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SCALING UP FROM ECOGRAZE – THE VIRGINIA PARK EXPERIENCE

Corfield, J.P.[1] and *Nelson, B.S.*[2]

[1] CSIRO Sustainable Ecosystems, Davies Laboratory, Townsville Q 4810
[2] QDPIF, Charters Towers Q 4820

Email: Jeff.Corfield@csiro.au

INTRODUCTION

A recently completed MLA funded study (Post *et al.* 2006) applied sustainable grazing strategies, including reduced utilisation and wet season spelling to commercial paddocks at Virginia Park Station, Mingela, north Queensland, using grazing management guidelines derived from the earlier Ecograze study (Ash *et al.* 2001). The objective of the Virginia Park study was to test commercial application of these grazing management guidelines and monitor impacts on land condition, hydrological function and sediment and nutrient movement over a four year period between 2002 and 2006.

The original Ecograze study explored pasture responses to a range of utilisation, spelling and burning treatments, using small (<2 ha) paddocks on three major land types in both good and fair-poor condition in the upper Burdekin region of North Queensland, from 1993 to 2000. Grazing management principles derived from this study, advocating reduced utilisation rates and systematic wet season spelling to recover and/or maintain good pasture condition were included in a widely distributed booklet titled *The Ecograze Project – developing guidelines to better manage grazing country* published in 2001 (Ash *et al.*, 2001).

Though intended as broad guidelines, these Ecograze grazing management strategies have since been widely applied at commercial scale with variable success, especially in landscapes with poorer starting land condition or more dominated by exotic increaser grasses such as *Bothriochloa pertusa*. Scaling up from small experimental paddocks to commercial properties also has its challenges, particularly in relation to increasing landscape complexity and variability, as well as the logistics and infrastructure necessary to implement practices such as wet season spelling. This paper compares the pasture responses over the first 4 years of the commercial paddock scale Virginia Park study with those of the earlier Ecograze study. The impacts of starting land condition, seasonal conditions, scale and land type variability on the outcomes of the two studies are discussed.

METHODS

For comparison purposes we used the plots with 25% utilisation plus biennial spelling treatments at the State II Ecograze site at Cardigan (Ash *et al.* 2001) and the Virginia Park Aires paddocks. Of the four paddocks involved in the Virginia Park study, the two Aires paddocks were the most comparable with the Cardigan state II site in terms of dominant land type, starting land condition and grazing management treatments (Table 1). At Virginia Park, GPS located fixed point (400 m * 100 m) survey grids were used to collect paddock scale data on pasture biomass, composition, frequency, perennial grass basal area, ground cover and defoliation at the end of the wet season and the end of the dry season between December 2002 and December 2006. In the Ecograze study, similar seasonal pasture data metrics were recorded from fixed point (20 m * 20 m) grids in the much smaller 2 ha paddocks.

SITE COMPARISONS

Despite the broad similarities between these study sites, there were some important differences in starting pasture composition and land condition. In terms of overall ABCD land condition class (Chilcott *et al.* 2003) the Cardigan site was uniformly C+ to B- condition at the start, with around 30% palatable, perennial and productive (3P) native tussock grasses and less than 10% *Bothriochloa pertusa*.

Though the Virginia Park paddocks were predominantly in C to C+ condition at the commencement of the study, there were significant areas of B condition and some D condition land associated with particular vegetation and topographic associations. Virginia Park paddocks started with approximately only 10% 3P grasses and over 85% *Bothriochloa pertusa*. At both sites, the remainder of the herbage was increaser native perennials, annual grasses and forbs. Starting frequency of 3P grasses was similar for both sites (Table 1) but the 3P plants were much smaller in the Virginia Park paddocks. There were also obvious differences of scale between the two studies. The Cardigan paddocks were approximately 2 ha and located entirely on upper to mid-slope ironbark/bloodwood (*Eucalyptus crebra / Corymbia erythrophloia*) communities with the same "goldfields" soil type. By contrast, Virginia Park's 800 ha Aires paddocks, though dominated by the main ironbark/bloodwood vegetation community, contained topography ranging from ridge to creek line and a diversity of smaller vegetation community and soil type associations, including riparian and frontage areas, lower slope sodic soil communities and gully lines (Figure 3a).

