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Sustainable grazing management: graziers' perspectives and implications for pasture management in the Maranoa region, south Queensland

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Abstract

Evidence of land degradation in Australia's pastoral areas suggests that some current grazing management systems are not sustainable. In the Maranoa region of southern Queensland there were no guidelines for sustainable pasture utilisation, but local landholders possessed a wealth of knowledge about management practices gained from years of practical experience. The Local Consensus Data technique was adapted to document local graziers' recommended management practices for profitable production with minimal degradation of the natural resources.

Groups of experienced graziers defined best pasture management practices, stocking rates and living areas necessary to achieve sustainable land use for the 5 pasture land types in the Maranoa. Many graziers run more livestock than the recommended levels of stocking. Of major concern are the number of properties smaller than the area considered necessary to apply sustainable management practices and the proportion of properties with stocking rates above those recommended. These constraints limit the adoption of technologies and are the most important determinants of sustainable land use in the Maranoa.

Introduction

Ecologically sustainable development which promotes productive land use without degradation of the natural resources has been the focus of attention both internationally (Anon. 1980) and nationally (Hawke 1989) since the early 1980s. More than 60% of Australia's land area is grazed by sheep or cattle (Hutchinson 1992), so the ecologically sustainable grazing management of these resources is of major importance to Australia and requires the collaboration of individual landholders to be successful (Green *et al.* 1991).

Agriculture in Australia is dominated by the "family-farm" form of ownership. A major problem is reconciling the maintenance of a farm's physical and biological resources for production with the need to generate income to sustain a family on the property (Longworth 1986). Working groups associated with developing a strategy for ecologically sustainable development in Australia's agriculture considered that "sound land management is based on good quality information worked into a plan of activity which has clear goals in mind" (Green *et al.* 1991).

The mounting evidence of land degradation in pastoral areas throughout Australia (Hutchinson 1992) suggests that some current grazing management systems are unsustainable. Noble *et al.* (1984) describe how droughts and unrelenting grazing pressures have caused widespread damage in semi-arid areas of New South Wales. These authors noted that loss of plant cover destabilises the soil surface, accelerates soil erosion and together with a deterioration in pasture composition can lead to a reduction in the grazing productivity of the land. Similarly in north Queensland, a combination of drought, supplementary feeding and over-grazing has led to significant changes in the botanical composition and ground cover of pastures (Gardener *et al.* 1989). Tothill and Gillies (1992) reviewed the condition of pastoral lands in northern Australia and suggested that "there is a widespread deterioration in most pasture communities in Queensland".

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The Maranoa region in southern Queensland is centred on the town of Roma. It is an important cattle and sheep production area within the 500–650 mm rainfall zone, and livestock have been grazed in the area since 1846. Rainfall is unreliable with dry years occurring about 2 years in 10, and major droughts once every 10–15 years.

Sustainable grazing management is difficult to achieve in such a variable environment. Burrows (1991) states that adjusting stock numbers to the feed available is the key practice determining long-term pasture health and stability. Landholders can manipulate stock numbers but have no control over climatic influences and have to manage with the natural resources present on the property. Until recently there were no written guidelines on pasture and animal management for the Maranoa. However, local landholders possess a wealth of knowledge about management practices gained from years of practical experience and a project was implemented to document this information. The aims of this project were:

- to record the appropriate enterprise options for a typical property in each pasture land type;
- to document current best management practices; and
- to obtain landholders' recommended practices for sustainable production from these pasture lands.

Materials and methods

The Maranoa has a diverse range of soils and vegetation (Vandersee and Slater 1984). To simplify the description of the region, 5 broad pasture land types are described: Mitchell grass, brigalow-belah, box woodland, box-mulga and pine country. The botanical composition of pastures in these pasture land types has been described by Schefe *et al.* (1993).

An adaptation of the Local Consensus Data (LCD) technique was used to document graziers' recommendations for sustainable management of the "whole farm" (Clark *et al.* 1990). Within each pasture land type, 2 or 3 'local areas' were targeted to give good representation of each pasture land type in the Maranoa. In each local area a grazier with more than 10 years experience was approached and asked to invite 5–8 other experienced landholders to a group discussion on property management in their local area. In this environment, a minimum of 10 years is necessary to gain knowledge of varying seasonal conditions including droughts and fluctuating commodity prices. The discussion was based on a typical but hypothetical property to enable free discussion of sensitive issues without reference to an individual grazier's property and situation.

