Carbon farming: reducing methane emissions from cattle using feed additives

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Feed additives or supplements can reduce methane emissions from ruminant livestock.

Livestock produce significant amounts of methane as part of their normal digestive processes. Some feed additives can inhibit the microorganisms that produce methane in the rumen and subsequently reduce methane emissions.

Why we should reduce livestock emissions

In Australia, direct livestock emissions account for about 70% of greenhouse gas emissions by the agricultural sector and 11% of total national greenhouse gas emissions. This makes Australia's livestock the third largest source of greenhouse gas emissions after the energy and transport sectors. Livestock are the dominant source of methane (CH_4) and nitrous oxide (N_2O), accounting for 56% and 73%, respectively, of Australia's emissions.

How methane is produced by ruminants

Ruminant livestock – cattle, sheep, buffalo, goats, deer and camels – have a fore-stomach (or rumen) containing microbes called methanogens, which are capable of digesting coarse plant material and which produce methane as a by-product of digestion (enteric fermentation): this methane is released to the atmosphere by the animal belching.

The amount of methane emitted by livestock is primarily driven by the number of animals, the type of digestive system they have and the type and amount of feed consumed. Ruminants are the principal source of livestock methane emissions because they produce the most methane per unit of feed consumed.

How feed additives work

Methane-reducing feed additives and supplements inhibit methanogens in the rumen, and subsequently reduce enteric methane emissions.

Methane-reducing feed additives and supplements are most effective when grain, hay or silage is added to the diet, especially in beef feedlots and dairies.

What are methane-reducing feed additives or supplements?

Methane-reducing feed additives and supplements can be:

- synthetic chemicals
- natural supplements and compounds, such as tannins and seaweed
- fats and oils.

Synthetic chemicals, such as antibiotics, are sometimes used to improve the efficiency of feed conversion in cattle, although it is not a recommended practice to use these additives to reduce methane emissions. There are legislative restrictions and human health concerns about using antibiotics as growth promotants in livestock.

There is potential for natural compounds and materials to reduce methane production in livestock, though these products have not been widely commercialised. **Feeding one type of seaweed at 3% of the diet has resulted in up to 80% reduction in methane emissions from cattle**.

Fats and oils show the most potential for practical application to farming systems and have shown methane emission reductions of 15–20%.

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Benefits from using feed additives or supplements to reduce methane emissions

Carbon benefits

There are 2 approved methodologies under the **Emissions Reduction Fund** (ERF) for using feed additives or supplements to reduce methane emissions and claim carbon credits.

1. **Reducing greenhouse gas emissions by feeding nitrates to beef cattle**
2. **Reducing greenhouse gas emissions through feeding dietary additives to milking cows**

Adding nitrates to the diet at a specified rate optimises rumen fermentation, and changes the pathway of hydrogen to produce ammonia rather than methane. This can have the dual effect of reducing methane emissions while improving or maintaining animal performance. We recommend that producers seek specialist advice before using this option because overdosing can result in nitrate poisoning.

In the approved methodology for feeding nitrates to beef cattle, nitrate salt licks are substituted for animals previously fed urea, and is potentially applicable outside of feedlots.

The use of dietary additives is currently approved only for grazing milking cows, and includes the addition of eligible additives to increase fat content of the diet to reduce methane emissions.

Co-benefits to using feed additives

There are several benefits:

The reduced volume of methane formation may lead to better efficiency of feed utilisation, given that methane emissions represent a gross energy loss from feed intake of about 10%.

Addition of fats and oils to the diet are a source of energy to the animal, as well as reducing methane.

Opportunities to use feed additives or supplements:

Reduction of methane emissions through feed additives, such as fats and oils, can reduce methane production by about 18% and offer energy and protein to the animal. For a 600 cow dairy herd (producing 100kg of methane per head per year) methane emissions could be reduced by 372 tonnes of carbon dioxide equivalent per year.

Reducing methane emissions is deemed ‘additional’ to normal management practices.

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Risks from using feed additives or supplements to reduce methane emissions

There are several risks:

The amount of additive ingested by livestock in paddock grazing systems is hard to regulate. Feed additives are more effective in feedlots and dairies.

Toxicity leading to ill health or death of livestock can result if nitrate supplements are introduced suddenly or ingestion is too high.

Long-term and consistent positive production responses to the addition of feed additives have not been found. These responses are essential for the commercial application of feed additives.

Fluctuations in carbon price may result in reduced or lost profit margins in a carbon farming project.

Additional information

Methane research from dairy cattle in Victoria

FutureFeed: **Feeding livestock a seaweed supplement called FutureFeed**. CSIRO

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See Also

- Carbon farming management options in Western Australia
- Carbon farming in Western Australia: an introduction
- Carbon farming: the economics, Western Australia
- Carbon farming: approved and proposed methodologies for carbon-offset projects
- Carbon farming and Western Australian agriculture

External Links

- More meat, milk and wool: less methane - Meat & Livestock Australia
- Feeding livestock a seaweed supplement called FutureFeed

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