550

Challa Station in 2045

Dowden, DLA

Challa Pastoral Pty Ltd

Key words: Future vision; technology; carbon farming; natural capital; biodiversity

Abstract
Sometimes it's good to look at what we are doing now and imagine what we will have achieved in the future. It gives us hope and encouragement to continue.

This paper, set in 2045, explores the research projects conducted at Challa Station, with a focus on carbon management, biodiversity conservation, and sustainable grazing land practices. The author reflects on what the future might look like in 20 years, suggesting that current research efforts provide a promising preview of what could be achieved. By 2045, Challa Station, through Australian-led rangeland innovations, has become a flourishing landscape despite increasingly variable rainfall patterns. This success has been made possible by advancements in understanding and monitoring landscape function and soil health, as well as the ability of land managers to make more objective, rapid decisions and implement precision grazing strategies.

The United Nations' proclamation of the International Year of Rangelands and Pastoralists in 2026 gave us hope that all aspects of rangelands would be promoted and supported in the future. By 2045, pastoralists are recognized for their contributions to society, particularly in mitigating the impacts of climate change through carbon sequestration and the protection of natural capital. Australian rangelands pastoralists also understand that carbon is only one aspect of sustainability. A thriving, robust ecosystem has become the true measure of value. In 2045, our natural landscapes function effectively, our human communities are resilient, and rural regions remain wonderful places to live.

Introduction

In Australia, pasture-raised beef accounts for 78% of the country's red meat ruminant livestock methane emissions (Mayberry et al. 2018). To achieve carbon neutrality by 2030 (CN30), grazing management has focused on promoting carbon storage (MLA, 2020). For instance, restoring soil carbon through improved grazing pressure management—preventing animals from selectively overgrazing—and using mechanical interventions to rehabilitate bare areas helps reduce soil erosion and biodiversity loss by restoring ground cover and pasture biomass. Additionally, revegetation offers rangeland managers an opportunity to address and mitigate climate change risks effectively.

Challa Station is our family run red meat operation that spans 206,000 hectares in the southern rangelands of Western Australia. Through participating in an Australian Government carbon project coined 'Human Induced Regeneration' (HIR) (Clean Energy Regulator 2024) – being the focus of regeneration of native forests, we were

able to gain a deeper understanding of critical biodiversity habitat and carbon sequestration. This not only led to changes in how we manage the land and our livestock but has also provided us with new visions for the future.

This paper explores our journey of adopting research and development on Challa Station and where we ultimately would like to be in 20 years' time.

Restoration and revegetation: improving land condition through adaptive grazing management

The Challa Human Induced Regeneration (HIR) carbon project, initiated in 2019, became the catalyst for embracing new research in biodiversity, conservation, and livestock management. Initially, so little work had been conducted in our region that we began discovering previously unknown species in the rangelands, such as *Baeckea sp. 'London Bridge'*, a shrub identified on Challa Station in 2000. This discovery motivated us to implement measures to trap and reduce goat numbers, thereby alleviating grazing pressures on the landscape. Scientists have since identified and named many more plant species and developed a clearer understanding of the grazing thresholds necessary to avoid suppressing or adversely impacting the growth of native flora, including species like *Baeckea* and *Canthium*.

In 2019, the HIR carbon project changed the way we managed our station. It provided the opportunity to be rewarded for managing our herd in a way that discouraged grazing on native Mulga (*Acacia aneura*) forests, allowing for regeneration and carbon sequestration. This initiative provided financial input through carbon credits, enabling us to improve how we managed our property. These improvements included reducing herd size by 30% whilst simultaneously improving the quality and productivity of the cattle. We invested in new water infrastructure to better distribute grazing pressure evenly across the landscape. Each of the watering points had a set of Total Grazing Management yards built to allow better control of our herd and feral herbivores. We built fences to protect the regrowing native forest and other sensitive areas. These changes not only supported environmental goals but also enhanced the sustainability of our business operations.

Satellite-based technologies: Adopting innovations that improve efficiencies and reduce our carbon footprint

Challa Station has been in the Dowden family since 1888, with five generations contributing to a deep understanding of the property. Over the years, the red meat enterprise on Challa Station has evolved, transitioning from small ruminants (sheep and goats) to large ruminants (cattle) and adapting cattle genetics, shifting from Droughtmaster to Santa Gertrudis breeds. The move away from sheep, beginning in 2008, was driven by the need to mitigate the impact of dingo attacks.

