dotted lines).

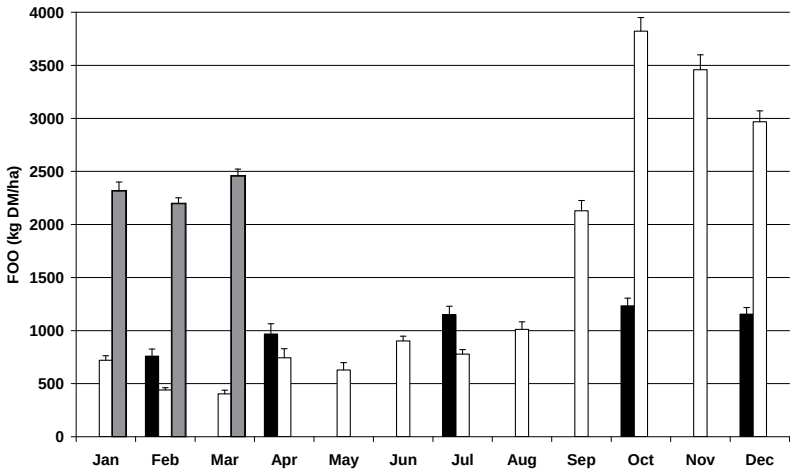

Figure 2. Pasture feed on offer (kg/ha dry matter) (2008 – solid bars, 2009 – open bars, 2010 – hatched bars)

Conclusions

In effect, the experiment has been in operation for less than 2 years and, for evidence-based decision making to take place, a longer period will be required to gather the necessary data – particularly with respect to production. To date, seasonal conditions have not given us the best opportunities to explore the system. However high lamb growth rates have been achieved in these less than favourable conditions. Native pastures are highly responsive to rainfall events and this responsiveness can provide increased grazing flexibility for producers.

By combining rotational grazing and improved soil fertility in native pastures, conception rates and lamb marking percentages can be increased. This result demonstrates that investment in managing (in particular, fertiliser and grazing management) of native pastures, can be worthwhile in terms of livestock performance. However, some of these results maybe attributed to the low stocking rates and supplementary feeding rather than just the pastures.

A future grazing system based on EverGraze research could look like a mosaic of diverse pasture systems matched to landscape, soil type

Table 2. Average lamb live-weights and growth rates

Year		No. lambs	Growth rates grams/head/day (± s.e.)		Live weights kg (± s.e.)		
			Birth to marking	Marking to weaning	Birth	Marking	Weaning
2008	Overall	161	289 ± 7	336 ± 5	5.5 ± 0.09	12.9 ± 0.28	31.8 ± 0.36
	Singles	80	341 ±8	357 ± 7	6.2 ± 0.10	14.7 ± 0.36	33.4 ± 0.49
	Twins	81	237 ± 9	316 ± 6	4.5 ± 0.10	11.1 ± 0.34	28.5 ± 0.50
	Males	73	290 ± 11	340 ± 7	5.3 ± 0.15	12.8 ± 0.46	30.9 ± 0.67
	Females	85	286 ± 9	332 ± 6	5.3 ± 0.12	12.9 ± 0.36	30.9 ± 0.48
2009	Overall	168	326 ± 5	273 ± 3	5.6 ± 0.08	15.0 ± 0.33	38.4 ± 0.50
	Singles	80	308 ± 5	286 ± 4	6.1 ± 0.09	17.7 ± 0.39	42.0 ± 0.72
	Twins	88	265 ± 3	261 ± 4	5.0 ± 0.09	12.5 ± 0.33	35.0 ± 0.50
	Males	74	295 ± 6	283 ± 5	5.7 ± 0.12	15.1 ± 0.53	39.5 ± 0.83
	Females	94	278 ±4	264 ± 4	5.4 ± 0.10	14.9 ± 0.40	37.5 ± 0.60

and production purposes. This could mean native pasture on the non-arable country and introduced species, (e.g. Phalaris) on the higher fertility and trafficable areas. The native pastures would be actively managed (i.e. rotational grazing). However there is the need for greater use of spatial information, that is, the variation of soils, pasture communities, etc across the landscape to assist landholders in determining fencing and grazing management plans.

Most native pastures are in fact a complex mix of a range of native and introduced grasses and legumes. We have a limited understanding of the contribution that individual species of native grass make to the entire pasture production. More research is needed to understand which species are grazed when during the year, and also the forage quality of different species throughout the year.

Acknowledgements

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References

Garden, DL & Bolger, TP (2001) Interaction of competition and management in regulating composition and sustainability of native pasture. . In 'Competition and succession in pastures'. (Eds PG Tow, A Lazenby) pp. 213–232. (CAB: International).

Garden, DL, Ellis, NJS, Rab, MA, KLangford, CM, Johnston, WH, Shields C, Murphy, T, Holmberg, M, Dassanayake, KB & Harden, S. (2003) Fertiliser and grazing effects on production and botanical composition of native grasslands in south-east Australia. *Australian Journal of Experimental Agriculture* 43, 843–859.

Isbell, RF (1996) 'The Australian Soil Classification.' (CSIRO Publishing: Melbourne, Australia).

Jeffrey, S, Carter, J, Moodie, K & Beswick, A (2001) Using spatial interpolation to construct a comprehensive archive of Australian climate data. *Environmental Modelling and Software* 16, 309–330.

Lodge, GM (1979) Effects of fertility levels on the yield of some native perennial grasses on the North-West slopes, New South Wales. *Australian Rangeland Journal* 1(4), 327–333.

Virgona, J, Mitchell, M & Ridley, A (2003) Native pastures – research and development directions with respect to the mitigation of dryland salinity. In 'The 2002 Australian Academy of Science Fenner Conference on the Enviroment: Agriculture for the Autralian Environment'. (The Johnstone Centre, Charles Sturt University, Albury: Canberra).