Through group discussion, best management strategies and practices for managing a typical property with minimal degradation of the productive resources were identified. Specific issues canvassed were:

- a description of the land resources of a typical property within the nominated pasture land type;
- the property size required to generate sufficient income to support a family with school age children;
- the enterprise mix which best matched resources to the markets;
- the best management of natural resources and stock for sustainable production;
- the impact of plant and animal pests on production; and
- perceived trends in grazing land and climate.

Results

The graziers in each group agreed with the simplified resource description because they could identify with the 5 broad pasture land type groupings. However, they also recognised subtypes within each pasture land type when attempting to describe the resources of a typical property in their area.

Enterprise options

On Mitchell grass pastures a combination of 60–80% sheep and 20–40% cattle was recommended in conjunction with grain and forage cropping (Table 1). More grain cropping was suggested in the Hodgson-Muckadilla local areas with up to 25% of the property area devoted to this activity. The livestock operations focussed primarily on breeding.

Cattle grazing and grain cropping were recommended for brigalow-belah areas. Up to 20% of the property area in the Muggleton district was utilised for grain and forage cropping while a smaller proportion (7%) was cultivated for

Table 1. Current enterprise options for the pasture land types of the Maranoa.

Pasture land type	Location	Enterprise option
Mitchell grass	Hodgson	60% sheep/40% cattle; 25% grain, forage
	Muckadilla	80% sheep/20% cattle; 25% grain, forage
	Surat	65% sheep/35% cattle; 10% grain, forage
brigalow-belah	Eumamurrin	Cattle; 7% forage
	Muggleton	Cattle; 20% grain, forage
box woodland	Bony creek	Cattle/sheep; forage
	Injune	Cattle
pine country	Yuleba creek	Cattle; forage
	Upper Maranoa	Cattle
box-mulga	Dunkeld	90% sheep/10% cattle
	Wallum creek	75% sheep/25% cattle

forage crop around Eumamurrin. Breeder herds varied from 180–280 head and the progeny were generally sold before 12 months of age.

Sheep and cattle were recommended on box woodland pastures in the Bony Creek area although there has been a move to predominantly store cattle production since the 1970s. Up to 7% of the property could be used for forage production. Producing store cattle for sale before 12 months of age, was recommended for the Injune area.

The cypress pine pastures were suitable for cattle breeding only. Sheep grazing was recommended for box-mulga pastures with cattle comprising 10–25% of the enterprise. A combination of breeder sheep and wethers was considered best with breeding restricted to the better improved country.

Living areas

The graziers' approach to judging a suitable living area reflected their dependence on stock numbers. Initially, they assessed the value and number of livestock required to meet their income needs. This was typically based on the assumption that the new landholder would need 80% equity in the purchase of land to be viable. They then judged the area required to run this number of livestock at a stocking rate which would maintain the land for beef or wool production.

Living areas varied from 1 600 to 28 000 ha. The pasture land type was the main determinant of the living area though there was some variation within each pasture land type (Table 2).

The smallest living areas were 1 600–2 400 ha (Mitchell grass) and 2 000–2 400 ha (brigalow-belah) in the more productive pasture land types. On box woodland pastures the size varied from 2 400–4 000 ha though the owner would need a minimum of 80% equity. In the more extensive areas of the cypress pine pasture land type in the Upper Maranoa, 16 000 ha was recommended as a living area, although 5 300 ha would be adequate around Yuleba Creek. On box-mulga pastures, predominantly sheep country in the drier south-west, living areas varied from 12 000–28 000 ha.