Table 1: Description of initial conditions at the Ecograze Cardigan state II and Virginia Park sites

Starting comparison	Cardigan state II, 25% utilisation	Virginia Park – Aires paddocks
Soil type	Neutral red duplex - goldfields	Neutral red duplex – goldfields
Paddock size	2ha each	~ 800 ha each
Dominant veg type	Ironbark / bloodwood	Ironbark / bloodwood + riparian, frontage and box
Topographic location	Upper and mid slope	Ridge top to creek line
Geology	Grano-diorite	Grano-diorite
Soil type	Neutral red duplex (goldfields)	Neutral red duplex + some alluvial and box soils
Starting 3P %	30%	10%
Starting B. pertusa %	10%	85%
Starting 3P freq. %	75%	65%
Ground cover	40%	65%
ABCD land condition	Uniformly C+ / B-	Predominantly C but some D and B areas
Target utilisation	25%	30-35%
Wet season spelling	Biennial, first 6-8 weeks of wet	Biennial whole of wet season spelling

WHOLE OF PADDOCK COMPARISON RESULTS

Both studies experienced a similar run of below average rainfall years over the first four years (Table 2). Drought conditions prevailed at both sites in the first 2 years with slightly lower rainfall at Virginia Park than at Cardigan in these years.

Table 2: Comparison of seasonal rainfall for first four years of Virginia Park and Cardigan study sites

Site	Study period	Year 1	Year 2	Year 3	Year 4	Long term av.
Virginia Park	2003-06	284	287	287	440	620
Cardigan	1993-99	385	376	253	335	595

Though Virginia Park paddocks started in poorer condition, both sites showed significant recovery in total end of wet season pasture biomass for the comparable ironbark/bloodwood upper and mid slope land type over the first four years (Figure 1). While both total and 3P grass biomass was comparatively lower in the Virginia Park paddocks for the first three years, the relative percentage contribution of 3P grasses was almost equal by year 3. In year 4, both 3P biomass and percentage contribution increased sharply at the Cardigan, indicating a significant improvement in land condition (Figure 1a). While total biomass also increased sharply in at Virginia Park Aires paddocks, this was almost entirely due to recovery of *Bothriochloa pertusa*, with no increase in 3P biomass and a drop in relative 3P contribution (figure 1b).

The frequency of 3P grasses at the end of the wet season declined at both sites in year 3 (Figure 2a) despite reduced utilisation and spelling, most probably due to the impacts of severe drought conditions.

The apparent continuing fall in 3P frequency for Virginia Park paddocks in 2005 may be an artefact of the difficulty in detecting very small 3P plants within the increasing *Bothriochloa pertusa* biomass during end of wet season surveys.

