Tree Competition Reduces Cattle Growth Rates in Eucalypt Woodlands of Queensland

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TREE COMPETITION REDUCES CATTLE GROWTH RATES IN EUCALYPT WOODLANDS OF QUEENSLAND

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Abstract

The wiregrass/bluegrass (*Aristida/Bothriochloa*) native pasture community in Eucalypt woodlands is a major cattle producing resource in Queensland. The effects of poplar box tree (*Eucalyptus populnea*) competition (at 5 m^2/ha tree basal area) and grazing pressure on pastures and on growth of Brahman-cross steers were measured in a grazing experiment. Treatments were 2 tree competition levels (live trees or clearing) by 3 grazing pressures (low - 25%, medium - 50% and high - 75% utilisation of annual pasture growth). Pasture yield and pasture foliage cover increased for 3 years from the reduction in tree competition by clearing and by low grazing pressure with increasing annual rainfall. Clearing increased pasture yield by 33% in the first summer growing season and by 94% in the third year. After 3 years, foliage cover after clearing was 51% compared with 39% in pastures with live trees. Pasture yield and cover were reduced by 34% and 33% respectively by high grazing pressure compared with the low rate. Reducing tree competition by clearing produced a 39% increase in annual average daily steer weight gain (0.32 kg/day) over the third year, by eliminating weight loss in winter. Annual steer growth was highest at the low and medium grazing pressures, with most rapid growth in summer when pastures were green and growing. Highest liveweight in the third year occurred with clearing and low grazing

pressure (gaining 131 kg/hd). There was greatest liveweight loss (14 kg/hd) between autumn and spring at high grazing pressure.

Keywords: Cattle, tree competition, grazing pressure, woodland, *Dichanthium, Aristida*

Introduction

Native pastures with a mix of desirable bluegrasses (*Dichanthium* and *Bothriochloa* spp.) and undesirable wiregrasses (*Aristida* spp.) dominate the Eucalypt woodlands of the sub-tropics of southern inland Queensland. These summer growing, perennial grass pastures of the *Aristida/Bothriochloa* pasture community (Weston *et al.* 1981) support beef cattle. Over grazing will reduce the populations of the desirable perennial grass species and they can be replaced by unpalatable grasses and weeds. Cattle producers have three main management options; clearing trees, regulating cattle grazing pressure and burning, to manage this pasture community for long-term production and sustainability. The undulating poplar box (*Eucalyptus populnea*) woodland country has a range of soil types from loams to clays, including potentially highly erodible duplex soils. The pastures need adjustment of cattle grazing pressures to maintain adequate grass cover that will prevent damaging soil loss, gully erosion and pasture degradation. A cattle grazing experiment was conducted to measure the effects of poplar box tree competition and differing grazing pressures on pasture production and on the growth rate of steers grazing native grass pastures.

Material and Methods

A grazing experiment was established in southern Queensland at “Glentulloch”, Injune (25^0 45’ S, 148^0 25’ E, annual rainfall 625 mm) on duplex soils in poplar box woodland in 1994.

The design used: 2 tree clearing treatments, chemically kill trees (Tordon^{R}) and retain live trees (basal area 5 m^2/ha), by 3 grazing pressures; low (25% utilisation of annual pasture growth), medium (50% utilisation) and high (75% utilisation). There were 2 replications and paddock sizes of 4 to 18 ha. Brahman-cross steers with a starting weight of 165 kg grazed the 12 paddocks continuously. Numbers were initially 3 head per paddock (1994-95). Thereafter, numbers and animal size were adjusted annually, depending on end of summer pasture production, to graze the pasture at the required utilisation rate.

Pasture dry matter yield, foliage cover and species composition were recorded annually using the BOTANAL program and steer liveweight was recorded every 2-3 months. Pasture production and foliage cover over the first 3 years, and steer liveweight change in the third year are reported.

Results

The experiment commenced after the 1993-94 drought which caused poor pasture growth of 600 kg/ha. Rainfall in the first 3 years (1994-95 to 1996-97) of grazing was 391, 571 and 654 mm respectively.