Challa Station has always been quick to embrace technological advancements to improve efficiencies and reduce its carbon footprint. One notable example was the implementation of satellite water monitoring devices back in 2015. This innovation allowed us to remotely monitor water tank levels from our home office, reducing the need to drive hundreds of kilometres to conduct physical water checks. Previously conducted every four days, these checks are now carried out every ten days. This change not only significantly reduces fuel consumption for vehicle-based mill runs (water checks) but also frees up valuable time for other essential management tasks.

Technological advancements have significantly improved our understanding of cattle behaviour and their movement across the landscape. For example, satellite tracking ear tags (Ceres Tag; CSIRO, 2020) have revealed areas preferentially grazed by cattle, such as alluvial plains (Vercoe and Durmic 2024). These tags have also enabled us to locate cattle more efficiently, including heifers (young female cows yet to calve) that might otherwise miss mustering because they had not yet established their home territory.

The potential of precision agriculture in the rangelands is vast. Tracking and monitoring livestock location is just one application. Advanced technology, such as accelerometer-equipped ear tags, can also link ear movements to

behavioural cues. With the development and validation of specific algorithms, these devices can predict activities like grazing, ruminating, and even calving (Hu et al. 2024; Trotter et al. 2018). This precision enhances both livestock management and our understanding of animal behaviour in the rangelands.

Furthermore, the advent of plant DNA analysis from animal dung provided us with new awareness of the plants on offer and selected by our cattle. This is explored in the next section.

Diet ID project: UWA BeefLinks

The Diet ID project (Vercoe and Durmic 2024), which was run with Meat & Livestock Australia and the University of Western Australia, used DNA metabarcoding of plant DNA detected in animal dung to determine the animal's dietary botanical composition (i.e., which plant species were being ingested). This information was assessed together with information on animal whereabouts (previous section) and the nutritional value of plant species (see Vercoe and Durmic 2024). Although the dung sampling was limited to a snapshot in time rather than continuous sampling over a year or across seasons, it did however reveal interesting results on animal diet selection. Firstly, there were more plant species making up cattle diets revealed by DNA metabarcoding than was perceived or easily observed closer to water. Secondly, differences in diet selection between individual cattle was apparent, and thirdly, plant species frequently ingested by cattle could be ascertained (e.g., native shrub species *Eremophila* and *Maireana*).

Biodiversity monitoring: manual and automated monitoring sites and application

Biodiversity monitoring technology was installed on Challa Station in collaboration with AxisTech Pty Ltd. To-date this has included four automated 'prototype' monitoring sites and a mobile monitoring unit. In brief, the close monitoring of environmental conditions (atmospheric and soil condition monitoring using weather stations and carbon soil probes, respectively) and above ground species diversity (flora and fauna monitoring using fixed cameras) is providing data for machine learning on how the landscape is performing. Challa Station also had 48 manual monitoring sites, which were established in the year 2000 (photo monitoring and plant counts). This new data on species richness and landscape function will help direct and validate grazing management decisions.

Future aspirations: moving cattle in response to pasture condition

In 2045, we reflect upon our achievements. At Challa Station, we have successfully integrated technologies that enable rapid, whole-system monitoring—including plants, landscape function, animal production, and nutrient availability—facilitating real-time decision-making. Precision agriculture, such as satellite monitoring and geo-referenced animal sensors, has optimized our grazing systems, improving both animal production and land condition outcomes.

A key innovation has been the adoption of virtual fencing technology, which was in its infancy in 2024 (Durmic et al. 2024) but now functions seamlessly in the rangelands. This technology allows us to precisely control the location, timing, and duration of grazing pressure. By implementing adaptive grazing strategies, we can now ensure that livestock remain productive while preventing overutilization of vegetation, enabling regeneration and enhancing resilience to climate change risks. It has made shifting cattle to different areas remarkably easy, allowing us to simply adjust the virtual fence line on our computer to create a new grazing inclusion zone. This flexibility enables us to respond quickly to localized rainfall events and protect sensitive areas undergoing regrowth. This approach not only enhances grazing efficiency but also supports better land stewardship and resource management.

Today, the benefits are evident across the landscape. An abundant understorey of white, gold, and pink wildflowers, primarily everlasting daisies (*Xerochrysum viscosum*), now flourishes during winter, showcasing the harmony between sustainable livestock management and ecological health.

In addition to mitigating the risk of landscape and biodiversity degradation, understanding the diet selection of our cattle opens up opportunities to access provenance markets—markets that value red meat produced in rangelands with recognized and valued plant species. For instance, cattle on Challa Station selectively graze on potential anti-methanogenic species such as *Eremophila* sp. Research has documented the anti-methanogenic properties of this genus, including *Eremophila glabra* (Li et al. 2014). This insight not only enhances the environmental credentials of our production system but also creates avenues to meet the growing demand for sustainable and environmentally conscious meat products.

