

Reducing sheep methane emissions through improved forage quality

Roy Latta

SARDI, Minnipa Agricultural Centre

RESEARCH

Searching for answers



Location: Minnipa Ag Centre
EP Agricultural Research
Foundation

Livestock

Enterprise type: Mixed farming
Stocking rate: At a rate to allow more than 4 weeks grazing while retaining groundcover
Type of stock/breed: Merino weaners

Key messages

- **Grazing a vetch crop, compared to a standing barley forage crop, increased merino weaner growth rates from 41 to 190 g/head/day.**
- **Data to compare daily methane production per animal is currently being collated and analysed.**
- **The increased growth rates provided the opportunity to sell weaners earlier per unit of production.**

Why do the trial?

Direct emissions from agriculture currently accounts for approximately 15 per cent of Australia's total greenhouse gas emissions of which approximately 65 per cent is methane resulting from sheep and cattle. The emission level is associated with the quality and digestibility of the animal feed; the higher the digestibility and the less feed required to maintain production

(higher quality), the lower the amount of methane produced per unit of product (e.g. per kg body weight produced). This trial aims to evaluate forage opportunities which may increase sheep production and reduce methane emissions through improved feed quality in late spring, autumn and early winter in southern Australian livestock production systems. It will contribute new data on methane production with different forage systems under commercial grazing conditions.

How was it done?

The trial commenced on 8 November 2013 with 200 mixed-sex Merino weaners (July 2013 drop) at an average live weight of 28 kg split equally into 2 groups of 100 animals. Group 1 was placed on a 15 ha unharvested vetch stubble; oats were supplied in a lick feeder. Group 2 were placed, with another 242 weaners, onto 35 ha of standing dry sown unharvested barley stubble with an annual medic pasture residue understory; a grain mixture of barley and field pea were available in a lick feeder. The weaners were weighed on 8 November following an overnight fasting and prior to being placed on their respective paddocks.

The 2 groups were retained on their treatments until 3 December when methane production measurements commenced. Each group had 50 animals allocated as replicate 1 and the second 50 as replicate 2, with methane measurements completed over 4 days with 30 animals from each replicate within each group being measured at the same time each day. Sheep were removed from grazing respective fields at 7:30

a.m., drafted into identified group and placed in a "polytunnel" from 8:30 a.m. for 3 hours (Group 1, Rep1 on 3 December, Group 2, Rep1 on 4 December, etc.). A polytunnel is a large inflatable tent into which the group of sheep is temporarily placed, with air containing all gases produced by the sheep extracted through a duct. Methane is analysed in real-time with a sensor, and data logged to a computer every 10 minutes for later analysis. CSIRO staff from Perth completed the measurements and are currently analysing the data. Sheep were returned to respective fields until they were removed on 8 December, and weighed after an overnight fast at 9:00 a.m. on 9 December.

Data which is being reported are the weaner live weights from the commencement and completion of the trial with the comparative forage availability, utilisation and quality. The pre- and post-grazing samples, 0.1 m² quadrants, were collected from the same 10 randomly selected points within each paddock and sorted into their specific components. Quality of the different forage components was estimated through a FEEDTEST analysis.

What happened?

The group 1 weaners gained a total of 5.5 kg/head live weight, the group 2 weaners an average 1.2 kg/head live weight gain over the 29 day trial.

Table 1 Forage biomass (tDM/ha, 8 November – 8 December) disappearance (kg/head/day) crude protein (CP) (% of DM), digestibility (% of DM) and estimated mega joules of energy (MJ/kg of DM) of a legume and cereal based crop residue

| Forages | | Biomass (tDM/ha) | Disappearance (kg/head/day) | Quality | | |
|----------------|-------------|------------------|-----------------------------|---------|------------|----------|
| | | | | CP (%) | Digest (%) | MJ/kg DM |
| Group 1 | | | | | | |
| Vetch | Pods/Grain | 0.3 - 0.1 | 1.2 | 28.9 | 88 | 12.6 |
| | Residue | 1.9 - 1.6 | 1.5 | 12.9 | 54 | 7.8 |
| Oats | | | 0.25 | 15.3 | 78 | 14.0 |
| Group 2 | | | | | | |
| Barley | Heads/Grain | 0.6 - 0.3 | 1.3 | 12.8 | 80 | 12.6 |
| | Residue | 1.9 - 1.5 | 1.3 | 8.7 | 60 | 9.4 |
| Pasture | Medic pods | 0.5 - 0.6 | 0 | 0 | 0 | 0 |
| | Residue | 0.9 - 0.7 | 0.9 | 8.7 | 48 | 6.6 |
| Field pea | | | 0.06 | 26.2 | 90 | 13.0 |
| Barley | | | 0.02 | 11.3 | 86 | 13.2 |

*As the feed intake capacity of a 28+ kg weaner is <1 kgDM/day some grain and most residue losses are attributed to stock traffic

What does this mean?

The increase from 50 grams/head/day to more than 190 grams/head/day from the flock grazing the vetch residue as compared to the flock grazing the barley/pasture residue reflects the higher nutritional quality of the vetch stubble compared the barley stubble, particularly the protein content. A higher supply of protein can improve the utilisation of the high-fibre components of stubble. Referring to the NSW DPI Primefacts No 347 weight gains of 190 grams/day from Merino weaners requires more than 0.8 kg of forage at 15%+ CP and a minimum 13 megajoules of metabolisable energy (MJ/kg DM).

The group 1 weight gain of 190 grams/day indicated that the diet was 0.8 kg vetch grain augmented by 0.2 kg of oats to provide the required CP and ME intake levels, 26% CP and 13 MJ/kg of DM. The group 2 weight gain result, 41 grams/head/day indicates a much lower protein intake from a barley grain heads diet 12.8% CP and 12.6 MJ/kg of DM, augmented with lower quality crop and pasture residue.

We await the methane production results, however, irrespective of the results the potential to achieve the increased weight gains measured in the study provides the opportunity to sell young sheep at an earlier age and thereby reduce methane emissions intensity (methane produced per unit of weight gain).

Acknowledgements

Mark Klante and Brett McEvoy for managing the livestock and the preparation of trial infrastructure. Jessica Crettenden for the livestock data management and presentation. Nathan Phillips and Andrew Toovey, CSIRO Animal, Food and Health Science, Perth for methane collection and data processing and analysis. This project is supported by funding from the Australian Government.



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