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Official publication of The Australian Rangeland Society

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The Australian Rangeland Society

EFFECT OF GRAZING STRATEGY ON ANIMAL PRODUCTION AND PASTURE COMPOSITION IN NORTH QUEENSLAND

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ABSTRACT

The ability of heavy, light, and variable stocking, rotational spelling (R/Spell) and a SOI-Variable strategy to cope with rainfall variability was tested over 8 years. Individual annual live weight gain (LWG/hd) was consistently higher under light than under heavy stocking, with LWGs in other strategies intermediate between these levels. LWG/ha was highest under heavy stocking but the strategy was not sustainable, requiring feeding and partial destocking in dry years. Pasture composition and yield were best in the light and R/Spell but poorest under heavy-stocking. Overall, light gave superior pasture condition and individual animal performance and reduced costs relative to heavy stocking. The SOI, Variable and R/Spell strategies show promise as a means of coping with rainfall variability but all require further testing.

INTRODUCTION

Rainfall variability in north Queensland is high, leading to fluctuations in pasture production and carrying capacity between years. Overstocking and/or only responding to dry years in a reactive fashion can incur major economic losses for producers through the costs of drought feeding, agistment and even stock loss. Drought and overstocking also lead to loss of ground cover and perennial grass species and increased runoff (McKeon *et al.* 2004).

A number of grazing strategies are currently recommended to manage for climate variability e.g. light stocking, variable stocking and/or spelling (O'Reagain *et al.* 2003). However, little objective data exists on their long-term profitability and sustainability. In 1997 a grazing trial was established to address this issue (O'Reagain & Bushell 1999). We present data on the effects of these strategies on animal production and pasture condition over 8 years and discuss some possible economic implications.

METHODS

The study was conducted on Wambiana Station near Charters Towers, north Queensland (mean annual rainfall = 650 mm; C.V. = 40%). Most precipitation falls during the hot summer months. The site is an open *Eucalypt* savanna on relatively infertile tertiary sediments. Ten *c.* 100 ha paddocks were laid out in 1997 in a randomised block design of 5 treatments replicated twice. Strategies being tested are (i) *light stocking rate* (LSR): 8ha/ large stock unit (LSU= 450 kg steer)), (ii) *heavy stocking rate* (HSR): 4 ha/LSU, (iii) *variable stocking rate* (VAR): 3-10 ha/LSU - stock numbers adjusted annually in May according to available pasture, (iv) a *SOI* (Southern Oscillation Index) – variable strategy – stock numbers adjusted in November according to available pasture and SOI-based rainfall predictions (SOI: 3-10ha/LSU) and (v) *rotational spelling* (R/Spell: 6 ha/LSU) - one third of the pasture annually wet season spelled to buffer variability in feed supply between years. Due to good rainfall the VAR and SOI strategies were initially run at 3.5 - 5 ha/LSU (1998-2001), but stocking rates were reduced thereafter to about 9-10 ha/LSU as rainfall declined.

Between 1997 and 2000, 18 month Brahman-X steers were used, with all being replaced every May. From 2000 paddocks contained equal numbers of 18 and 30 month old animals with the older cohort being replaced every May. Animal numbers varied from 11-35 per paddock, depending upon the treatment. Annual live weight gains were calculated from the difference between fasted start and end weights. Dry-season lick (32 % urea), wet season P (14.76 % P, 21.87% urea) and *Compudose* hormone growth promotants were used from May 2003 onwards. Low pasture yields (<200 kg/DM/ha) in late 2003 and 2004 necessitated molasses and urea (M8U) drought feeding in the HSR. Cattle were removed from one replicate of the HSR in December 2004 but returned in February after good rains. Pasture total standing dry matter and species contribution to yield were assessed annually in May using BOTANAL (Tothill *et al.* 1992). Plant data were grouped into eight functional groups i.e. 3-P and 2-P (palatable, productive and/or perennial) grasses, wire grasses (*Aristida* and *Eriachne* spp.), annual grasses, 'other grasses', forbs, legumes and sedges. Statistical analyses were done using ANOVA on the GENSTAT program.

RESULTS

After applying the strategies for eight years, the yield of 3-P grasses at the end of the wet season in May 2005 was ten fold greater ($p<0.05$) in the LSR than in the HSR (Figure 1) : 3-P species made up 63% of the total yield under light stocking but only 25% of the yield under heavy stocking. Conversely, the contribution of annual grasses to yield was greatest under heavy stocking (37%) but least under light stocking (10%). Under heavy stocking, wiregrass as a % of total yield was also almost twice that under light stocking (15 vs. 8.7%). Pasture composition for the SOI, VAR and R/Spell treatments was intermediate between the heavy and light treatments. The total amount and proportion of grazeable forage was thus greatest in the LSR and R/Spell, lowest in the HSR and intermediate in the VAR and SOI strategies.

