

Carbon Farming in WA

Fact sheet No. 5

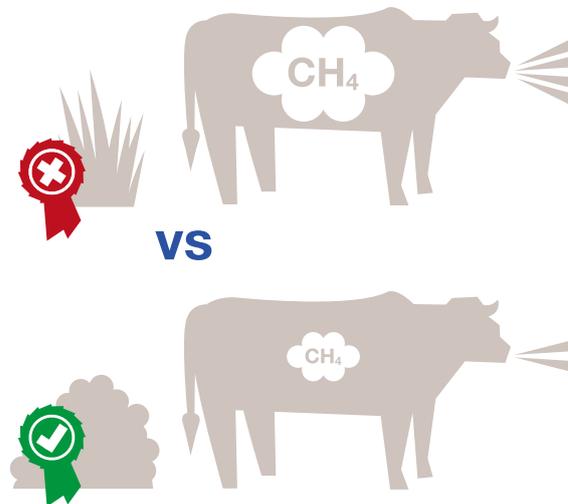
PRACTICE: **Managing pastures and stocking rate to reduce methane emissions from cattle**

Description of practice

Pastures that lower methane emissions can be categorised into two areas: high quality grasses and legumes; and plants containing secondary metabolites like tannins.

The use of high quality pastures can lower methane emissions compared to low quality pastures. Legumes and immature grass pastures are examples of high quality forages. These forages are

relevant for use in the higher rainfall and irrigated regions of the south coast of Western Australia.



Outline of procedure

Growing and managing improved pastures for cattle increases the availability and digestibility of feed on offer. High digestibility feeds produce less methane than poor quality feeds. Controlled grazing systems that incorporate higher stocking rates can be used to manage the quality of improved pastures and repay sowing costs (see Meat & Livestock Australia grazing strategies in reference list).

The enhancement of cattle diets through improved forages potentially has the dual effect of increasing animal production and reducing methane emissions per unit of dry matter intake. Improved pastures can increase the amount of biomass available and the total yield of animal production but only bring about small reductions in methane per animal. However, if improved pastures are established and managed with sustainable stocking rates over a reduced area, then there is an opportunity to increase profit and reduce methane emissions per hectare over the whole farm.

Plants containing secondary metabolites include those containing condensed tannins and many woody perennial shrubs that are used as a feed base in the pastoral regions of Western Australia (hence, the current

The Department of Agriculture and Food is the lead agency and is working with the Department of Regional Development and Lands to deliver this Royalties for Regions funded project.

For more information please refer to agric.wa.gov.au

More Information

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Enrich project, which seeks to develop new forage systems based around shrubs). Plants containing condensed tannins have been reported to depress methane emissions by up to 16 per cent from standard ryegrass species. In vivo trials (trials done within a controlled environment) are needed to progress the development of these plants for methane mitigation. Controlled grazing systems can lead to more efficient use of pasture. In controlled grazing, large areas of pasture are divided into smaller paddocks. Higher stocking rates are applied to the smaller paddocks and this increases pasture use leading to higher forage growth and quality. The increase in stocking rate increases enteric methane emissions in terms of volume per day but reduces the methane yield per unit of meat produced. To reduce total enteric methane from the enterprise using improved pastures, total stock numbers would not increase but less land would be required to feed the stock.

Work done to date

- Mainstream Western Australian pastures have been examined at the Centre for Legumes in Mediterranean Agriculture (CLIMA) with several species identified for low methane potential.
- Meat & Livestock Australia is supporting research into a range of strategies for ruminant methane reduction and corresponding increases in productivity under the National Livestock Methane Project (see MLA factsheet in reference list). Projects that are relevant to pasture and stocking rate practices include: measuring methane in the rumen under different production systems as a predictor of methane emissions (CSIRO); impacts of *Leucaena* plantations on greenhouse gas emissions and carbon sequestration in northern Australian cattle production systems (CSIRO); best choice shrub and inter-row species for reducing emissions and emissions intensity (UWA); efficient livestock and low emissions from southern grazing systems (UWA).

- UWA and CSIRO Livestock Industries have examined Australian woody perennials and in terms of methane reduction about 20 per cent of species reduced methane formation in the laboratory compared with less than 5 per cent of international plant species.
- Non-invasive techniques for measuring methane emissions from cattle have been examined by the Department of Agriculture and Food, Western Australia (DAFWA) and CSIRO (Queensland). Each technique is compared for accuracy with accepted laboratory techniques.

The economic viability of the proposed abatement methods has not yet been established.

Current level of adoption

The practice of combining improved pastures with sustainable stocking rates has a moderate level of adoption. However, the current motivation for adoption is to increase farm productivity and profit rather than to reduce methane emissions. If methane avoidance assumes a dollar value, existing practices will benefit and the uptake of the practice will increase.

