Grazing exclusion and woody carbon: key insights from Forrester et al. (2025)

In the March edition of The Rangeland Journalⁱ, scientists from CSIRO published a paper titled: <u>Does grazing exclusion in Australia's rangelands affect biomass and debris carbon stocks</u>?

This summary of the key findings has been prepared by members of the Carbon Market Institute's Integrated Farm and Land Management (IFLM) Taskforce Secretariat to share with its members and stakeholders interested in supporting the ongoing development of the IFLM method. Whilst the paper's findings are relevant, the proposed IFLM method involves broader grazing and land management practice change and is not focused on livestock exclusion only.

What the study findings indicate:

- 1. Response to grazing exclusion is variable and depends on local factors like vegetation type, climate, initial land condition and past land use.
- 2. Excluding grazing can lead to notable increases in woody carbon storage and tree density in rangelands ecosystems used for pastoralism.
- 3. Positive effects of grazing exclusion are more likely and becomes stronger over longer time periods (decades as opposed to a few years).
- 4. The likelihood of woody biomass increasing after the exclusion of livestock or changing grazing requires careful consideration of the land condition of a site, the historic impacts of a grazing regime on land condition, and the site's potential to store carbon.
- 5. Based on these findings, projects that aim to increase carbon storage through grazing management need appropriate guardrails for site selection, property-specific land management strategies and monitoring to confirm positive outcomes over time.

Research Approach

The paper analysed 46 study sites across Australia. Each site had a fenced-off area (an "exclosure") protected from grazing animals. Sites varied in vegetation type, rainfall, and duration of exclosure, with fences in place for between 9 and 98 years. The authors measured the carbon stored in live aboveground wood, live belowground roots, and the basal area (a measure of tree and shrub density) both inside and outside the fences.

Summary of Key Findings

1. Impact of excluding livestock varied significantly from one site to another

- Variation of duration: In some cases where fences had been up for several decades, there was woody carbon and a higher basal area inside the grazing exclosure. At other sites, the difference between the fenced and grazed plots was minimal.
- Variation across ecosystems: Sites where grazing had little measurable impact on woody carbon included ecosystems that are naturally grassy or shrubby (i.e. ecosystems that don't grow many trees anyway); slower growing ecosystems in lower rainfall areas, or sites where fences were breached by livestock.

2. The longer grazing was excluded, the greater the effect on carbon stocks

- The study showed a clear increase in the positive effect of exclusion of grazing on carbon stocks with each additional year the fences were in place.
- This suggests that woody vegetation takes time to accumulate carbon after grazing pressure is removed (Figure 1). It also helps to explain why some shorter-duration studies showed little impact of grazing.



Figure 1. Satellite imagery of study sites (left) Site 5 in QLD, with a clear fenceline effect around a grazing exclosure established in 1995, (right) Site 6 in SA, with less obvious effects of a grazing exclosure established in 2010. It's important to note that satellite imagery often struggles to detect changes in woody vegetation in the rangelands.

3. The study demonstrates variability of grazing impact, not a lack of effect

- The authors explicitly state the implications of their research as: "variable and difficult to predict, not that there are no grazing effects on C stocks." The data shows effects happen but depend on site conditions and time.
- The authors also noted that having more detailed historical information (like past and current grazing intensity, data on soil and water availability) would help better explain the differences between sites.

Some commentary following the release of the paper has suggested it shows that stopping grazing has no overall effect. This conclusion is incorrect and not supported by the study's data or the authors' analysis.

The CMI IFLM Taskforce has first-hand experience integrating sustainable grazing and carbon farming and recognise the integral role of pastoral and farming communities in managing Australian landscapes. The <u>Taskforce's method proposal</u> requires projects to clearly identify eligible carbon abatement in an auditable Land Management Strategy and promotes using a measurement approach to ensure that only eligible abatement from the changed management of grazing is credited.

This research confirms the potential for grazing management to increase woody carbon in specific environmental contexts. This review has been shared and received feedback from the key authors, and we thank them for their input. The CMI IFLM Taskforce commends the scientists for their work, which helps to advance the body of rangelands science.

About the IFLM Taskforce

In 2021, the Carbon Market Institute (CMI) formed the Integrated Farm and Land Management method Taskforce (IFLM Taskforce). The IFLM Taskforce is made up of a broad cross-section of CMI members and stakeholders that are committed to a high-integrity, fit-for-purpose carbon market in Australia.

Since its creation, the IFLM Taskforce has sought to develop and provide technical advice to the Australian Government on the creation of an IFLM method for the Australian Carbon Credit Unit Scheme (ACCU Scheme), including as part of the initial method prioritisation process.

The IFLM Taskforce also wants to see widespread consultation and clear development timelines in a way that ensures adequate public consultation and expert input from a wide range of experts and stakeholders.

The views of the IFLM Taskforce do not necessarily represent the views of CMI, nor any individual CMI member.

ⁱ The Rangeland Journal is published by CSIRO Publishing on behalf of the Australian Rangeland Society. It publishes original work that makes a significant contribution to understanding the biophysical, social, cultural, economic, and policy influences affecting rangeland use and management throughout the world.