Fact sheet No. 12

PRACTICE: Sheep reproduction and reduction in methane emissions

Description of practice
Farmers can change the level of methane emissions from their sheep enterprise by altering their management of the animals. Methane emissions per hectare or per farm are closely related to total feed intake and, therefore, to the stocking rate. Most ewes are usually mated for the first time at 18 to 20 months of age. Mating ewes at earlier—at eight to 10 months of age—could enable farmers to reduce whole farm methane production because this practice would also reduce the number of adult ewes. Allard (2009) found that adult sheep lose 6.5% of gross energy as methane, whilst growing sheep lose 4.5%.

Outline of procedure
Management options to reduce reproductive rate include:

• altering the genetic potential of the breed by selecting rams on the basis of their breeding values for number of lambs weaned
• altering the nutrition of the adult ewe flock during the entire reproductive cycle
• reducing the number of productive ewes in the flock by retaining extra age groups of wethers.

Mating ewe lambs requires feeding them to achieve target liveweights prior to introducing the rams and then maintaining a high level of nutrition through the reproductive phase and up to the next joining. Analysis has shown that the best metric for quantifying reproductive rate is number of lambs weaned per hectare. This practice is superior to number of lambs weaned per ewe as a predictor of CO$_2$-e emissions (1 unit CH$_4$ = 25 units CO$_2$-e$_1$).
Work done to date
Hegarty et al. (2010) found that joining ewe lambs at seven to eight months increased the profitability and reduced the intensity of emissions by 9 to 12 per cent for self-replacing merino systems. A New Zealand study reported a 14 per cent reduction in emissions intensity from joining ewe lambs in a crossbred flock (Cruickshank et al. 2009). Young (2009) reported no significant effects on profit or emissions from joining ewe lambs. However, an updated analysis by Young (pers. comm.) with current sheep meat prices shows that mating ewe lambs increases profit and reduces emissions intensity by 7.5 per cent.

Current level of adoption
We are not aware of any farmers who have manipulated reproductive rate specifically to reduce CO₂-e emissions.

Industry activity
None at this stage. The modeling analyses in the current report indicate that farmers will be financially disadvantaged from reducing reproductive rate in order to reduce carbon emissions because the reduction in profit is much greater than likely compensation through the Emissions Trading Fund (ERF).

Carbon benefits
Currently none.

Co-benefits
- Increasing the reproductive rate by mating ewe lambs increases on-farm profit. The increase in farm profit from this practice was calculated at $17 000/farm or $17/ha.
- For these strategies there is a financial incentive associated with increased on-farm profitability for farmers to increase emissions (Young 2009).

Opportunities
- This practice is relevant to all sheep enterprises in Western Australia—including purebred merino, merino crosses and composite breeds. The state has about 6500 sheep farms with 14.5 million sheep, of which 8.6 million are breeding ewes.
- Studies show that the practice of increasing reproductive rate by mating ewe lambs can reduce total carbon emissions and emissions intensity by 7.5 per cent.

Risks
- Reducing the reproductive rate of the flock by varying flock structure reduces profitability by much more than the current value of the carbon emissions saved.
- The main risks associated with adoption of mating ewe lambs as a technique to reduce carbon emissions are associated with seasonal variation. The reproductive rate achieved from the ewe lambs is likely to vary widely between good and poor seasons. This risk can be reduced if farmers are actively managing their sheep to achieve target liveweight or condition score profiles.
- Another risk is associated with commodity prices. Currently, sheep meat prices are high and there is a large financial incentive for farmers to mate ewe lambs. However, if sheep meat prices drop then the incentive to continue drops.

Case study
The typical sheep farm in Western Australia runs 1220 ewes, 560 lambs and 170 wethers and rams. This equates to about 2700 DSE. The farm would emit about 550 tonnes CO₂-e per annum from methane and nitrous oxide emissions. Mating ewe lambs was the only strategy which reduced emissions, but the carbon credits from adopting this practice would be valued at less than $100 for the farm. The benefits from adopting strategies to manipulate reproduction specifically for the reason of ERF credits are limited.

Key contacts – Australia
- Dr Hutton Oddy (NSW DPI, Armidale)
Next steps
Major research, development and extension activities related to reproduction are planned under the National Reproduction Research Development and Extension Strategy and DAFF’s Filling the Research Gap: National Livestock Methane Program.

Key references


Young J 2009, Implications of managing the greenhouse gas emissions from the livestock enterprise, unpublished report commissioned by the Sheep CRC

International work
Existing collaboration related to reproduction and methane emissions exist with two institutions in New Zealand:

- Dr Harry Clark (New Zealand Agricultural Greenhouse Gas Research Centre, AgResearch)
- Professor Paul Kenyon (Institute of Veterinary, Animal and Biomedical Sciences, Massey University)

Stakeholders
- Farmers
- State government agencies and research institutions including DAFWA, Murdoch University, the university of Western Australia and CSIRO
- Rural Industry Research Corporations: Australian Wool Innovation and Meat & Livestock Australia
- Department of Agriculture, Fisheries and Forestry

The other major collaborator is the Department of Agriculture, Fisheries and Forestry’s Filling the Research Gap National Livestock Methane Program (see link in reference list).