Industry activity

None at this stage.

Carbon benefits

Currently none.

Co-benefits

- High quality pasture increases animal production per kg of dry matter intake.
- Tannins can protect feed proteins from microbial break down in the rumen resulting in increased flow of protein to the lower digestive tract; resulting in the reduction of nitrogen excretion and an increase in the amount of protein available for uptake by the animal.

Opportunities

- The reduction of emissions from ruminants by manipulation of their

digestive processes is on the ERF (Emissions Reduction Fund) positive list.

- Most of the land that is currently being used to support beef production could be used for growing improved pasture or woody shrub species. Some of these species already exist on pastoral leases and in high intensity systems. The key to earning carbon credits will be 1) the approval of a methodology, 2) proving that the activity is additional to normal farming practices and 3) the correct implementation and management of forage species.
- Suitability for integration into current farming systems: perennial shrubs, improved pastures and controlled grazing systems are suitable because these practices can improve farm profitability under certain circumstances.
- Commercial potential.
- A theoretical comparison of continuous grazing versus intense controlled grazing systems reports that methane production per head can be lowered by more than 20 per cent in the controlled grazing system. However, in-field comparisons need to be undertaken to validate model outcomes.
- In addition to methane reduction from secondary metabolites, the stems and root systems of woody perennial shrubs are a potential source of carbon credits via sequestration of organic carbon, estimated at 2 to 28 t CO₂-e/ha/yr. (averaged over a 10 year trial period).

Risks

- Currently there are no ERF-approved methodologies for reducing emissions from improved pasture and stock management practices.
- There are currently no accurate techniques for measuring feed intake and methane emissions from livestock in commercial grazing situations.
- The ERF additionality test will determine if a cattle enterprise is eligible for carbon credits. If the test determines that the practice of growing novel pastures and using controlled grazing

systems generates both productivity and emissions benefits there is a risk that the practice will be ineligible for recognition under the ERF (Australian Farm Institute 2011).

- A major barrier to the success of these practices is that there is unpredictable variation in methane emissions between animals and across differing environments. The variation needs to be quantifiable using standardised measurements for animal feed intake and methane emissions.
- The potential financial return from an enterprise that is based on carbon offset at present is dependent on the voluntary carbon market and the policies of the Commonwealth and state governments. However, maintenance of the practices will be practical and cost effective because of the associated production benefits.
- In spite of the identification of novel plant species that reduce methane, new plant species have yet to be commercialised.

Case study

The success of improved pastures and stocking rates to reduce methane emissions depends on the ability to accurately measure feed intakes and emissions in situ. Many techniques for measuring methane emissions are invasive and lead to changes in feed intake. McGinn et al. (2011) evaluated a non-intrusive technique using point-source dispersion with multiple open-path concentrations to calculate enteric methane emissions from grazing cattle. The technique involves a scanner with a mounted open-path laser to measure methane concentration above a paddock containing grazing cattle. The development of techniques such as this will enable ERF methodologies to be established for animals grazing in a range of environments and stock densities.

Key contacts – Australia

- Ms Fiona Jones (DAFWA)
- Dr Dean Revell (CSIRO Livestock Industries)
- Professor Roger Hegarty (University of New England)



- Associate Professor Philip Vercoe (UWA)
- Professor William Erskine, plant breeding (UWA)
- Dr Ed Charmley (CSIRO Livestock Industries Queensland)
- Dr Frances Phillips (University of Wollongong)

Key contacts – international

New Zealand Agricultural Greenhouse Gas Research Centre (NZAGRC): the centre was formed because more than 50 per cent of New Zealand's greenhouse gas emissions come from the agricultural sector compared to about 17 per cent in Australia. Most of the emissions in New Zealand come from dairy cattle that graze pasture. This has prompted a large research effort into ruminant methane and nitrous oxide research. Because New Zealand agriculture is based largely on pasture production, a large portion of the research effort has been put into pasture systems and management of livestock through stocking rates (Pinares-Patiño et al. 2009). Potential for collaboration exists between industry (DairyNZ), research (AgResearch) and universities (Massey and Lincoln).

Stakeholders

- Traditional owners, landowners, pastoralists, mining and resource companies
- Research organisations and universities
- Private carbon consulting and brokering groups such as offset project developers, private investors and equity firms
- Producer lobby groups
- Government: Commonwealth Government; DAFWA; Department of Environment and Conservation's Office of Climate Change; Department of Regional Development and Lands

Next steps

Australian grasses, shrubs and legumes including Biserrula and subclover are being examined for morphological traits that might lead to methane reduction in ruminants.

Plants with the greatest anti-methanogenic potential are to undergo in vivo tests in sheep. This work is a combined effort by CLIMA, DAFWA, CSIRO and UWA.

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