Grazing management:

The performance of set-stocked pastures on the northern tablelands of NSW through severe drought.

C.A. Harris and J.F. Ayres

NSW Agriculture, Agricultural Research & Advisory Station, Glen Innes, NSW, 2370.

It is generally accepted that Australian pastures are in decline as defined by botanical composition and pasture production being below the optimum (Anon 1992). The evidence for this deterioration of the pasture base is largely anecdotal; a composite of widespread observations by producers, advisors and scientists (Archer *et al.* 1993). A survey undertaken by Lees and Reeve (1994) highlighted farmer perceptions of pasture decline. On the northern tablelands of NSW, 51% of survey respondents considered that pasture decline was a problem in their district and 82% said that pastures had declined on their own properties. The major causes of pasture decline were considered to be a cycle of dry seasons in recent decades and low fertiliser use. Lack of persistent cultivars was also considered to contribute to pasture decline (Scott *et al.* 1994).

Re-sowing degraded pastures is a common method of restoring pastures. However, given the high cost to re-establish pastures ($150 - $250/ha plus annual maintenance costs), the limited persistence of current cultivars and the time frame of five to eight years to recover costs (Vere *et al.* 1993), frequent pasture re-development may not be financially viable. An alternative to pasture re-establishment is to utilise grazing management practices that maintain desirable species in newly sown pastures and expand remnants of desirable species in degraded pasture. Research has been directed at understanding the processes that determine stability of the pasture community. A comprehensive summary of the theory and practice of grazing management was provided by Hutchinson (1993) who evaluated current grazing management systems and also proposed research-based grazing management guidelines.

The grazing management system that is traditionally practiced on the northern tablelands is best described as "intermittent grazing" - the progressive movement of grazing livestock onto fresh paddocks to utilise regrowth and ration the limited feed resource. The survey of Lees and Reeve (1994) suggests that this system of grazing management is typically directed at achieving livestock management goals rather than sustain-ability of the pasture base - a concentration on the "grazer" at the expense of the "grazed" (Hutchinson 1993). The present study examined the performance of set-stocked pastures during a severe drought. The rationale for examining set-stocked pastures was that set-stocking is a minimal control system that is readily definable and has features in common with "intermittent grazing", especially during seasonal or episodic drought.

Methods

Data were abstracted from results at two on-farm northern tablelands sites (basalt soil, granite soil) of the Temperature Pastures Sustainability Key Program (Lodge 1996) in which contrasting strategic grazing treatments were compared with set-stocking at 22 sites in the high rainfall zone. [Full results from the 22 sites will be reported in a 1998 Special Issue of the Australian Journal of Experiment Agriculture.]. The pH and Olsen P status were 5.0 and 15 and 4.7 and 5 mg/kg for the basalt and granite sites, respectively. The experimental plots (2 reps per site) were set-stocked by sheep from September 1993 to September 1996. The experi-mental period encompassed a severe and protracted drought in 1994 and 1995 (Figure 1). Stocking rates were set by a local producer group and commenced at 10 wethers/ha (basalt site) and 7.5 wethers/ha (granite site). During the drought, the stocking rate was progressively reduced. Following good summer rain in late 1994, the stocking rate was restored to 5 wethers/ha (basalt site) and 7.5 wethers/ha (granite site). Sward biomass and botanical composition were measured using Botanal procedures (Hargraves and Kerr 1978) and bare ground was measured using the

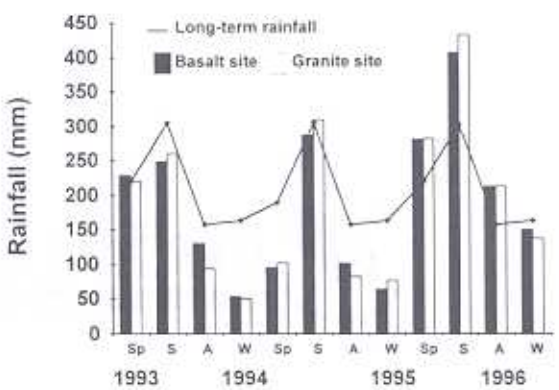

Figure 1. Seasonal rainfall during 1993-1996 at two northern tablelands experiment sites.

