Reducing emissions in the rangelands

Against the often-harsh backdrop of Australian rangelands, red meat production can be challenging. According to a new project, such conditions also create difficulties for producers to reduce their enteric methane emissions, although they are not impossible to overcome.

Research has revealed optimal interventions for rangeland producers to reduce their emissions without compromising profit, productivity or biodiversity habitat.

"Reducing enteric methane is a challenge regardless of whether you're in the rangelands or elsewhere, because enteric methane can account for 70–80% of direct farm emissions," University of Tasmania Professor Matt Harrison said.

"In the rangelands, it's difficult because some of the levers you could pull elsewhere are disabled by lower rainfall, lower pasture production and lower capacity to sequester carbon."

Keeping profit in mind

Throughout the project, the context of 14 farms across Australia have been modelled, considering what intervention would best suit their environment and their business.

"We looked at pathways to reduce emissions, with close attention to the trade-offs and co-benefits such interventions may have on profit, productivity and biodiversity, because even if greenhouse gas emissions could be reduced to net-zero, a producer won't want to do it if it reduces profit," Matt said.

The research found that planting anti-methanogenic pastures to manipulate livestock emissions was one of the most beneficial interventions on profit and emissions. In the rangelands, however, the ability to manipulate existing pasture species is limited.

Opportunities to reduce emissions

Matt said while soil carbon sequestration in the rangelands is lower than that in higher rainfall zones, enteric methane emissions per hectare in the rangelands are much lower than those in high-rainfall zones. This is because stocking rates in rangelands are typically much lower.

"The scale of rangelands enterprises offers greater opportunity for carbon sequestration and biodiversity habitat improvement in woody vegetation compared with intensive zones, because land area in the rangelands is more abundant, although potential for carbon sequestration via woody vegetation is very much site-specific," he said.

With this in mind, Matt said the most effective intervention for rangelands producers revolved around good herd management – with a focus on improving emissions intensity (kilograms of carbon dioxide equivalents per kilogram of liveweight) through improving reproductive performance.

Better breeders reduce emissions intensity

A significant proportion of the emissions per kilogram of liveweight are attributed to maintaining the breeding herd. The more liveweight produced through successful offspring, the more kilograms to attribute emissions too, reducing the emissions intensity.

"If your calf mortality is high because of poor cow nutrition, focusing on improving breeder nutrition to reduce calf mortality will improve productivity and reduce emissions intensity," Matt said.

"If you can increase the whole enterprise ratio of growing animals to mature animals, that will also improve your emissions intensity by having less cows in the paddock which aren't growing. Increasing the proportion of growing animals to adults will further reduce whole farm emissions intensity.

"Improving your emissions intensity is really a co-benefit of improved animal management and improved nutrition," he said.

Fine-tuning carrying capacity

Productivity can be better sustained by optimising – not necessarily increasing – carrying capacity to your environment.

"Try to calibrate your whole-farm stocking rate to the worst conditions you can expect, within and across years. This is the number of animals you can sustainably carry in the worst conditions."

Matt said, often those conditions are drought.

"Droughts are common in the rangelands. It's important to plan for them and learn from those producers who are in highly drought-prone regions."

According to Matt, in good seasonal conditions, lower stock rates can be compensated for by having fatter animals and better liveweight gain. Lower stocking rates also tend to reduce the need to destock or buy in feed during dry conditions.

"When existing stocking rates are excessive, pastures are often overgrazed, increasing the risk that the most productive and palatable pasture species are lost. This reduces ground cover, increases soil erosion and causes losses of productive pasture species. Together, these factors reduce livestock nutrition to the point where mortality and animal welfare becomes a risk," Matt said.

"But every environment is different. Optimal stocking rate depends on how long pastures are grazed, soil type and rainfall, which together influence pasture growth and recovery from grazing."

Every farm is different

Throughout the project, Matt and colleagues have been working with producers across Australia to model the impact of interventions they're interested in undertaking, including whether it will be environmentally impactful and beneficial to their operation.

For one producer, addressing feral browsers was the answer that unlocked every co-benefit.

"There was an issue with excessive rabbits grazing his pasture, so we modelled the impact of a game-proof fence along a 3km stretch, fencing off his native bushland," Matt said.

