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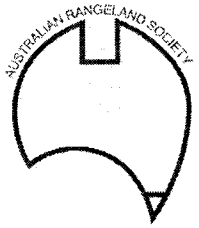

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INVESTIGATIONS INTO CELL GRAZING ON TWO RANGELAND TYPES IN CENTRAL QUEENSLAND (STUDENT)

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ABSTRACT

Although not widely adopted, many producers have claimed beneficial responses in environmental sustainability and livestock productivity following introduction of cell grazing. However, there has been much discussion regarding the impact of cell grazing in the Australian landscape and the lack of research data for producers. This investigation was conducted to provide data from a comparison of cell grazing and conventional grazing.

The study was conducted on two different rangeland types in the Emerald region of Central Queensland. The measurements taken related to: Landscape Function Analysis, bulk density, microbial activity, total nitrogen, plant frequency and soil biological crusts. Much of the data indicated that the parameters were generally similar or at a more favourable level for cell grazing than conventional grazing. However, data for some of the parameters were at a significantly lower level at the end of a graze period on the cell grazing sites, but these became equal to or higher than for the conventional grazing by the end of the rest period.

It was concluded that, overall, cell grazing improved ecosystem processes and productivity on the bloodwood woodlands-native pasture country and cleared ironbark-improved pasture country.

INTRODUCTION

There has been an increasing focus on both the productivity and environmental sustainability of grazing lands. One of the consequences of this concern has been the increasing interest in "cell grazing" and its principles. There has been only limited research into cell grazing in Australia.

This study investigated the differences between cell grazing compared to conventional grazing and how these differences contributed to changes in ecosystem processes.

METHODS

The field work was conducted on 'Avocet', 30 km south of Emerald in Central Queensland.

The sites for the study were:

(1) Bloodwood (*Corymbia* spp) woodland - Vertosol soil:
- VTG: conventional rotationally grazed for 3 months each year (annual stocking rate: 1 AE per 12 ha.) (native pasture).
- VCG: cell grazing

(2) Ironbark (*Eucalyptis melanophloia*) – Kandosol soil:
- KTG: conventional rotationally grazed for 3 months each year (annual stocking rate: 1 AE per 1.6 ha); (pasture: buffel grass *(Cenchrus ciliaris)* and seca stylo *(Stylosanthes scabra)*).
- KCG: cell grazing

The cell grazing sites had been in operation for 5 years before the assessment. Paddocks average 10 ha and average annual stocking is 1 AE to 12.8 ha; stock density averages 1 AE to 0.1 ha.

Measurements were taken on three different occasions in relation to cell grazing movements: (1) during a rest period, (2) at the end of a rest period, and (3) at the end of a graze period.

RESULTS

Landscape Function Analysis (LFA)

Soil surface assessment indices for LFA are presented in Tables 1 and 2.

Table 1: Soil Surface Condition Indices for Cell (VCG) and Conventional Grazing (VTG) on the Bloodwood - Vertosol country

Treatment	Soil Surface Assessment indices (%)								
	Stability			Infiltration			Nutrients		
Time	T1	T2	T3	T1	T2	T3	T1	T2	T3
VCG	53	53	53	33	33	30	26	26	22
VTG	63	58		35	33		26	23	

Table 2: Soil Surface Condition Indices for Cell (KTG) and Conventional Grazing (KCG) on the Ironbark - Kandosol country

Treatment	Soil Surface Assessment indices (%)								
	Stability			Infiltration			Nutrients		
Time	T1	T2	T3	T1	T2	T3	T1	T2	T3
KCG	53	51	49	31	27	29	26	21	23
KTG	53	51		31	30		26	26	

For each land type, there was little difference in soil surface assessment indices between the conventional and cell grazing.

Soil Bulk Density

Figure 1 illustrates a significant differences ($p<0.05$) in bulk density between VCG and VTG.

Microbial Activity

The KCG treatment had significantly higher ($p<0.05$) microbial activity than the KTG treatment (Figure 2).

Plant Frequency

In the bloodwood-vertosol soil site there was a significant difference ($p<0.05$) between the frequency of a native legume (*Rhynchosia minima*) (53% for cell grazing; 5% for conventional).

Total Nitrogen

Total nitrogen changed significantly over the graze/rest periods under cell grazing for both sites – Figure 3.

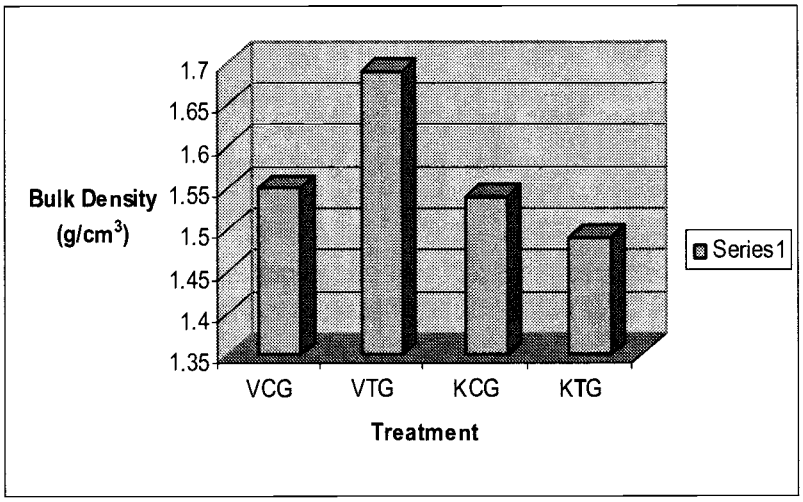

Figure 1: Soil bulk density for conventional and cell grazing for bloodwood-vertosol and ironbark-kandasol country