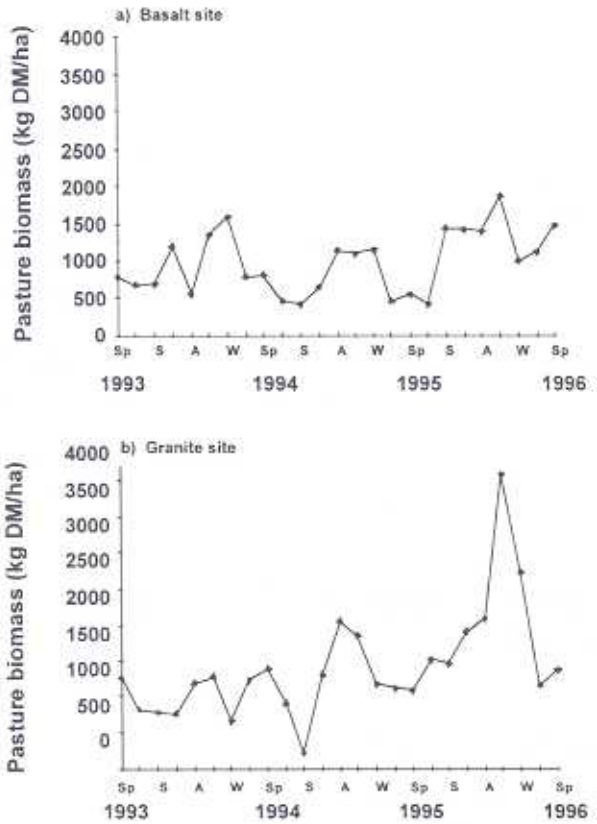

Figure 2. Pasture biomass (kg DM/ha) of set stocked pasture at two northern tablelands sites, 1993-1996.

point quadrant method in conjunction with measurement of basal cover of perennial grasses.

Results

Pasture biomass at both sites was restricted between low limits. At the basalt site, pasture bio-mass varied between 500-1800 kg DM/ha and at the granite site between 750-2000 kg DM/ha. Pasture mass at the granite site exceeded these limits in two seasons, spring 1994 and in autumn 1996.

At the basalt site, the introduced species component was maintained mainly due to the contribution of phalaris. However, fescue, cocksfoot and white clover declined progressively with the onset of the drought. The % composition of native grasses increased giving a balanced sward of danthonia and phalaris with some invasion of broadleaf weeds. At the granite site, one year of drought caused the rapid loss of cocksfoot, fescue and white clover to trace levels and progressive invasion by *Eleusine spp*, parramatta grass and broadleaf weeds.

A feature of the basalt site during the drought was the large area of bare ground (50% in spring 94). A profuse germination of *Danthonia* occurred after the drought and an increase in basal cover of phalaris reduced bare ground to approx-imately 2%. At the granite site there was also a high percentage (27%) of bare ground at the height of the drought;

Table 1. The botanical composition (%) of set-stocked pastures at two northern tablelands sites, 1993-1996.

Pasture component	Season			
	Sp 93	Sp 94	Sp 95	Sp 96
(A) Basalt site				
Phalaris	23	40	50	28
Fescue	9	4	3	1
Cocksfoot	2	3	0.5	0
White clover	3	0.5	0	0.5
Danthonia	11	30	28	55
Eleusine spp.	24	1	1	1
Broadleaf weeds	11	4	6	12
Others	17	17.5	11.5	2.5
(B) Granite site				
Cocksfoot	37	29	2	6
Fescue	31	29	0.5	1
White clover	7	0	0	22
Paramatta grass	4	8	24	20
Eleusine spp.	0	20	49	18
Broadleaf weeds	1	2	18	6
Others	20	12	6.5	27

Table 2. Incidence of bare ground (%) in set-stocked pastures at the two northern tablelands sites, 1993-1996.

Site	Season			
	Sp 93	Sp 94	Sp 95	Sp 96
Basalt site	2	48	6	2
Granite site	2	27	4	0

this was reduced by a significant germination of white clover following the drought.

Conclusions

This study examined the key sustainability indicators of pasture biomass, species composition and bare ground for temperate perennial pastures set-stocked during a severe drought. The aim was to observe whether set-stocking - a minimal control system - promoted or averted pasture decline.

1. At both sites, pasture biomass was restricted within narrow limits (500-1500 and 750-1800 kg DM/ha for the basalt and granites sites, respectively) during the two drought years. This degree of close grazing under drought conditions provided the pasture community at both sites with little opportunity for recovery from intensive and con-tinuous defoliation and exposed the swards to high levels of bare ground. The results reflect the combined effects of drought induced moisture stress and set-stocking for sites with low (granite site) and medium (basalt site) soil phosphate status.

2. Under these conditions, progressive loss of fescue, cocksfoot and white clover occurred, however, phalaris (at the basalt site) retained persistence through the drought and the native species *Danthonia* increased. With return to favourable seasonal conditions, recovery of white clover and cocksfoot was observed at the granite site.

Acknowledgments

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