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Pasture Monitoring in the Southern Rangelands of NSW

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Key words: pasture; monitoring; grazing management; livestock production.

Abstract
The Producer Demonstration Site: Pasture Monitoring in the Rangelands, initiated in 2022, showcases the productivity benefits of routine monitoring and targeted management of key pastures species in the southern rangelands of NSW. Utilising a combination of on-ground monitoring and remote sensing data, the project tracks pasture production and groundcover percentages at four producer sites across 237,747 hectares in the Oxley and Booligal areas.

Critical decision points in February and August align with pasture supply and demand for these regions, influencing management decisions such as feed supplementation, destocking determinations, and weaning. Therefore, biannual observations and pasture samples of four key pasture species are taken in late summer and late winter at each site. Pasture samples are collected to analyse the crude protein, digestibility and metabolisable energy through feed test data results. Remote sensing tools, Geoglam RaPP Map and Cibo Labs, are used to measure groundcover and green cover at each observation point. Core producers meet twice each year to discuss their sites and share management learnings.

In the project's second year, notable findings include consistent composition of nutritional plants during autumn and winter across two monitoring sites. On other sites, shifts in plant quality were attributed to seasonal availability rather than nutritional changes. The key contributing plants of higher quality in August 2023 included Burr Medic (*Medicago polymorpha*), Barley Grass (*Hordeum leporinum*) and Bladder Saltbush (*Atriplex vesicaria*). Noting that although these species may represent the greatest nutritional value and availability within a paddock, grazing preferences of sheep/cattle (Graetz and Wilson 1980) mean these species might not contribute the largest portion of the livestock's diet in all cases.

The project will continue to track feed quality and its impact on livestock production in western NSW, further demonstrating the efficacy of proactive monitoring and tactical management practices in enhancing rangeland productivity.

Introduction

Managing productive and palatable plants in the pastoral system in alignment with livestock production requirements and sustainable land management is a constant undertaking for rangeland producers. Rainfall has been noted as one of the largest contributors to pasture and soil health in the Western Riverina district (Eldridge and Stafford 1999; Eldridge and Grant 2004). Considerable biomass and vegetation cover declines were recorded

between 1990 – 2003 in the Saltbush range-type where seasonality was a larger driver of pasture growth than annual rainfall totals (Eldridge and Grant 2004). Declines in effective rainfall and the deterioration of pasture were linked to a reduction in pastoral productivity through reduced stocking rates (Eldridge and Stafford 1999; Eldridge and Grant 2004). This is reflective of a reduction in the perennial feedbase composition (Eldridge and Grant 2004) and a greater reliance on annual species and opportunistic rainfall to provide short term productivity benefits. As seasonal rainfall irregularity increases, managing a productive livestock enterprise conducive to maintaining and recruiting supporting perennial species will prove more difficult for producers.

The Pasture Monitoring in the Rangelands project seeks to demonstrate that livestock businesses in the southern rangelands of NSW can enhance productivity by implementing routine pasture monitoring and targeted management of key pasture species. Seasonal monitoring is conducted across four producer sites to collect locally relevant data, which permits producers to make informed and timely production decisions aligned to grazing strategies, supplementary feeding, and stocking rates. The project also facilitates peer-to-peer knowledge exchange within the producer group, where participants collaborate and share insights to improve their grazing management practices. This enables producers to combine personal experience with new tools and information to make more informed choices. The project aims to enhance producers' ability to track pasture health, species composition, and feed quality by integrating monitoring tools, including remote sensing, feed testing, and on ground assessments. Participation in the project is designed to deliver long-term improvements in pasture resilience, boost productivity in rangeland livestock businesses, and promote sustainable grazing practices that can adapt to the challenges of the region's variable climate.

Methods

Pasture Monitoring in the Rangelands commenced in 2022 as an approach to continue the site monitoring, pasture sampling and producer engagement established in the initial intakes of the Improving Tactical Decision Making (ITDM) program. The ITDM program is based on tactical management principles (Campbell and Hacker 2000) which continue to be utilised in this project to guide the methodology.

The project emphasises data-driven decision-making by combining on-ground and remote sensor monitoring. Pasture metrics, including species present, groundcover, and grazing strategies, are tracked with seasonal observations. Utilising property trigger points (Hacker et al. 2006) alongside participant producer consultation, two monitoring periods were identified for February and August, aligned to significant decision-making stages in producer management cycles. Site observations, including photo and step point assessments (Campbell and Hacker 2000), and pasture samples of four contributing pasture species are conducted biannually at each monitoring site. Feed quality is assessed primarily through crude protein (CP %), dry matter digestibility (DMD %) and metabolisable energy (MJ/kg DM) laboratory analyses. Scanning percentages, weaning rates and stock sale numbers will be incorporated into the decision-making process. Remote sensing tools, Geoglam RaPP Map and Cibo Labs, are used to collect complementary biomass, green cover and groundcover data for each monitoring period.