In 2045, we manage cattle movements with unprecedented precision, responding to pasture conditions with far greater accuracy than ever before. Advancements in ecosystem and biodiversity monitoring have transformed how we assess land health. Using rapid data capture via handheld devices, we can simply wave our mobile phones over a section of land to instantly receive accurate, quantitative data on pasture condition, eliminating the guesswork from rangeland management.

We now also have a deep understanding of the nutritional value of plants and the specific anti-methanogenic species that cattle reliably graze. Rangelands cattle are celebrated for their carbon-negative status, and high-quality red meat from these regions has become synonymous with sound environmental stewardship and the preservation of biodiversity values. These advancements not only enhance production but also solidify the role of sustainable rangeland management in combating climate change and maintaining ecosystem health.

By 2045, the rangelands will provide a multitude of benefits that extend far beyond supporting numerous families in marginal areas and producing red meat to feed a growing population. Pastoralists will be widely acknowledged for the ecosystem services we deliver, playing a vital role in enhancing and safeguarding natural capital for the benefit of the entire community.

Additionally, the rangelands will be valued for contributions that cannot be measured economically, such as the resilience of our communities and the deep trust and strong friendships that are the backbone of rural life. These intangible but essential values underscore the enduring importance of the rangelands, not just as a source of production but as a foundation for social and environmental well-being.

The strong global foundation and momentum generated by the United Nations' proclamation of the International Year of Rangelands and Pastoralists helped shift the narrative about the rangelands. By 2045, we can confidently celebrate a bright future for Australia's rangelands, recognizing their vital role in sustainable agriculture, ecosystem health, and community resilience.

Conclusion

Adopting innovations to enable greater efficiencies and better-informed decision making is important to livestock grazing enterprises paving a path to carbon neutrality. One way for rangeland managers to combat climate change is to improve ground cover. In doing so, this reduces the risks of soil erosion, where increases in pasture biomass will allow for improved soil carbon and biodiversity. In addition, Natural Capital Accounting is expected to assume even greater importance in the future. This will increase the demand for sophisticated monitoring of ecosystems and landscape function, so that rangeland managers can demonstrate they are sustainable. For this reality, science advancements will need to continue to ensure the required monitoring technologies are available and practical to implement in the rangelands.

Acknowledgements

Thank you to Dana Kelly for her support in preparing this paper.

References

Clean Energy Regulator, Australian Government (2024) Challa Station Regeneration Project. Available at https://cer.gov.au/schemes/australian-carbon-credit-unit-scheme/accu-project-and-contractregister/project/ERF121431 [Accessed 30 December 2024]

Commonwealth Scientific and Industrial Research Organisation (CSIRO) (2020) Ceres Tag: smart ear tags for livestock. Available at https://www.csiro.au/en/research/animals/livestock/ceres-tag [Accessed 30 December 2024]

Durmic Z, Vercoe P and Hill J (2024) BeefLinks: Managing cattle in the Australian rangelands: using virtual fencing technologies for sustainable outcomes. Meat & Livestock Australia Limited, Final report for project P.PSH.1306, North Sydney, NSW

Hu S, Reverter A, Arablouei R, Bishop-Hurley G, McNally J, Alvarenga F and Ingham A (2024) Analyzing cattle activity patterns with ear tag accelerometer data. *Animals* 14, 301.

Li X, Durmic Z, Liu S, McSweeney CS and Vercoe PE (2014) Eremophila glabra reduces methane production and methanogen populations when fermented in a Rusitec. *Anaerobe* 29, 100-107.

Mayberry D, Bartlett H, Moss J, Wiedemann S and Herrero M (2018) Greenhouse Gas mitigation potential of the Australian red meat production and processing sectors. Meat & Livestock Australia Limited, Final report for project B.CCH.7714, North Sydney, NSW.

Meat & Livestock Australia (MLA) (2020) The Australian Red Meat Industry's Carbon Neutral by 2030 Roadmap. Available at https://www.mla.com.au/globalassets/mla-corporate/research-and-development/programareas/environment-and-sustainability/2689-mla-cn30-roadmap_d3.pdf [Accessed 30 December 2024]

Trotter M, Cosby A, Manning J, Thomson M, Trotter T, Graz P, Fogarty E, Lobb A and Smart A (2018) Demonstrating the value of animal location and behaviour data in the red meat value chain. Meat & Livestock Australia Limited, Final report for project P.PSH 0835, North Sydney, NSW.

Vercoe P and Durmic Z (2024). BeefLinks: "DietID" Feedbase mapping to raise productivity of cattle. Meat & Livestock Australia Limited, Final report for project P.PSH.1245, North Sydney, NSW.