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Can the principles of multipaddock grazing accelerate land condition recovery?

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Abstract

Recovery of land condition would significantly improve livestock carrying capacity and ecosystem services on many properties in northern Australia. Unfortunately, this is often extremely slow, even with significantly reduced stocking rates and pasture resting. There is interest amongst graziers in using the principles of intensive, multi-paddock, rotational grazing systems to accelerate recovery. However, evidence for their effectivity relative to conventional recommendations is often anecdotal and sometimes contradictory.

To test the ability of these principles to accelerate land condition recovery, a short duration grazing treatment (SDG) was implemented on two poor condition paddocks in a long-term grazing trial in north Queensland, Australia. Two experienced multi-paddock practitioners have been engaged to guide management. The treatment results can assist to develop cost-effective, evidence-based guidelines to accelerate recovery on grazing lands in northern Australia.

Introduction

Land condition has declined in many parts of northern Australia due to grazing practices that have reduced carrying capacity, productivity and ecosystem services. Recovery of the land condition of these areas will have substantial financial and ecosystem benefits but can be extremely slow even with significantly reduced stocking rates and pasture rest, e.g., McIvor (2001). There is growing interest amongst graziers in the use of multipaddock rotational grazing (MPG) to accelerate recovery. These systems vary but in essence involve short grazing periods, moderate to high stock densities and long rest periods, all applied adaptively.

Evidence for the superiority of MPG systems relative to simpler, more conventional, systems involving, for example, moderate stocking and occasional spelling is nevertheless contested (O'Reagain and Turner 1992; Briske *et al.* 2008; Hall *et al.* 2014). However, previous grazing trial research on MPG systems has been criticised as being unrepresentative of industry practice due to the small, relatively uniform paddocks often involved. The rigid application of MPG treatments in research rather than the more flexible, adaptive application adopted by most MPG practitioners has also been highlighted (Teague *et al.* 2013).

To test the ability of such systems to accelerate land condition recovery relative to conventional management, an MPG treatment, termed Short Duration Grazing (SDG) was established on a long-term grazing trial in north Queensland, Australia. The treatment involves applying the key principles of short grazing periods, increased herd density, and long rests (Teague *et al.* 2013) to two previously overgrazed paddocks in poor condition. To address the issue of scale, paddocks are relatively large (100 ha) and spatially heterogenous. Two producer advisors, both experienced MPG practitioners, were engaged to guide management. Here we report on the first year's application of the SDG treatment and its performance relative to the other grazing strategies in the trial.

Procedure

The trial is located on 'Wambiana' (20° 34' S, 146° 07' E), a commercial cattle station 70 km south of Charters Towers, Queensland, Australia. Long term (114 year) mean annual rainfall is 643 mm (C.V.= 40%), with 70% falling in the hot summer months. The vegetation is an open *Eucalyptus-Acacia* tropical savanna overlying C4 tropical grasses. Soils are relatively infertile, ranging from texture contrast to heavy clays. The main trial was established in 1997 with five grazing strategies: heavy stocking (HSR: 5 ha/AE [1 AE=450 kg steer]), moderate stocking (MSR:10 ha/AE), rotational wet season spelling (R/Spell: 10 ha/AE) and flexible (Flex) stocking (4 to 20 ha/AE) applied with/without spelling (S). Treatments are replicated twice. In May 2022, the HSR strategy was terminated with these paddocks used for the SDG treatment from November 2023 onwards.

Paddocks are approximately 100 ha in size and contain a mix of soil-vegetation types in similar proportions. Treatments are grazed by Brahman cattle managed according to industry recommendations (O'Reagain *et al.* 2009). For the SDG treatment, a large herd of cattle from the surrounding property is utilised.

Grazing management and data collection

Prior to grazing, SDG paddocks were assessed and a weighted forage budget based on the proportion of usable forage and a 25% utilisation rate of the 3-P species used to calculate the number of stock grazing days available. The appropriate grazing period was then calculated for each paddock based on the number, weight and reproductive status of the cattle available.

To monitor treatment effects pasture species composition and yield were assessed in the late wet season (May) using the Botanal procedure (Tothill *et al.* 1992). Pasture species are grouped for presentation as: 3-P grasses (palatable, preferred perennials), 2-P grasses (palatable/productive, perennials), annual grasses, legumes, wiregrasses (*Aristida* and *Eriachne* spp.) or 'other' (other grasses, forbs and sedges). An attempt was made to measure animal weight gains using remote Optiweigh[15] walk over platforms but given the short grazing periods, this was unsuccessful. Faecal samples were also collected for diet quality analysis but are yet to be analysed.

Results

Seasonal conditions and treatment implementation

Following nine consecutive (2012-2022) below median, rainfall years, the 2021/22 season was particularly harsh, with extremely low pasture availability at the end of the usual wet season in May 2022. Given the lack of forage (<500 kg DM/ha), the HSR, MSR and R/Spell paddocks were destocked. The two Flexible stocking strategies remained stocked as the progressive adjustment of stocking rates in preceding years had ensured sufficient forage for the approaching dry season.