Stocking rates

The recommended sheep stocking rates for sustainable land use were 0.8–1.2 ha per dry sheep equivalent (DSE) for both Mitchell grass and box woodland and were more than 2–3 times higher than the box-mulga pasture land type recommendation of 2–4 ha per DSE (Table 3). With cattle, the heaviest recommended stocking rate for a breeder plus calf up to weaning age was 4–8 ha per breeder unit in the brigalow-belah pasture land type and about 7–10 ha per breeder unit for both Mitchell grass and box woodland pasture land type. The pine pasture land type comprises a varied mixture of subtypes with different levels of development and so the recommended stocking rate ranges from 12–30 ha per breeder unit. A stocking rate of one breeder unit per 20–24 ha was recommended for the box-mulga pasture land type.

Table 2. A comparison of recommended living areas and the actual range of property sizes in the local area for each pasture land type in the Maranoa.

Pasture land type	Location	Recommended living area	Range of local property sizes
		(ha)	(ha)
Mitchell grass	Hodgson	1 600	>800
	Muckadilla	2 400	800–22 000
	Surat	4 800	4 000–30 000
brigalow-belah	Eumamurrin	2 400	800–6 400[1]
	Muggleton	2 000	800–6 400[1]
box woodland	Bony creek	3 200	1 600–11 000
	Injune	2 400–4 000	800–8 000[1]
pine country	Yuleba creek	7 300 (60% equity) 5 300 (80% equity)	800–29 000
	Upper Maranoa	16 000	
box-mulga	Dunkeld	12 000	2 000–20 000
	Wallum creek	28 000	14 000–40 000

[1]Graham, Schefe and Punter (unpublished data).

Table 3. A comparison of the recommended and actual stocking rates for the different pasture land types of the Maranoa.

Pasture land type and location	Stocking rates (ha/unit)			
	Dry sheep equivalent		Cattle breeder & weaner	
	Recom'd	Common[1]	Recom'd	Common[1]
Mitchell grass				
Hodgson	1.0		10.0	
Muckadilla	0.8		8.0	
Surat	1.2		7.5	
Range	0.8–1.2	0.8–1.2	7.5–10.0	3.2–8.1
brigalow-belah				
Eumamurrin	na[3]		4.0–8.0	
Muggleton	na		7.0	
Surat	0.8–1.2[2]		na	
Range	0.8–1.2	0.8–1.2	4.0–8.0	4.9–8.1
box woodland				
Bony creek	na		7.0–10.0	
Injune	na		7.0	
Surat	0.8–1.2[2]		na	
Range	0.8–1.2	0.8–1.2	7.0–10.0	4.9–8.1
pine country				
Yuleba creek	na		12.0 20.0 (undeveloped)	
Upper Maranoa	na		30.0 (undeveloped)	
Range	na	na	12.0–30.0	6.5
box-mulga				
Dunkeld	2.0–2.8		20.0	
Wallum creek	4.0		24.0	
Range	2.0–4.0	0.8–2.0	20.0–24.0	6.5–11.3

[1]Graham *et al.* (1991). [2]Jordan *et al.* (1991). [3] Not applicable.

Pasture management and timber control

Continuous grazing of pasture was recommended by all groups. Assessment of pasture condition was rare and limited.

Pasture spelling was generally considered unnecessary if conservative stocking rates were applied. However, it was suggested that spelling or deferred grazing could have a beneficial effect in allowing grasses to set seed, to accumulate fuel for pasture burning and, particularly with sheep, to avoid grass seed contamination of wool and as a strategy for internal parasite control. Spelling was suggested when other feed was available after good soaking rains or the planting of forage crops. Most graziers said that kangaroos and wallabies reduced the benefits from pasture spelling.

Pasture management options were restricted by existing fencing arrangements on many properties. The position of fencing had generally been determined by previous property owners and was considered too costly to alter in the short term.

Timber regrowth and woody weed control were major problems in most pasture land types. It was recommended that any pasture development or regrowth control program should not begin until sufficient funds to complete the program were available. Control of regrowth by fire was considered effective, but sufficient fuel for a good fire was rarely available.

Drought management

Stock reductions were considered unnecessary, even in dry times, if the recommended stocking rates were observed. When drought conditions developed and stock reductions were necessary, it was recommended that the normal saleable livestock should be sold early. Subsequent groups for sale were non-breeding stock, such as calves and steers, then heifers, older and empty cows, with the younger breeding stock being kept as long as possible. Finally, the nucleus of breeding stock may have to be fed. Recommendations for reducing sheep numbers were similar; first cast-for-age ewes, then culls and a percentage of weaner wethers.

