

Carbon Farming in WA

Fact sheet No. 3

PRACTICE: **Cattle breeding for lower greenhouse gas emissions**

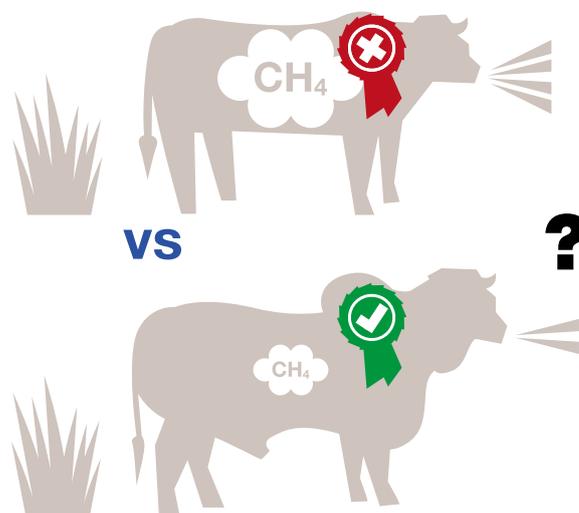
Description of practice

Breeding animals for lower methane production could be a new criterion for genetic selection of cattle in the future. Researchers are investigating whether livestock can be bred as low methane emitters without compromising production. Cattle with a greater ability to convert feed into energy will eat less feed and ultimately produce less methane. Any measures to reduce methane production will also improve efficiency, with economic benefits to the farmer.

Direct selection for animals with lower methane emissions is currently impractical. First, there is no selection index for low methane heritability. Second, it is difficult and costly to measure emissions. However, it is possible to select low emissions animals indirectly via correlated traits for feed use efficiency. That is, some animals have been found to produce the same amount and quality of meat with a lower feed intake than less efficient animals.

The extent to which methane can be reduced by selection for feed conversion efficiency (FCE) will depend on several factors, including: 1) whether the efficiency trait can be inherited; 2) the dispersal of efficient animals through all populations; and 3) the resilience of efficiency traits in a production system (robustness). Early results indicate that the most efficient cattle can produce up to 25 per cent less methane per day than less efficient feed converters (Hegarty et al. 2007).

However, animals that are efficient at low stocking rates may not be efficient at high stocking rates and there may be a corresponding loss in methane abatement. It remains to be seen whether or not animals that are genetically selected to produce more efficiently cost more over their lifetime than current livestock populations.



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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Outline of procedure

Scientists are working towards reducing methane emissions from livestock by genetically improving cattle. For example, recent trials conducted by the NSW Department of Primary Industries (DPI) show that genetic make-up plays a role in the amount of methane produced by individual animals. In particular, the researchers identified bulls with strong phenotypic divergence in methane production, maintained across time and diet, relative to that predicted for their intake. This provides a unique opportunity to select bulls that can be used in breeding programs to produce progeny with naturally lower methane emissions (see NSW DPI video in reference list).

Under the Emissions Reduction fund (ERF) land managers get carbon credits for each ton of greenhouse gas they stop from going into the air. To get the carbon credits, projects must register a methodology with ERF. These methodologies include calculations based on a methane emissions index, which will ultimately be included in estimated breeding values or EBVs (predictions of an animal's genetic merit, based on available performance data on the individual and its relatives). Farmers will then be able to claim carbon credits for breeding animals with superior genetics for methane emissions. The index will be established using data from grazing trials where the progeny of low emissions bulls are measured for methane emissions.

The path to implementation will be through the use of EBV. The beef industry already has the BREEDPLAN quality assurance system to produce Breeding Values that describe the genetic merit of bulls. Additional research can lead to accredited Breeding Values for methane emission reduction by animal breeding.

Work done to date

- Most of the breeding for low methane emissions research has been provided by the NSW DPI, Meat & Livestock Australia and the University of New England (Armidale, NSW).

- Work also has been done on methane emissions from low and high efficiency cattle (Jones et al. 2011) at the Department of Agriculture and Food, Western Australia (DAFWA) Vasse Research Centre.

Current level of adoption

None at this stage. Industry progress toward higher genetic merit for methane traits is expected to be slow due to relatively low heritability and competing economic imperatives for progress in other traits.

Carbon benefits

Currently none.

Co-benefits

- Selection for low methane emissions indirectly selects for animals with high production traits and better FCE.
- The selection for low emissions cattle will increase the productivity and profitability of farming enterprises.

Opportunities

- Commercial potential: trials at NSW DPI have shown that the progeny of low methane emission bulls produced up to 24 per cent less methane than control groups (29 g v. 38 g of methane/kg dry matter intake). These and other data will be used to calculate methane indices for EBV. Because methane emissions cannot be measured at a farm scale, it is expected that farmers will be able to claim carbon credits based on the EBV indices.
- When methodologies are registered, the likely uptake of the technology is high because breeding for low methane emissions complements good management practices for improving the efficiency of animal production.
- Selecting for low methane animals is suitable for integration into current farming systems.

Risks

- Ineligibility for 'additionality' status. If the additionality test determines that the practice of breeding animals for high FCE generates both productivity and emissions benefits the practice will be ineligible for recognition under the ERF (Australian Farm Institute 2011).
- In the absence of ERF-approved methodologies, it is not possible for farmers to gain carbon credits from lowering methane emissions from their cattle.
- Environmental variation is likely to cause divergence between expected and actual methane emissions. Therefore, animals need to be selected that can perform in a variety of environments. Work at DAFWA has shown that methane emissions from high and low efficiency animals are difficult to predict when varying qualities of feeds are offered.
- Selecting bulls with genetically superior methane traits may be deleterious to other desirable traits.
- Claiming carbon credits via EBV indices is an indirect estimate of methane emissions and is not measurable in the same way that selection for production traits is quantifiable.
- The income benefits to smaller enterprises may not be high enough to justify the adoption of the practice.

Case study

Jon Wright, of Woodstock, near Cowra, NSW, breeds bulls for maximising feed conversion. To our knowledge, he is the only private breeder in Australia who tests his animals for efficiency of feed conversion (see ABC Rural in reference list). Although Jon is not directly breeding animals for reducing methane, his high feed conversion stock would also be superior in terms of methane intensity (i.e. grams of methane per kg of meat sold).

Key contacts – Australia

- Professor Roger Hegarty (University of New England, Armidale, NSW)
- Dr Robert Herd (University of New England)
- Dr Peter Moate (DPI Ellinbank, Victoria)

Key contacts – international

- DairyNZ (Hamilton, New Zealand). In ongoing trials, steers are tested for FEC. Early results show that the most efficient feed converters emit up to 25 per cent less methane than the less-efficient steers. Dairy NZ collaborates with Dairy Australia in these trials and there is potential for the Western Australian beef industry to become a collaborator.

Stakeholders

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

Next steps

- The ability of high-efficiency and low-efficiency cows to perform under variable grazing systems is being investigated under the Beef CRC Maternal Productivity Project.
- Technology is being developed (with BREEDPLAN) for the addition of a methane index in the estimated breeding value of elite breeding bulls (Department of Agriculture, Fisheries and Forestry). The methane index is likely to be made available for farmers to claim carbon credits within three years.



- Meat & Livestock Australia advises that the practice of improving animals by traditional selective breeding is the most wide-reaching, permanent and simple tool to mitigate emissions from the extensive cattle sector.
- Future work will involve the discovery of genetic markers or genes that affect methane emissions. The seed stock elite herd at NSW DPI in Armidale will be DNA tested and screened for genetic markers for low methane emissions. It is forecast that this process will be finished in 2016.

Key references

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