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MEAT & LIVESTOCK AUSTRALIA

Reducing Emissions from Livestock Research Program

Manure management to reduce greenhouse gas emissions from cattle feedlots

Manure pads and stockpiles at cattle feedlots are a significant source of the greenhouse gases, methane and nitrous oxide. In addition, ammonia emissions cause huge losses of nitrogen nutrients from manure, representing up to 70% of dietary nitrogen intake. For feedlots with 13,000 to 20,000 cattle, the average NH_3 emission is equivalent to 4,000 to 5,000kg urea fertiliser per day. When deposited on adjacent land, ammonia may also be a significant source of indirect nitrous oxide emissions downwind of the source. Allowing for 1% conversion of emitted (and later deposited) NH_3 & NOx, the combined N_2O emissions is 60% of CH_4 emissions, much bigger than current estimates

The objectives of this project are to:

- support development of methane abatement technologies, specifically for feedlot cattle
- promote development of lower net emissions for the whole supply chain
- provide data for continued improvement in greenhouse gas accounting and informed decisions relating to agriculture

The outcome of this research will be a set of recommendations to feedlot managers on strategies for effective, quantifiable reductions of greenhouse emissions from beef cattle feedlots.

Measuring emissions from a feedlot using open-path lasers.

The program

The Reducing Emissions from Livestock Research Program is a national collaborative program focused on developing practical on-farm options for significantly reducing emissions from livestock while simultaneously increasing productivity. The research will develop more accurate data on emissions from sheep and cattle and the levels of mitigation achieved using a range of strategies.

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Project objective

Use open-path spectroscopy and soil chambers to evaluate the effectiveness of innovations in manure management (urease inhibitors and stockpile aeration) in a cattle feedlot, for reducing CH_4, NH_3 and N_2O emissions from feedlot manure sources, and quantify the indirect N_2O emissions downwind.

This project is using open-path spectroscopy (laser and FTIR), trace gas analyser and soil chambers to evaluate the effectiveness of innovations in manure management (urease inhibitors, lignite and biochar) in a cattle feedlot, to reduce nitrous oxide and ammonia emissions from feedlot manure sources. Micrometeorological measurements are also taken, to translate gas concentrations at the sensor to vertical flux estimates, by two different methods. The first method utilises micrometeorological measurements from a 3D sonic anemometer in a backward Lagrangian Stochastic (bLS) model, while the second method employs an array of five 2D sonic anemometers, in a mass balance model. In addition, modelling of ammonia yield, microbial protein synthesis and methane yield, in the animal rumen and in manure stockpiles, may clarify the results from the broader monitoring program.

Field experiments from two manure treatments (with and without urease inhibitor applied) has been established at Charlton Feedlot, Victoria. We are monitoring methane, ammonia and nitrous oxide emissions in experiments over winter and summer for two consecutive years. In addition, we will conduct two *in vitro* incubation experiments using field samples collected from Charlton Feedlot to provide information on the underlying processes of carbon and nitrogen redistribution within, and ammonia and methane emissions from, the field treatments.

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