In mixed enterprises, the decision on whether to reduce sheep or cattle numbers depends on the importance of each enterprise to the whole business. On sheep properties, cattle were considered a bonus and were sacrificed before sheep. Sheep were generally considered to hold their condition better in droughts and were easier to keep alive.

Most graziers recommended that stock reductions be considered by the end of March if summer rain had not been received. Factors influencing the timing and extent of reductions included stock condition, market prices, the amount of moisture in the soil, the likelihood of rain, past experiences, neighbours' opinions, attitudes to risk and the state of the pasture. Few graziers recommended the sale of all stock. Agistment for the remaining stock was recommended only if feed was available within a reasonable distance and where the agistment manager was responsible and reliable.

Discussion

Traditional methods of consulting with industry representatives have been useful in identifying major industry or regional issues, but do not necessarily highlight subregional issues or production system problems. Group discussion through the LCD process was an effective and efficient method of collecting and documenting the current best practices, opinions and recommendations of a significant group of experienced graziers in the Maranoa. The process of obtaining recommended practices from producers highlighted the socio-economic constraints of the production systems and led to a better understanding of opportunities for improving current practices.

Graziers enthusiastically endorsed the process of documenting realistic management recommendations which may help new landholders coming into the district. Some producers thought that these recommendations would provide a balanced point of view which might counter some of the very optimistic estimates of property carrying capacities used to promote property sales. A positive outcome of this LCD activity was the formation of 4 new Landcare groups in the Maranoa by graziers who had participated in this study.

Enterprise options

Similar enterprise combinations were recommended within each pasture land type. However,

the recommended enterprise combinations varied between pasture land types. The choice of enterprise was determined by the pasture land type, its subtypes, the extent of property development, station facilities, personal preferences for stock types, labour requirements and the presence of plant and animal pests.

Most groups recommended diversified enterprises to reduce the risk associated with poor seasons and market fluctuations. The diversified income from grain production was considered essential to stability of business on the heavier soils which have greater moisture holding capacities (such as the fertile brigalow-belah and Mitchell grass soils). Forage crops were also recommended where possible (such as the favourable sub-land types within the pine and the box woodland pasture land types).

Cattle enterprises dominated the northern areas because wiregrasses, white speargrass (*Aristida spp.*) and dingoes reduced the area's suitability for sheep. However, sheep were recommended in the box-mulga pasture land type in which the weed pimelea *(Pimelea trichostachya)*, causes poisoning in cattle.

Living areas

Many properties in the Maranoa are smaller than the areas recommended for sustainable production. Diversification such as the introduction of grain and forage crops may enhance profitability, but many smaller properties would probably still be non-viable if the recommended sustainable stocking rates were applied.

Studies into degradation in mulga lands of western Queensland have demonstrated the usefulness of 'living areas' or minimum property sizes to assess the potential for sustainable production (Mills *et al.* 1989; Passmore and Brown 1992). However, these 'living areas' may be expected to change with the quality of life that individual graziers expect, graziers' management, current costs and returns, technology and the availability of other income. Concentration on sustainable stocking rates may overcome these problems and allow individuals to calculate a living area for their own situation and needs. Therefore the living areas described in this paper should be considered only as a guide to the area needed to maintain the long term viability of family enterprises.

Stocking rates

In most instances, the recommended stocking rates for sustainable production were lower than the current practices recorded by government agencies and the estimates advertised in the promotion of recent property sales in the district. The proportion of properties operating at stocking rates above the recommended rates varied from 25% in the brigalow-belah pasture land type to over 90% in the box-mulga pasture land type (Graham *et al.* 1991).

The graziers' viewpoint was that more stock per area meant more profit in the short term. However, Meppem and Johnston (1990) found that for mulga lands of western Queensland, higher levels of pasture utilisation were most profitable in the short term but this led to consistently lower pasture yields, greater variability of income and decreased profitability of the system in the longer term. In the southern Queensland brigalow lands, higher grazing pressure led to similar or lower economic performance and considerably greater risks than light–moderate stocking rates (Cavaye *et al.* 1989). These studies and the results of the LCD discussions highlight the potential conflict between graziers' short term needs and the broader concept of ecologically sustainable agricultural production.

