



Do Multi-Paddock Systems Increase Evenness of Grazing at the Paddock Scale?

Robyn A. Cowley

Department of Primary Industries and Fisheries, Australia

Ian A. White

University of Adelaide, Australia

Mark H. Hearnden

Department of Primary Industries and Fisheries, Australia

Leigh Hunt

CSIRO, Australia

Steve P. Petty

Northern Development, Australia

See next page for additional authors

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Presenter Information

Robyn A. Cowley, Ian A. White, Mark H. Hearnden, Leigh Hunt, Steve P. Petty, and Lindy Symes

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Robyn A Cowley^A, Ian A White^B, Mark H Hearnden^A, Leigh P Hunt^C, Steve P Petty^D, and Lindy Symes^{DE}

^A Department of Primary Industry and Fisheries, Darwin, Northern Territory Australia 0801 www.nt.gov.au

^B University of Adelaide, South Australia, Australia 5005

^C CSIRO Ecosystem Sciences, Winnellie, Northern Territory, Australia 0828 www.csiro.au

^D Northern Development, Kununurra, Western Australia, Australia 6743

^E Cooinda, Dingo Queensland, Australia 4702

Contact email: robyn.cowley@nt.gov.au

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Introduction

There is ongoing debate about the benefits of multi-paddock rotationally grazed systems compared to continuous grazing (Briske *et al.* 2008). One of the purported benefits of high density short duration grazing is more spatially uniform defoliation. A commercial-scale trial in northern Australia (Hunt *et al.* 2013) compared continuously grazed paddocks to cell grazed and wet season spelled systems in newly developed paddocks. This paper reports the effect of grazing system on defoliation with distance to water through time.

Methods

The unreplicated trial was on Pigeon Hole Station in northern Australia's seasonally dry tropical savannah region (average rainfall 752 mm falling mostly between November and April). Three grazing treatments were compared: cell grazing (CG), wet season spelling (WSS) and continuous grazing (CA and CB) (Table 1). All treatments were variably stocked, with regular adjustments made to stocking rate to utilise 20% of standing dry matter available in May each year. All treatments were imposed by 2004, and 2003 data

Table 1. Summary of treatment paddocks used in the grazing systems study. One AE = 450kg dry steer.

Treatment	Number (and size) of paddocks (km ²)	Total system area (km ²)	Stocking density when grazed (AE/km ²)	Maximum distance to water (km)	Proportion paddock >3 km from water (%)
Cell grazing	25 (0.7-1.7)	31	404	2.2	0
Continuous A	1 (21)	21	15	4.7	22
Continuous B	1 (21)	21	15	3.5	2
Wet Season Spelling	3 (5)	15	44	3.8	5

represent a 'before treatment' baseline. All water points were new, except for in CA, which used an existing water source.

Defoliation was visually estimated in categories (0, >0-5%, >5-25%, >25-50%, >50-75%, >75%) in 4 m² quadrats arranged in a 100 x 500 m grid across each paddock. Spearman's correlation tested for significant distance to water (DTW) patterns in defoliation. ANCOVA was used to detect differences in DTW patterns between grazing systems in the proportion of ungrazed and heavily grazed (>50%) quadrats.

Results

Initially there were no distance to water patterns in defoliation for any treatments (Fig. 1). Distance to water patterns in defoliation were strongest and developed most rapidly for CA and WSS. Defoliation in CG and CB was less correlated with distance to water, although by the end of the study, there was a slight tendency for higher defoliation closer to water in these paddocks too, but much less so than for CA and WSS.

The proportion of ungrazed (DTW $F_{1,49} = 0.09$, $P=0.76$) and heavily grazed (DTW $F_{1,49} = 0.95$, $P=0.33$) quadrats were not significantly related to DTW in October 2003. In May 2006 (Figure 2) CG had significantly more ungrazed quadrats than WSS or CA (Bonferonni $P<0.05$). There were significantly more ungrazed quadrats further from water in CA and WSS (DTW $F_{1,49} = 9.17$, $P<0.01$, slope=0.007, $t=3.03$, $P<0.01$; DTW x Grazing system $F_{3,49} = 8.42$, $P<0.001$), but not in CG and CB. In October 2006 (Fig. 2) CG had fewer heavily grazed quadrats than both continuously grazed paddocks (Bonferonni $P<0.01$), but all treatments except CB had significant DTW patterns with fewer ungrazed (DTW $F_{1,49} = 22.4$, $P<0.0001$, slope=0.01, $t=4.73$, $P<0.0001$; DTW x Grazing system $F_{3,49} = 22.4$, $P=0.14$) and more heavily grazed (DTW $F_{1,49} = 42.2$, $P<0.0001$, slope=-0.0008, $t=-6.49$, $P<0.0001$; DTW x Grazing system $F_{3,49} = 3.42$, $p=0.02$) quadrats near water.

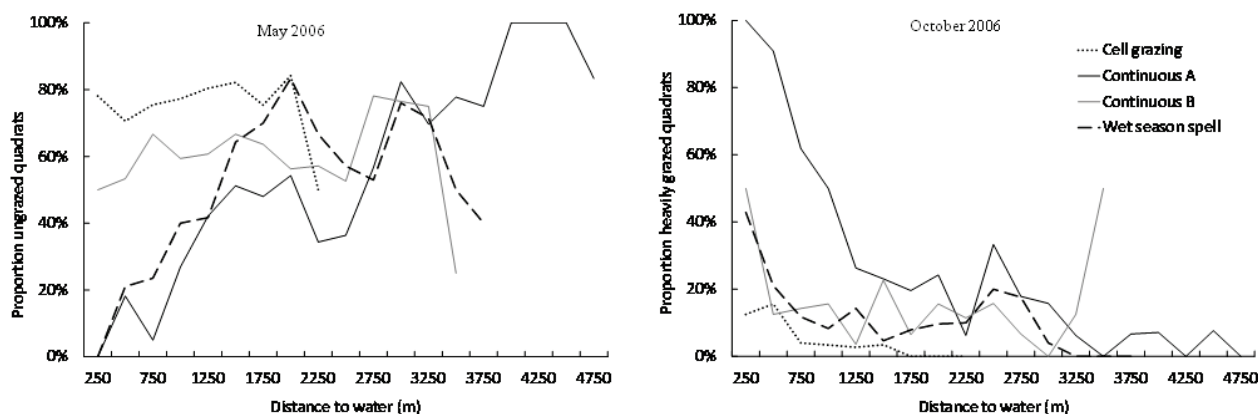


Figure 2: The proportion of ungrazed in May (left) and heavily grazed in October (right) quadrats with distance to water for the different grazing system paddocks in 2006.

Discussion

The limited DTW patterns in CB are likely due to the effect of an historical waterpoint distant from the current water. Wet season spelling as implemented here reduced neither the incidence of overgrazing nor DTW grazing patterns at the paddock scale, with patterns very similar to CA around an old water source. The much higher stocking density and smaller paddocks in CG may have delayed the development of DTW patterns and reduced the incidence of overgrazing in October. The higher incidence of ungrazed and lower incidence of overgrazed areas in CG did not lead to improved land condition during the limited timeframe of this study. The higher infrastructure and management costs for the cell grazing system, without any benefit to land condition or animal production, contributed to its poorer economic performance compared to the continuous systems (Hunt

et al. 2013). There was some evidence that cell grazing, but *not* wet season spelling, increased the evenness of grazing at the paddock scale.

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