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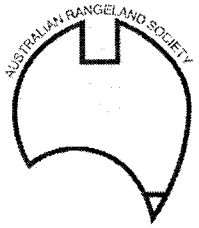

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ALTERNATIVE GRAZING SYSTEMS-OPTIONS FOR PASTORAL MANAGEMENT IN AUSTRALIA'S TROPICAL SAVANNAS

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ABSTRACT
As well as ensuring the continuation of profitable animal production, the focus of grazing management systems is turning towards ongoing, sustainable use of native pastures and maintenance or improvement of biodiversity in the tropical savannas of the VRD. The Pigeon Hole Project is investigating three alternative grazing management systems with potential benefits for the region and comparing them with the current widespread management system. A comprehensive array of data is being collected to inform the development of a grazing management system suited to the district.

INTRODUCTION
Victoria River Downs Station, the largest property in the Victoria River District (VRD) of the Northern Territory, was developed as a pastoral property in the mid 1880s, with 20,000 cattle overlanded from Queensland around 1882 and almost 1,000 breeding ewes delivered via Port Darwin in 1891 (Makin 1992). Since this time, the local pastoral industry has had a chequered history having been moulded by the harsh and variable climate, uncertain markets and variable prices (Ash and Stafford Smith 2003). The industry is characterised by low input, low output enterprises facing an increasing cost/price squeeze and community demands for enhanced environmental and social sustainability.

Set stocked, continuous grazing has been the traditional form of grazing management on pastoral enterprises in the VRD. Under this management system, pasture utilisation levels have only averaged around 10% of annual forage production, with some pasture degradation evident. Long-term grazing trials from experimental paddocks at the adjacent Mt Sanford Station have indicated that utilisation levels in excess of 20% are environmentally sustainable and provide enhanced animal production through more even grazing distribution and better overall utilisation of the landscape.

Grazing management systems other than set stocking have been investigated extensively in other regions and countries and have, at times, demonstrated various benefits. For example, wet season spelling, with overall utilisation levels of 35%, is currently recommended for northern Queensland, providing benefits of increased utilisation rates and profitability, while maintaining the dominance of important perennial grasses (Ash *et al.* 2001). Over the past 10 years cell grazing, in a variety of guises, has been widely touted as having potential benefits for the Australian rangelands, (for example Earl and Jones 1996). Do these alternative grazing systems have applicability for the tropical savannas that underpin the pastoral industry of the VRD?

Three alternative grazing systems are being compared to set stocking at commercial paddock scales within the Pigeon Hole Project. These are:

1) Set utilisation, where the stocking rate is adjusted annually to achieve a desired level of pasture use (20%) based on the amount of available pasture present at the end of the growing season;
2) Wet season spelling, a rotational resting system where each paddock receives a period without grazing for two out of every three wet seasons; and
3) Cell grazing, an infrastructure and labour intensive system that is based on rapid rotations of livestock through many small paddocks.

Compared to set stocking, the other three grazing systems require greater management input but have potential benefits including more sustainable use of the pastures, superior animal production and enhanced commercial viability. As part of this study, these are all being investigated at appropriate spatial scales to facilitate adoption of outcomes.

METHODS

Within the trial area (319 km^2), single or multiple paddocks are managed as different grazing systems. Data is being collected on pastures, cattle production, commercial viability and biodiversity values from the: wet season spelling treatment (3 paddocks of 5 km^2); cell grazing treatment (33 km^2 divided into 25 paddocks); 20% set utilisation treatment; and set stocking (both in single paddocks of 21 km^2).

Pastures

Pasture assessments are undertaken at around 6,200 sites at the end of the wet (May) and dry seasons (October). Virtual quadrats, 2 m x 2 m, are arranged on a grid pattern 500 m apart in an east/west direction and 100 m apart in a north/south direction and are relocated using global positioning systems (GPS). At each quadrat species composition, yield, defoliation, basal area of perennial grasses, ground cover, land type, patch type and influence of fire are recorded.

Cattle production

In line with the industry norm for the VRD, all cattle in the study are mustered twice per year. Study cattle have electronic identification, which facilitates recording their weight and ongoing presence in the paddock. The pregnancy status of the study cows is recorded, as well as their body condition score and the presence of a calf. Calves are tagged, branded, and processed. Monthly faecal NIRS samples are analysed from every paddock to provide an ongoing indication of diet.

Commercial viability

Details of infrastructure costs and additional operational costs, including extra labour requirements have been recorded since the trial commenced.

Biodiversity

Extensive biodiversity surveys are undertaken across the trial site twice per annum and are reported separately (see Fisher *et al.* this volume).

DISCUSSION

Numerous reviews of grazing management research have been undertaken over the years and across different continents e.g. O'Reagain and Turner (1992), Ash and Stafford Smith (1996), Joseph *et al.* (2002), etc. Each of the reviews has suggested ways that research methodology can be improved to make outcomes more useful, for example:

Ash and Stafford Smith (1996) concluded that, as well as animal growth rates, measurements of reproduction and deaths have relevance for rangelands pastoral production systems that involve self-replacement herds. Data should be collected to enable whole enterprise economic analysis of animal and vegetation management options. These are being measured as part of this study.

Brown and Allen (1989) suggested that both temporal and spatial scale are important in observing grazing systems, designing experiments, analysing results and reporting outcomes. The extrapolation of known plant-animal interactions across scales is questionable and it is unclear how measures of animal productivity on small trial paddocks relate to large paddocks (Roshier and Nicol 1998). WallisDeVries *et al.* (1998) showed that temporal aspects of grazing behaviour could not simply be scaled up by changing units because processes and behaviours in the larger scale simply do not occur in the smaller experimental scale. Choice of the most appropriate temporal scale can be exacerbated in rangelands and savannas where high variability is customary through all time scales. Moreover, Fuhlendorf and Smeins (1999) demonstrated that the scale of observations can determine whether grazing appears to have a positive, negative or no influence on heterogeneity between grazing units. The perception of spatial heterogeneity is highly scale dependent, greatly influenced by the resolution of measurements (Laca 2000).

With the Pigeon Hole Project using commercial scale paddocks in which to undertake the research, a number of diverse spatial and temporal factors, and their respective scale issues, have been given due consideration e.g. paddock heterogeneity, appropriate data collection, duration of trials. As recommended by Sanderson *et al.* (2004), where appropriate, the trial has moved beyond small-scale experiments to measure animal productivity, behaviour and plant selection at relevant scales to enable practical grazing management recommendations to be made.

The main reasons for adopting different grazing management systems are to improve animal performance and control, or pasture productivity and vegetation condition, with the importance of biodiversity being acknowledged more recently. However, given that grazing management is a business enterprise, underlying any change must be a neutral or positive commercial outcome either in the short or long-term. At the completion of the Pigeon Hole Project complete data sets will be analysed to identify best-bet, cost-effective grazing systems suited to this environment and animal production system.

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