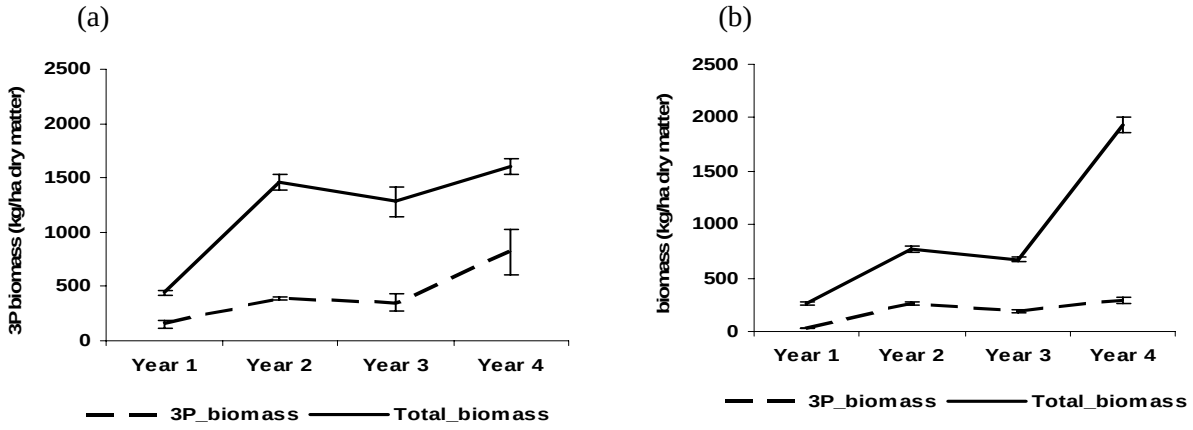

Figure 1: End of wet season (EW) total biomass and 3P biomass yields for (a) Cardigan and (b) Virginia Park for the first 4 years (means and standard errors).

There was a contrast between end of wet season ground cover trends over the first four years of each study site (figure 2b). The Cardigan paddocks, with a higher proportion of 3P and increaser native perennial tussock grasses, started with cover levels of 36%, which rose to just over 60% in year 2 (due to increased annuals) before declining again to around 41% in years 3 and 4, as the 1990s drought set in..

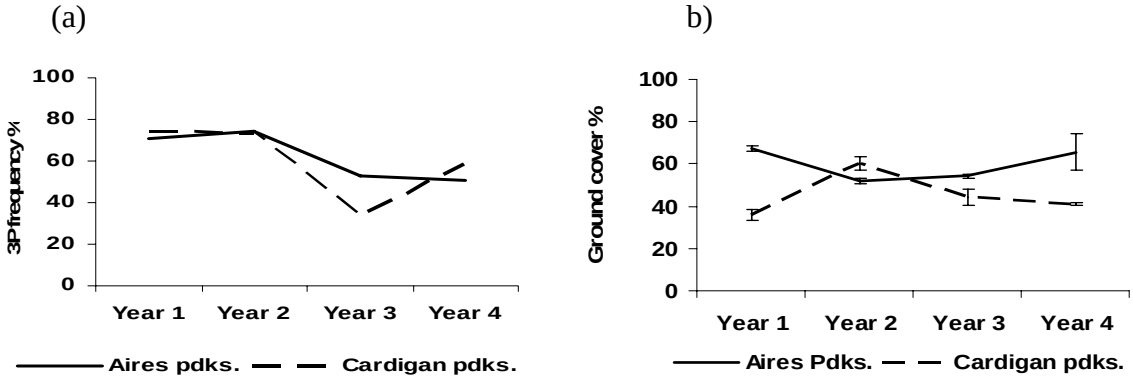

Figure 2: Comparison of seasonal trends in (a) end of wet season 3P frequency, and (b) ground cover for first four years at Cardigan and Virginia Park (means and standard errors)

By comparison the Virginia Park paddocks, dominated by *Bothriochloa pertusa*, started with around 67% cover but this fell sharply to 52% during the severe drought year of 2003, rising steadily back to 65% by year 4, in response declining paddock utilisation (>60% in 2003 to around 35% in 2006) and, wet season spelling The year to year fluctuations in end of wet season ground cover at Virginia Park are mainly due to the response of the dominant *Bothriochloa pertusa* pasture component to variation in rainfall conditions.

SCALE RELATED COMPARISONS

While some of the differences in paddock-scale temporal responses relate directly to initial land condition and pasture composition differences, the much larger paddock size and topographic and land type diversity of the Virginia Park paddocks (Figure 3a) also impacted on responses. Selective grazing

preferences for particular vegetation community/land condition associations also led to variable response patterns within paddocks for key land condition metrics such as 3P grass recovery and ground cover trends (see Figure 3b).

