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Long term performance of different cattle stocking strategies in a variable climate

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In the extensive beef industry of northern Australia, failure to manage for rainfall variability such as by applying heavy stocking rates and/or not matching animal numbers to feed availability, frequently results in land degradation and economic loss. While sustainable management strategies such as stocking at long-term carrying capacity (LTCC) exist, adoption rates are often low due to perceived unprofitability. One important factor limiting adoption is the lack of empirical evidence showing the relative economic, production and environmental benefits of recommended strategies. To address this issue, a large (1040 ha) grazing trial was established in 1997 near Charters Towers, Queensland, to test the relative performance of different stocking strategies.

The study area is an open *Eucalyptus-Acacia* savanna, dominated by native grasses; mean annual precipitation is 640 mm. Five strategies were tested: a heavy stocking rate (HSR) stocked at 4 ha/AE (animal equivalent), a moderate stocking rate (MSR) without wet season spelling stocked at the long term carrying capacity of 8–10 ha/AE, a moderate stocking rate at LTCC with wet season spelling (R/Spell) and Flexible stocking (Flex) with or without spelling (+/- Spell). Strategies were replicated twice (O'Reagain *et al.* 2009). Paddocks were stocked with Brahman steers, managed following industry best practice. Cattle were weighed at the start and end of each grazing year (May), gross margins (GM) calculated as product value less costs (O'Reagain *et al.* 2011) and the density of 3P (productive, palatable, perennial) grasses recorded on permanent monitoring sites. Ethics approval was granted by the Department of Agriculture and Fisheries Animal Ethics Committee (SA 2019/06/691).

Rainfall varied markedly (246–1223 mm) over the 24-year trial period, with two distinct wet and dry cycles: 2014/15 (246 mm) was the fourth driest season on record, with on-going drought conditions persisting into the present year. Average annual liveweight gain (LWG) per head over the 24 years was highest in the MSR, R/Spell and Flexible strategies but lowest in the HSR due to reduced feed availability and generally lower diet quality. Conversely, total LWG per ha was highest in the HSR but this was only achieved with expensive drought feeding in seven of the 24 years of the trial (Table 1). Average GM/ha in the HSR was consequently only about half ($7/ha) that of the other strategies ($13/ha).

Table 1. Average annual liveweight gain (LWG) per head (hd), LWG per hectare (ha), gross margin (GM) per hectare and the number of years drought feeding was needed in five treatments over 24 years at the Wambiana grazing trial. The density of 3P grasses in 2021 is also shown. See text for treatment abbreviations

Treatment	LWG/hd (kg)	LWG/ha (kg)	Years drought fed	GM/ha ($)	3P density (tussocks/m-2)
Flex	115	15	1	$13	1.3
Flex+Spell	115	16	1	$13	3.7
HSR	100	19	7	$7	0.5
MSR	117	14	1	$13	2.1
R/Spell	116	15	1	$13	2.4

Heavy stocking resulted in a major decline in pasture condition in terms of the density of 3P species relative to the other treatments. This not only shows the deleterious effects of heavy stocking in this variable environment but also shows that adopting basic principles of good management at least partly ameliorated the effects of the recent severe drought relative to heavy stocking. After 24 years it is nevertheless surprising that the differences in pasture condition between the remaining four treatments are relatively small, possibly reflecting the ongoing, 8-year dry period. However, the results also indicate that constant stocking even at LTCC without reducing stocking rates in dry years will also cause a decline in pasture condition in the longer term. Evidence from this work and other trials also highlights the importance of wet season spelling.

In conclusion, this work shows that all things being equal, heavier stocking rates are likely to be both unsustainable and extremely unprofitable in the longer term. (O'Reagain *et al.* 2018). The results and our experience managing the trial also show that risk-averse flexible stocking around long-term carrying capacity coupled with wet season spelling, is likely to be the most profitable and sustainable strategy for managing climate variability.

References

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