Pasture yield responses to tree competition and grazing pressures followed similar trends during the first 3 years (Table 1). Clearing produced higher yields than with tree competition (meaned across grazing pressures) in all years, for example, almost double at 3440 kg/ha in 1997. End of summer yields increased in both the cleared and treed treatments to a peak of 4250 kg/ha in the cleared and low grazing pressure treatment in autumn 1997. The treed and high grazing pressure treatment was consistently lowest yielding. Pasture foliage cover increased markedly to 51% in the cleared treatments over 3 years (Table 1). Cover increased to 50% at the medium and low grazing pressures, but remained relatively unchanged at high grazing pressure (33% in 1997).

Steer liveweight over the third year in all cleared treatments showed higher growth rates (mean 0.32 kg/day) than in the tree competition treatments (0.23 kg/day). The main difference was steers in the cleared treatments maintained weight in winter and spring (average gain of 0.03 kg/day), while with tree competition, steers lost weight (average –0.12 kg/day from May to November) (Figure 1 a). The liveweight in the third year shows the superiority of low grazing pressure during winter and spring. Growth rates were similar at the low and medium grazing pressures in summer and autumn (Figure 1 b). There was a rapid increase in summer, peaking in late autumn as pastures matured, when temperatures and soil moisture declined. Weight was maintained at low grazing pressure in winter. Greatest liveweight changes in winter occurred with tree competition and high grazing pressure, losing 0.15 kg/day between May and November (176 days).

Mean annual steer growth rates were 0.35, 0.29 and 0.17 kg/day for the low, medium and high grazing pressures respectively. Peak growth rate was during summer (166 days from November to May) when steers at low grazing pressure averaged 0.73 kg/day, compared with 0.44 kg/day at high grazing pressure. A mean weight loss of 0.08 kg/day occurred in winter and spring (May to November) at high grazing pressure.

Discussion

Clearing Eucalypt trees increases pasture production and foliage cover for at least 3 years compared with competition from trees, even at a relatively low tree basal area of 5 m^2/ha. Poplar box trees can produce over 15 m^2/ha basal area in this environment. The reduced pasture yield with trees lowers cattle carrying capacities and animal production per ha, and the reduced cover

increases the risks of soil loss and erosion, further deteriorating the potential pasture and cattle production.

The pasture yield increase in all treatments over the three year period was assisted by increasing annual summer rainfall following the drought. Pasture cover was similar at the medium and low grazing pressures, but autumn pasture yields were reduced by the medium rate. This indicates that 50% utilisation of end of summer feed may be too high for this environment. However, animal production per ha was consistently higher from the medium than from low pasture utilisation rate for this 3-year period. Pasture cover increased under the low and medium grazing pressures (to 50% over 3 years), while cover remained low, near 30%, at high grazing pressure. In this *Aristida/Bothriochloa* community, a cover of near 40% is desirable for maintaining a stable soil surface. The high grazing pressure, adjusted to utilise 75% of autumn standing pasture, not only reduces pasture production, but will cause increased water runoff and soil erosion, leading to a degraded and less productive landscape.

There was an immediate response in pastures, of a 33% increase in yield, and in steer growth rate over the first year by reducing tree competition. These differences increased over 3 years. The higher weight loss over winter from the tree competition meant steers were lighter and in poorer condition, causing a lower sale value the following summer.

The steer growth rates responded strongly to periods of green grass availability. There was little treatment difference in growth rates during summer when pastures were green and growing. Main differences in weight gain between the grazing pressures were in the drier period from autumn to spring. The cattle were limited by insufficient green or leafy material and possibly lower quality pasture at the high grazing pressure. The high grazing pressure may change the pasture composition by increasing unpalatable *Aristida* spp. density. Such poor

composition pastures occur in this Eucalypt community causing reduced sheep growth rates (Hall *et al*. 1997) and they may also further reduce cattle growth rates.

Competition from Eucalypt trees on pastures in the *Aristida/Bothriochloa* community reduces annual pasture production and foliage cover, and also reduces cattle growth rates, especially in winter, over the dry half of the year. Trees in combination with high grazing pressure, or pasture utilisation rate, have the most detrimental effect on pastures and on cattle production.

References

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Table 1 - Tree competition and grazing pressure (pasture utilisation rate %) effects on pasture dry matter yield (kg/ha) and foliage cover (%) in the first 3 years of grazing.