Paradoxically, the destocking decision was followed by record winter rains, resulting in exceptional (1064 mm), well distributed precipitation over the 2022/23 season. Consequently, the HSR, MSR and R/Spell paddocks

[15] Optiweigh, Armidale, NSW, Australia

experienced a full year's rest under ideal conditions. The MSR and R/Spell were fully restocked in June 2023. The former HSR paddocks were also lightly stocked (12 ha/AE) for four months from July to October 2023.

The SDG treatment effectively began in November 2023 with these paddocks rested for five months until late March 2024 when they were grazed by 354 heifers (443 AEs) for 1.5 and 2 days each. The paddocks were grazed again in late July 2024 by 406 cows (500 AEs) for 2 and 3 days each. These two grazing periods yielded 26 stock days/ha (averaged over both paddocks), compared to the 29 to 36 stock days/ha/year removed from the other treatments on the trial.

Pasture composition

Total pasture yield and 3-P grass yield increased more than four-fold in the SDG treatment between the end of the HSR treatment in 2022 and the start of the new treatment in 2024 (Figure 1). However, the fact that yields also increased to a similar extent in all treatments indicates that this response was almost entirely due to the exceptional rainfall received and the long intervening periods of rest before the SDG treatment was initiated. Interestingly, despite these favourable conditions, both total and 3-P species yield were still lower in the SDG than in the other treatments. This appears to reflect the legacy of the previous 26 years of heavy grazing on the condition of these former HSR paddocks. This legacy effect will be accounted for by comparison of pasture change relative to the other simpler, systems in the trial.

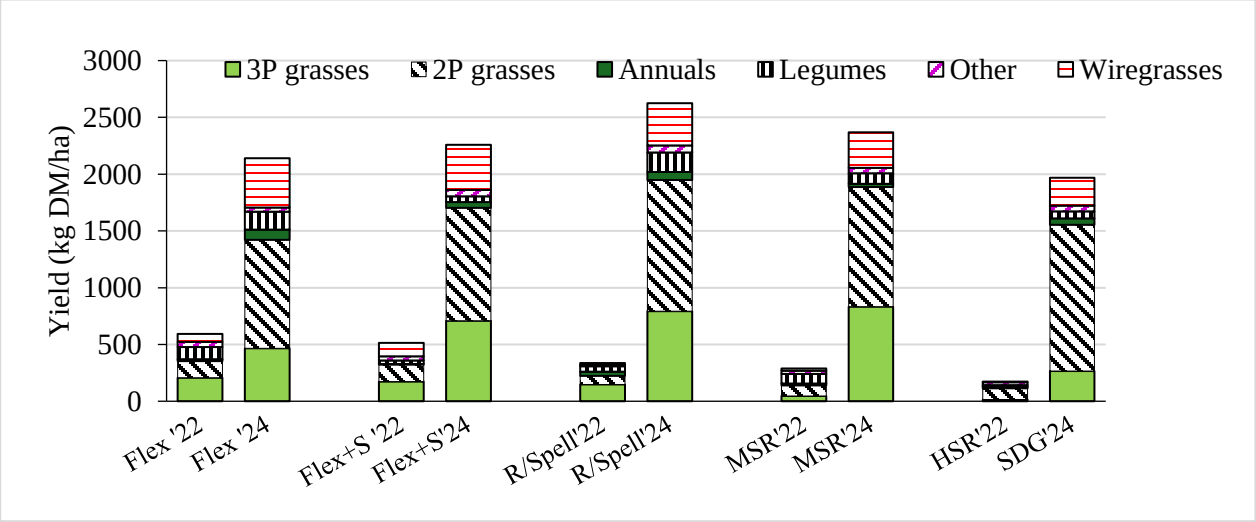

Figure 1: End of wet season (May) pasture DM yield and species contribution to yield in the Short Duration Grazing treatment (SDG) in 2024 compared to the other treatments in 2022 and 2024. See text for abbreviations.

Despite these initial positive results, the available evidence suggests that full recovery is likely to be very slow, e.g., McIvor (2001). In other work at the Wambiana trial site, the key perennial grass *Bothriochloa ewartiana* took nearly 12 years to recover following previous overgrazing, despite reduced stocking rates and annual wet season spelling (O'Reagain *et al.* 2023). Nevertheless, recovery could well be faster in the SDG treatment given the longer, more frequent rest periods and the close matching of grazing pressure to forage availability.

Discussion

The SDG treatment will be continued with the key principles applied adaptively, based on seasonal conditions and pasture response, allowing changes in land condition to be compared to the other simpler, more conventional management treatments on the trial site. Grazing exclosures within the SDG treatment will also allow the separate effects of complete rest and rest with managed grazing on recovery to be quantified.

One challenge will be assessing animal production in the SDG to enable a full assessment of the costs and benefits relative to other systems. An attempt is being made to assess weight gains using remote walk over weighing technology but given the very short grazing periods has not been successful. However, diet quality data combined with stock days per hectare may allow the profitability of the SDG system relative to other treatments to be modelled. Whatever the outcome, these results will be valuable in informing industry of the relative ability of different management techniques to accelerate recovery of paddocks in poor condition. We look forward to reporting this data as the project continues.

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