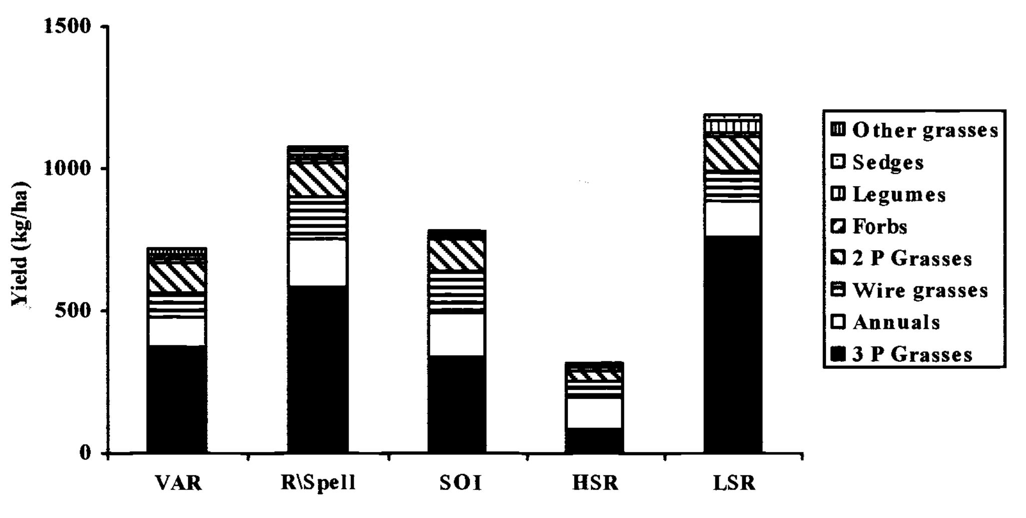

Figure 1: Contribution (kg/ha) of species groups to yield in May 2005 under different stocking strategies
(VAR=variable, R/Spell=rotational spell, SOI=Southern Oscillation Index, HSR=heavy stocking rate and LSR=light stocking rate)

As expected, mean annual live weight gain per head (LWG/hd) varied markedly between years, reflecting inter-annual rainfall variability (Figure 2). Treatment also had a significant effect ($p<0.001$) on LWG/hd which was consistently higher under light stocking than under heavy stocking (mean: 126 vs. 95 kg/yr). LWG/hd in the R/Spell (mean: 108 kg/yr), VAR (mean: 111 kg/yr) and SOI (mean: 111 kg/yr) strategies, varied between these extremes and largely depended upon stocking rate. On leaving the trial after two years, lightly stocked animals were 50-70 kg heavier than those from heavily stocked strategies and in most years received appreciable price premiums due to superior condition (data not shown).

The effect of the different strategies on LWG was most noticeable in the dry season: while animals maintained or even gained weight under light(er) stocking, weight loss usually occurred in the heavier stocked regimes, despite urea supplementation. Drought feeding (M8U) was required on occasion in the HSR to halt extreme weight loss as happened in the 2003\04 and 2004\05 dry seasons.