Treatments		DM yield (kg/ha)			Foliage cover (%)		
		Yr 1	Yr 2	Yr 3	Yr 1	Yr 2	Yr 3
Tree competition	Cleared	1057	2305	3435	36	47	51
	Treed	794	982	1771	33	25	39
Grazing pressure	25 %	1168	2552	3198	43	42	49
	50 %	873	1468	2490	26	36	52
	75 %	735	911	2120	35	29	33

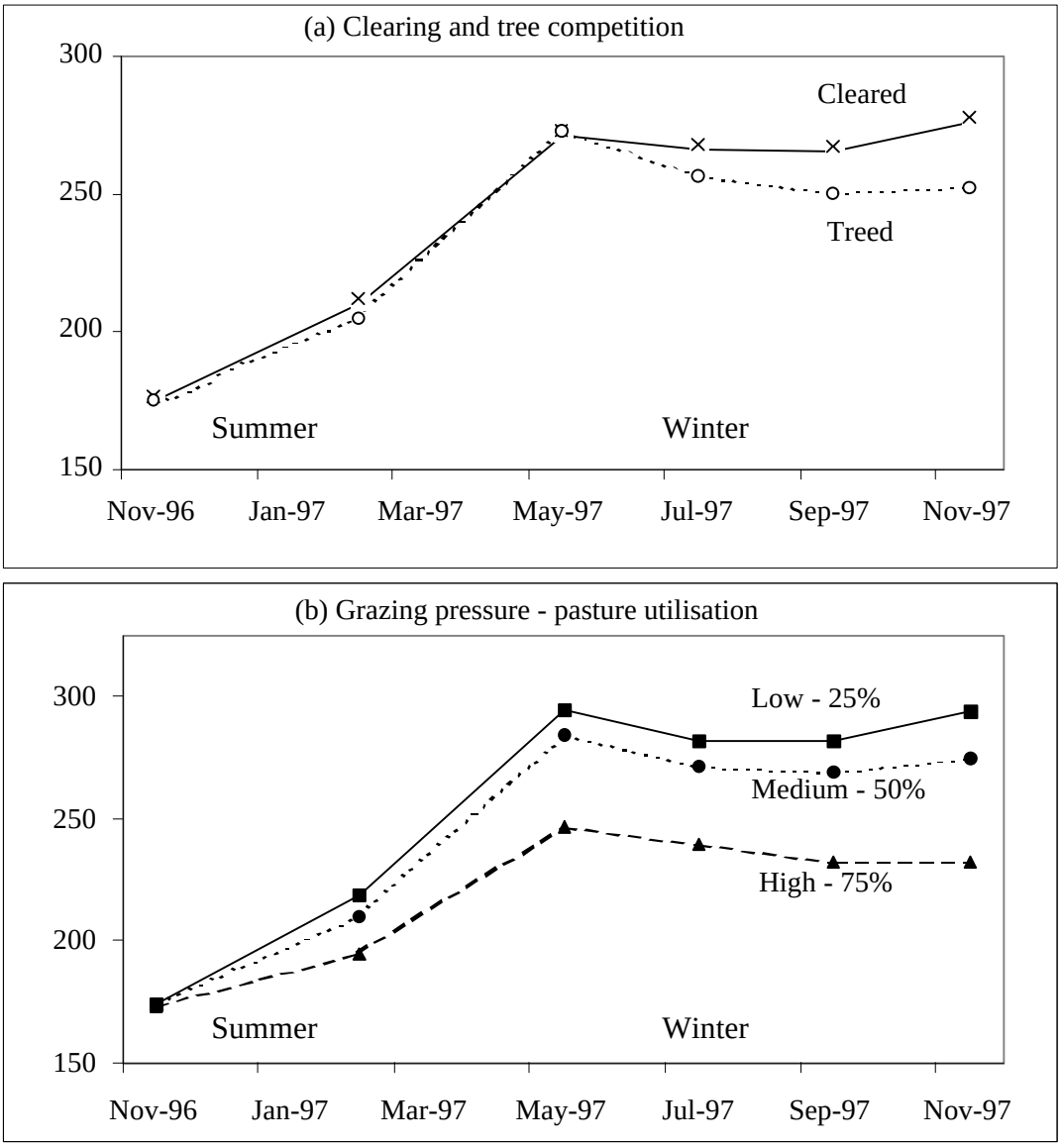

Figure 1 - Steer liveweight change in response to tree competition (a) and grazing pressures (b) in the third year of grazing.