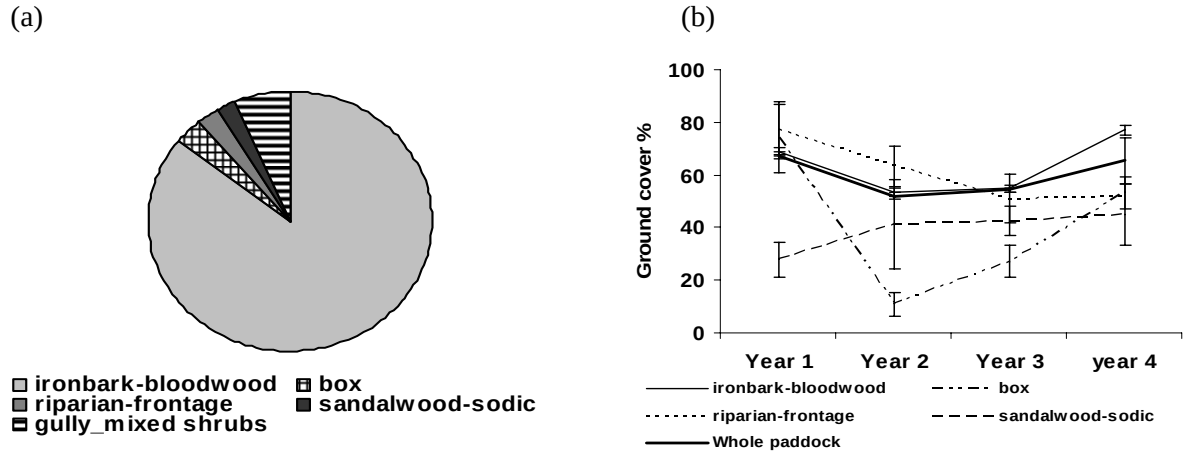

Figure 3: (a) Relative proportions of the main vegetation/land type associations in Aires paddocks, Virginia Park and (b) ground cover response trajectories for the these same vegetation/land type associations from 2003 to 2006.

DISCUSSION AND CONCLUSION

Scaling up Ecograze sustainable grazing strategies to commercial paddocks presents many challenges but these results indicate they can be successful. The Virginia Park paddocks improved significantly in both total pasture biomass and ground cover over the four year study period in response to application of the Ecograze derived practices of reduced utilisation and wet season spelling. However, there were important differences in the temporal and spatial responses between Virginia Park and the original Ecograze Cardigan state II site, due in part to differences in starting pasture composition, specifically the lower 3P grass and higher *Bothriochloa pertusa* levels at Virginia Park, which contributed to the slower response of 3P grasses there and seasonal conditions.

The greater landscape diversity at commercial paddock scale can prove to be a challenge for sustainable grazing management, as it is often accompanied by increased grazing selectivity for particular vegetation community, topography and land condition associations, which can in turn lead to more patchy spatial and temporal patterns of recovery. The recently published *Managing Recovery – tools for sustainable grazing in the Burdekin catchment* information package provides useful guidelines on managing patchy recovery in these landscapes, drawing on the Virginia Park experience.

REFERENCES

Ash, A., Corfield J. and Ksiksi T. (2001). The Ecograze Project – developing guidelines to better manage grazing country. **CSIRO Sustainable Ecosystems, Davies Laboratory,** Qld. 4814.

Chilcott, C. R., McCallum B.S., Quirk M.F. and Paton C.J. (2003). Grazing Land Management Education Package Workshop Notes – Burdekin. **Meat and Livestock Australia Limited**, Sydney.

Post, D.A., Bartley, R., Corfield, J., Nelson, B., Kinsey-Henderson, A., Hawdon, A., Gordon, I., Abbott, B., Berthelsen, S., Hodgen, M., Keen, R., Kemei, J., Vleeshouwer, J., MacLeod, N. and Webb, M., (2006). MLA NBP.314 Sustainable Grazing for a Healthy Burdekin Catchment final report **CSIRO, Canberra.**