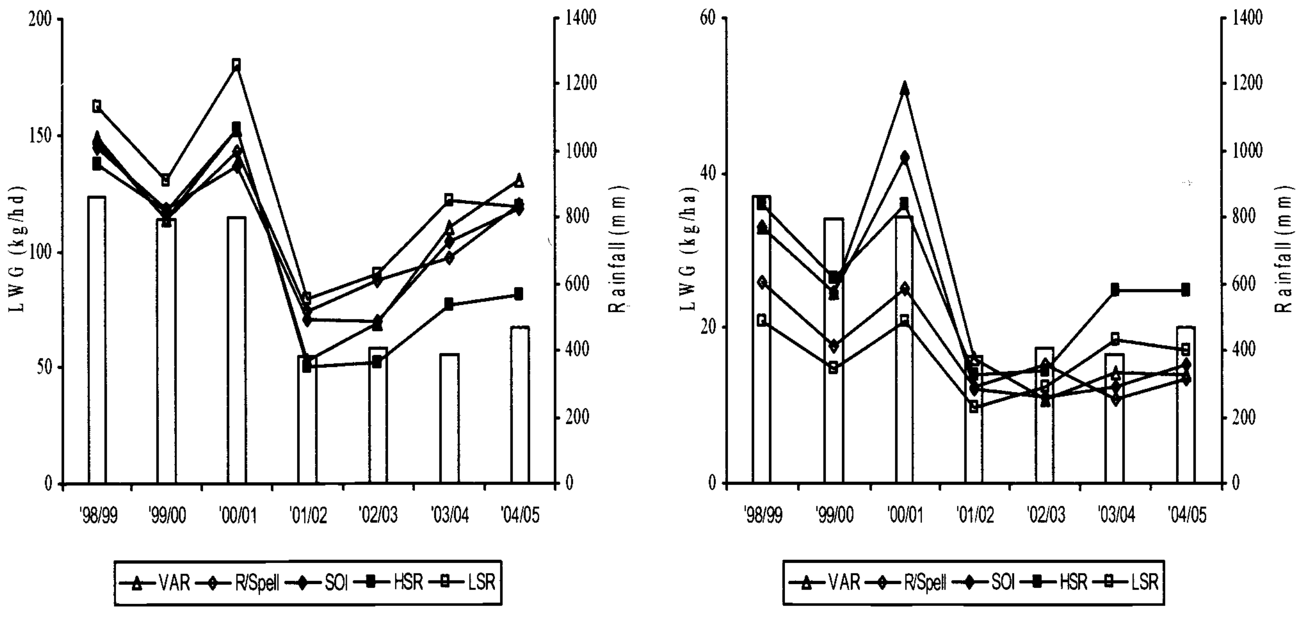

Figure 2: Annual rainfall and live weight gain (LWG) per animal (Left) and per hectare (Right) for different grazing strategies 1998 – 2005
Treatment abbreviations as before

LWG/ha also varied markedly between years according to rainfall (Figure 2). Treatment significantly (*$p<0.001$*) affected LWG/ha but the effect was inconsistent due to variability in rainfall and, in some cases, stocking rate between years. Generally the greatest LWG/ha occurred in the heaviest-stocked strategies e.g. the VAR strategy in 2000/01 while the lowest occurred in lightly-stocked strategies. In 1999/00 the HSR produced almost twice the LWG/ha of that produced in the LSR strategy (27 vs. 14 kg/ha). These differences later narrowed, so that by 2003/04, LWG/ha in the HSR and LSR were fairly similar (14 vs. 12 kg/ha). Importantly, the HSR had to be destocked by *c.* 40 % in June 2005 due to the extreme shortage of forage. This situation may in future be reversed by a return to good seasons but it does suggest that constant heavy stocking is not sustainable, at least in the medium term.

DISCUSSION

The trial data suggest that heavy stocking will give the greatest LWG/ha, at least in the short term, but this will be at the expense of pasture condition. Experience also suggests that a significant decline in carrying capacity is inevitable, but this requires validation in the longer term (>8 years). Light stocking delivers major benefits for pasture condition and animal production, producing heavier animals of larger frame size, that reach turnoff sooner than those under heavy stocking. These will be more marketable and will command a premium at the meatworks because of the weight-for-age pricing structure. In the longer term, improvements in pasture condition could also increase animal productivity and possibly, carrying capacity. There is also some evidence that strategies that adjust stock numbers in relation to seasonal (i.e the VAR and SOI) strategies have the potential to capture the superior production/ha of heavier stocking in good seasons without incurring the costs of drought feeding or causing significant overgrazing in poor seasons. A possible disadvantage however of such systems is the increased management skill required and greater environmental and economic risk.

In conclusion, the trial should be continued so that the long term effects of the different strategies on animal production and pasture condition can be quantified and the exact nature of any effect of declining resource condition on secondary production quantified.

ACKNOWLEDGEMENTS

We thank the Lyons family 'Wambiana' and the Grazier Advisory Committee for their continued support and guidance. The trial is funded by Meat and Livestock Australia and the CRC for Tropical Savanna Management.

REFERENCES

McKeon G., Hall W., Henry B., Stone G, and Watson I. (2004). Pasture degradation and recovery in Australia's rangelands: Learning from history. QDNR, Brisbane, 256 pp.

O'Reagain P.J. and Bushell J.J. (1999).Testing grazing strategies for the seasonally variable tropical savannas. *Proc. VIth International Rangelands Congress*, Townsville, July 1999, 485-486.

O'Reagain P.J., McKeon G.M., Day K.A. and Ash A.J. (2003). Managing for temporal variability in extensive rangelands – a perspective from northern Australia. *Proc. VIIth International Rangelands Congress, Durban, South Africa, July 2003, pp. 799-809.*

Tothill J.C., Hargreaves J.N.G, Jones R.M & McDonald C.K. (1992). BOTANAL – a comprehensive sampling and computing procedure for estimating pasture yield and composition 1. Field sampling. *CSIRO Trop. Agron. Memo.* #78.