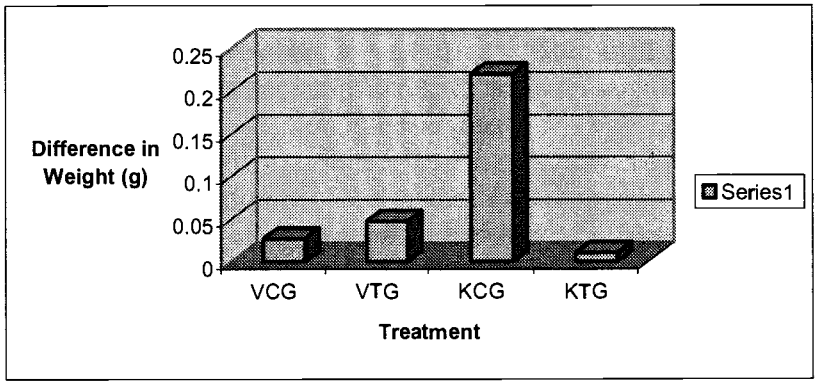

Figure 2: Comparison of microbial activity ("weight") for conventional and cell grazing for bloodwood-vertosol and ironbark-kandasol country

Cryptogams

The KCG treatment contained active cyanobacteria, bacteria and diatoms. The cyanobacteria *Microcoleus* spp. were dominant. Other cyanobacteria included *Chroococcales* spp. and *Oscillatoria* spp. The VTG, VCG and KTG treatments also contained *Microcoleus* spp. and other unidentified species. However, due to the colour of the soil it was harder to isolate cyanobacterial filaments, and to assess other species present. There was no indication of the presence of any bryophytes (non vascular plants).

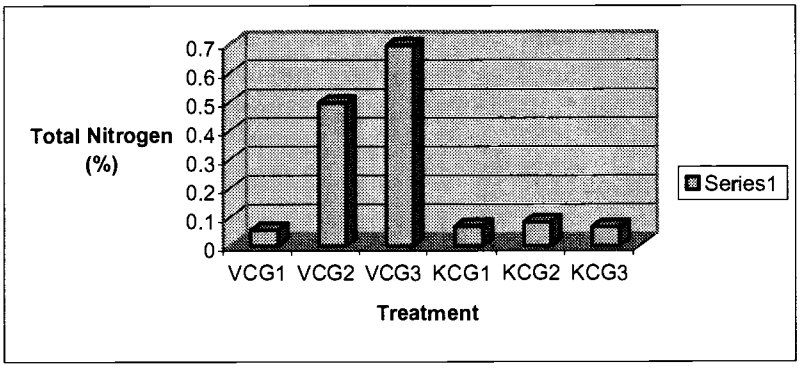

Figure 3: Comparison of total nitrogen for cell grazing on both sites at different times

DISCUSSION

The overall lack of difference in LFA data for soil surface condition was unexpected.

On the bloodwood–vertosol country, the soil bulk density was significantly higher under the conventionally grazed (VTG) compared to the cell grazing (VCG). This was attributed to an improved root system, and rest periods under cell grazing.

There was significantly more microbial activity under cell grazing compared to conventional grazing on the ironbark-kandosol soils was attributed to the higher pasture biomass and litter.

The presence of *Rhynchosia minima* in cell grazing on the vertosol site and its absence from conventional grazing could be due to the long periods of rest in the cell grazing, providing opportunity to regrow, whilst being suppressed by selective grazing in conventional grazing.

The total nitrogen % was significantly higher at the end of the graze period compared to the recordings for the rest period on the cell grazing-vertosol site. This may have been the result of nutrient distribution during the graze period. It is evident however that the total nitrogen % returned to the previous level during the rest period. This additional nitrogen may have been used by plants responding to defoliation. There is no clear explanation for the significant differences between the nitrogen levels at different times on the cell grazed kandosol site.

The presence of *Microcoleus* spp. on all treatments is significant in that they are nitrogen fixing. The *Chroococcales* spp. and *Oscillatoria* spp. cyanobacteria, which were only present on the cell grazed vertosol site, often precede *Microcoleus* as early colonisers. Their presence on only the cell grazed vertosol site indicated that it was "healthier" for these organisms than the conventionally grazed site. Their absence from the vertosols may indicate they are not supported by that soil type. Based on the fact that the samples were cultured for several weeks it would indicate a healthy progression in biological activity. Nevertheless, it is relevant that there are nitrogen fixing species of cyanobacteria present in all soil types and this may contribute to overall soil health and landscape vitality.

CONCLUSIONS

The general conclusions from this study were that cell grazing was contributing positively to landscape function in the bloodwood-vertosol and ironbark-kandasol rangelands of Central Qld. This applies particularly to soil physical and chemical properties, plant frequency and cryptogams. The findings in relation to the differences in nitrogen-fixing bacteria under different grazing systems and rangeland types has opened up a new line of study on soil-plant nutrition.