Murphy (1993) concluded that a 16% increase in sale weights or a 10% increase in branding percentages was required to maintain the production surplus on cattle properties in the box woodland pasture land type if the recommended stocking rates (14% lower than current rates) were applied and costs remained the same. However, some reduction in annual production costs and drought feeding costs may also be expected if the recommended sustainable stocking rates were applied.

There is a general belief that property size is the most significant factor influencing stocking rates. Passmore and Brown (1992) found significant correlations between property size, stocking rate and degradation in mulga lands. However, an analysis of data from the Maranoa showed that property size accounted for only 44% of the variability in stocking rate (Graham *et al.* 1991). Cavaye *et al.* (1989) found no relationship between the area of native pasture, liabilities and stocking rate.

The single value stocking rates recommended in this study were considered as a general guide for long term production. Stocking rates could be adjusted on pasture growth from the previous summer and therefore may vary from year to year.

Pasture management

Pasture scientists are developing techniques for measuring the 'condition' or degradation state of pastures based on an understanding of the plant species present in the pasture and their reaction to both climate and grazing pressure (Foran *et al.* 1986; Holm *et al.* 1987). The objective of such an ecological approach is to maximise sustainable animal production without degradation of the pasture resource (Smith 1979). However, the graziers in this study rarely considered pasture 'condition' in their livestock management and marketing decisions. No objective measures were used to determine pasture condition or feed availability. Informal questioning after the meetings revealed a lack of knowledge of the specifics of pasture condition assessment. Animal body weight and condition, market prices and social factors appeared more important to most graziers in their stock management.

Since graziers have based their property management decisions mostly on the condition of their livestock, it is important to demonstrate to graziers the relationship between pasture condition and productivity. Only then could a need for pasture assessment 'tools' be expected to develop. These 'tools' must be simple enough to be easily implemented by graziers, yet accurate enough to detect changing 'condition' states. They should be developed with graziers and use measures that are meaningful to graziers to enhance their acceptance and use.

Lighter overall paddock stocking rates generally appeared more acceptable than incorporating some system of paddock spelling. The graziers were adamant that spelling was of limited value because kangaroos consumed the available feed. Pasture spelling is unlikely to become widespread in the Maranoa region until kangaroos can be more effectively controlled.

Pasture spelling has been advocated to accumulate fuel for burning, allow plants to recover vigour, enhance seed production, allow seedling establishment and accumulate litter on the ground (Heady 1975). Graziers in this study used pasture spelling to promote seed set or to accumulate fuel prior to pasture burning for timber regrowth control. This opportunity was available only in favourable seasons when there was considered to be sufficient feed in other paddocks. The absence of 'fuel' in normal seasons may indicate the over-utilisation of pastures in the area. The lack of seed production due to unfavourable summer seasons and not poor plant vigour was the graziers' explanation for the decline of desirable species with over-grazing.

Conclusion

The Local Consensus Data technique is effective in obtaining information representative of local areas within major natural resource types. This information will help judge the value of technology and to design processes which may result in changes in practices on farms. It takes into account the socio-economic constraints affecting the management decisions of many graziers. Since the LCD process involved local graziers in discussion and identification of sustainable grazing management practices, awareness and ownership of important management issues was enhanced among participants. Several Landcare groups have formed as a result of these group discussions and are addressing the differences between the current and recommended grazing practices.

Graziers' management was based largely on the condition of their livestock and did not include regular objective measures of pasture condition. This is because graziers do not have the management tools to assess the impact of grazing management on pasture condition, and the linkage between pasture condition and profitability has not been clearly demonstrated.

Groups of experienced graziers defined stocking rates and living areas necessary to achieve sustainable land use. There is evidence that many graziers apply stocking rates higher than those recommended by these experienced graziers. Of major concern are the number of properties smaller than the area considered necessary for sustainable management to support a family, and the proportion of properties applying stocking rates above those recommended. These issues must be resolved if Australia's extensive pastoral lands are to remain productive.

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