Following each data collection, the producer group is brought together to discuss the monitoring results, seasonal conditions, reflections on production system changes and to review concepts of the ITDM. Group meetings are held online and on-property enabling producers to share ideas, experience and practices with neighbouring businesses guided by data collected directly from their paddocks.

Data collection and producer engagement is still on-going with completion projected for early 2027, therefore, only preliminary results will be presented in this paper.

Results

Step Points

Shifts in groundcover were observed at all sites over the monitoring period to date; Sites A and D declined in groundcover in summer contrasting Sites B and C that increased in cover (Figure 1). Notably, three of the four sites have a greater level of groundcover than at the first measurement.

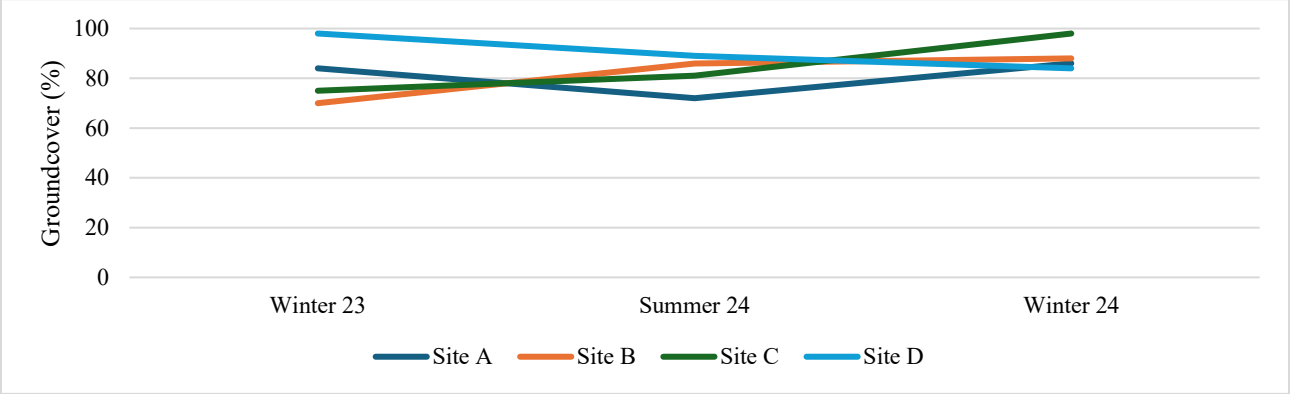

Figure 1. Percentage (%) of groundcover recorded via step point assessment at each monitoring site in Winter 2023, Summer 2024 and Winter 2023. Step point groundcover assessments were undertaken biannually at each monitoring site apart from winter 2022 and summer 2023.

Pasture Sampling

Since the inception of the project, feed testing has occurred biannually with the exception of autumn 2022 at two sites and summer 2023. Demonstrated in the site D results, species availability has changed in all sites across the course of sampling (Figure 2). *Atriplex vesicaria* and *Sclerolaena brachyptera* have consistently been available at site D. Notably at this site, *Atriplex vesicaria* is relatively stable in nutritional value, especially from winter 2023 to winter 2024 (14.6-16.3 CP%, 57-57.5 DMD %, 8.2-8.3 MJ/kg DM) but is nutritionally surpassed by more productive annual plants in winter such as *Sporobolus caroli* (8.9 CP%, 61 DMD%, 8.6 MJ/kg DM) and *Medicago polymorpha* (32.2 CP%, 84.8 DMD%, 12.6 MJ/kg DM)

Photo Points

Permanent photo points have been established at all sites to record the site condition during observational periods. Photographs were taken biannually at each monitoring site with exception of summer 2023. These images provide valuable visual comparison between seasonal conditions and corresponding feed quality data. Comparing site condition through photographs taken in this manner, as demonstrated in the site D photo point, further assists producers in understanding the changes in the timing of effective rainfall, grazing effects and progress of the site towards the grazing management objective (Figure 3).