"We found that would improve profit, liveweight gain, pasture growth and soil carbon.

"This improved economic, environmental and agronomic outcomes. That producer has now fenced off the bushland based on these results.

"For some producers, this work is about building an awareness of practices they can implement and what sustainable pathways mean for their operation, whether it's now or in 10 years."

It is important to note that impacts of any practice change depend on historical management, climate and context. Because every farm is at a different current state, the relative benefit, or lack thereof, associated with any practice change varies for farm to farm and year to year. ■

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Sustaining the rangelands through stocking rate

WA beef producers Ashley and Debbie Dowden may run less than a third of the region's recommended stocking rate, but it's proving to be a more sustainable approach on the 200,000ha they call home.

"We're located in the southern rangelands of WA. It's some of the most challenging agricultural country and we run about 1,000 breeders," Debbie said.

"If we did run the recommended 3,500 animals on our property, the land condition would deteriorate until the property isn't capable of supporting any livestock."

The Dowdens participated in a recent MLA-supported project, where modelling of their property found their stocking rate was, in fact, more sustainable than the traditional approach.

Reducing emissions

The project looked at interventions suitable for reducing emissions in rangelands, without compromising profit and productivity.

"Our land is already marginal, so we understand how incredibly important it is to be environmentally sustainable," Debbie said.

"We're looking at interventions to lower emissions, but unless there's a market for those interventions or a possible return on investment, they're too expensive in a rangelands environment."

Interventions that are common in higher rainfall zones – such as planting trees – are not viable in rangelands. Instead they are focussing on creating an efficient and high quality herd, and regenerating existing native vegetation.

"We're really specific with our heifer selection and culling. That way we run an efficient herd that fetches a premium price," Debbie said.

"We want to make sure every one of our cows has a calf and sell those calves as young bulls or cull heifers, and cull old or non-productive cows every year to keep the herd as efficient as possible."

Putting figures behind the farm

The Dowdens have always focused on running a sustainable beef operation and Debbie said the modelling undertaken in the project validated the work they've been doing for years. It also provided direction on where to go next.

The data revealed that the Dowdens' emissions intensity (the kilograms of carbon produced per kilogram of liveweight) was -42kg with sequestration, making their beef production carbon negative.

The emissions intensity excluding sequestration was 13.6 kg CO_2e/kg of liveweight.

"We knew we would be carbon negative because we only have 1,000 cattle on 200,000ha, but it's useful to know the figure and have confirmation that what we're doing works," Debbie said.

Data-backed decisions

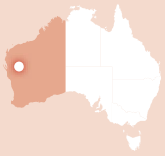
Going forward, the Dowdens will use the data they received from the project – including ecological condition, net station emissions, habitat condition and biodiversity modelling – as a baseline to introduce natural capital improvements.

"This is the most robust baseline data we've ever had," Debbie said.

"Quite often the southern rangelands are overlooked because their variability and unpredictability mean they're quite difficult to study and model. It's some really important research for the region to move forward sustainably."

» WA Southern Rangeland producers Debbie and Ashley Dowden.

SNAPSHOT



DEBBIE AND ASHLEY DOWDEN –
East Murchison, WA

AREA
200,000ha

ENTERPRISE
1,000 breeders

PASTURES
Native pastures – mulga forest and saltbush/bluebush flats

SOILS
Red sandy clay/loam, calcrete soil, stony flats

RAINFALL
220mm

TOOLBOX

- Explore MLA's sustainability hub: **mla.com.au/sustainability-hub**
- Get more beef from your pastures: **mbfp.mla.com.au**
- Scan or click the QR code to learn about the MLA-supported Rangelands Living Skin project:
- Scan or click the QR code to learn about carbon storage opportunities:
- Rangelands resources: **mla.com.au/southern-rangelands**

INTERNATIONAL YEAR OF RANGELANDS AND PASTORALISTS 2026

The **International Year of Rangelands and Pastoralists** (IYRP 2026) celebrates Australia's iconic outback and the people who live there. For further information, including resources, visit **iyrp.info**

» The low rainfall of rangelands regions makes emissions reductions a unique challenge. Image: Debbie Dowden

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