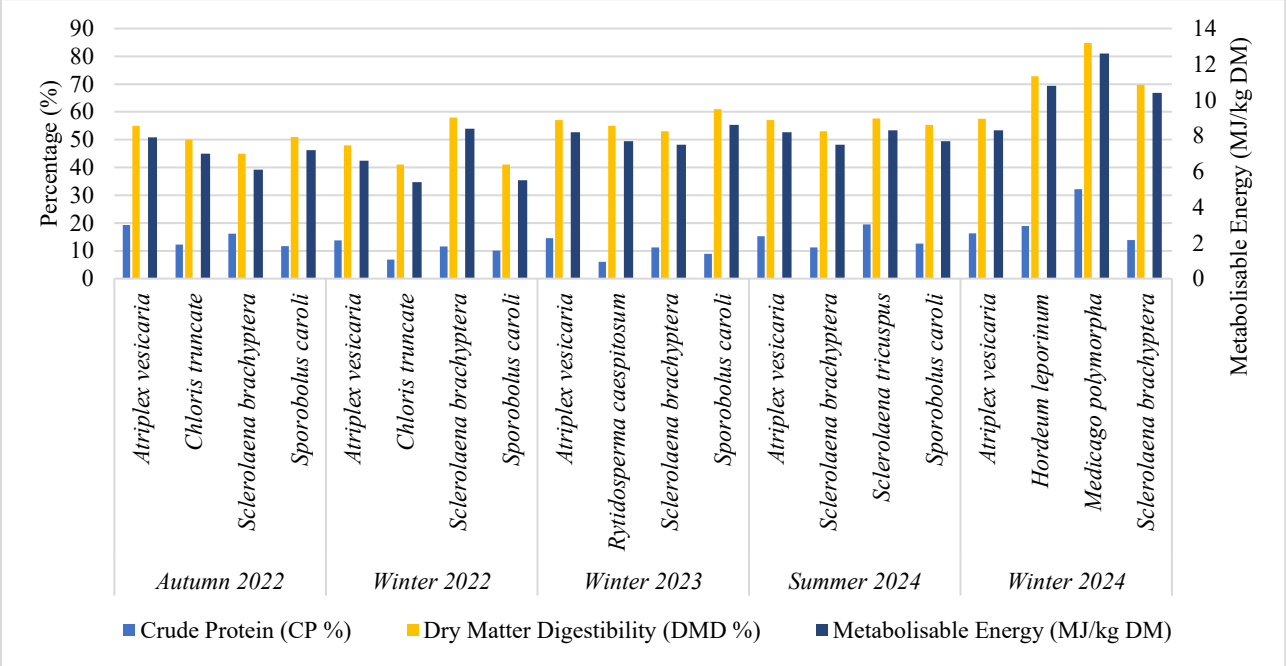

Figure 2. Feed test results summary of monitoring site D (Booligal, NSW) key pasture species at five different sampling periods throughout the project.

Figure 3. Photographs demonstrating the difference in site condition in the same season in different years. The photographs were taken at a permanent photo point at monitoring site D (Booligal, NSW) in August 2023 (left) and August 2024 (right).

Discussion

The pasture sampling process has been impacted by several factors. Sampling where sites were actively utilised by livestock or had recently been destocked resulted in preferred key species unable to be sampled on occasion due to risk of plant defoliation, biomass/height restrictions and lack of individual plants. Furthermore, staff changes early in the project, regional flooding in late 2022 to mid 2023, and shifting producer involvement have all impacted data collection, though these factors are not anticipated to significantly altered the overall findings.

Significant rainfall variability has occurred during the project. Dry winter conditions in 2023, followed by a wet summer did not directly affect the nutritional value of pasture or the feedbase composition. The largest changes were arguably when composition shifted prior to the August 2024 observation period, initiating the growth of

annual grasses and forbs, a noted characteristic of effective cool season rainfall in the southern rangelands (Hacker and McDonald 2021). This is consistent with previous findings in the Western Riverina, where seasonal variability played a large role in vegetation growth and rangeland productivity (Eldridge and Grant 2004).

While the pasture species sampled generally offer high nutritional value, the selective grazing habits of sheep and cattle make it challenging to accurately assess diet composition. For instance, *Atriplex vesicaria*, although typically of high quality, was not observed to have been consistently chosen by sheep grazing at the monitoring sites. This aligns with previous findings in the district where shrub species, despite their potential nutritional value, are not commonly preferentially grazed by livestock initially (Graetz and Wilson 1980). Notably, perennial saltbushes appeared to be relatively unaffected by grazing pressure during monitoring, in contrast to annual forbs and grasses, which were more heavily utilised.

Group meetings provide producers an opportunity to discuss their own experience in relation to local literature and the alignment with the monitoring results of this project. Incorporating tools, such as Geoglam Rapp Map and Cibo Labs, into the meetings assists producers to correlate on-ground measurements with previous events and seasonal conditions. Therefore, several knowledge sources and tools are brought together to enable data-driven decisions to be undertaken for rangeland businesses.

Conclusion

Fluctuations in effective rainfall and pasture health have direct implications for pastoral productivity (Eldridge and Stafford 1999). As such, maintaining a sustainable feedbase amidst increasing seasonal variability requires tactical management strategies that account for short-term climatic changes and long-term ecological shifts. The Pasture Monitoring in the Rangelands project aims to demonstrate the role of data-driven decision-making and producer engagement in enhancing the resilience and productivity of livestock enterprises in the southern rangelands of NSW.

Acknowledgements

Pasture Monitoring in the Rangelands is delivered by Western Local Land Services, a NSW Government Agency. The project is a Producer Demonstration Site, an initiative of Meat & Livestock Australia. The author would like to acknowledge the work of past and current team members involved in the development and delivery of this project.

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