

# Improving production efficiency as a strategy to mitigate greenhouse gas emissions on dairy farms



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## OBJECTIVE

Use modelling to explore strategies to maintain production, but reduce greenhouse gas emissions per unit of land and product by improving production efficiency.



## METHODS

### Models:

- DairyNZ's Whole Farm Model (WFM) with Molly cow model was used to predict milk production, intakes, methane, urinary-nitrogen and operational profit
- The Overseer® nutrient model predicted CH<sub>4</sub> and N<sub>2</sub>O emissions as CO<sub>2</sub>-equivalents.

### Mitigation strategies:

Baseline. An average pasture-based Waikato farm with no mitigation. In the WFM strategies were sequentially added while maintaining MS/ha:

- Reduced replacement rates mean lower emissions from non-productive animals (= herd efficiency)
- Use higher genetic merit cows resulting in a lower stocking rate (= cow efficiency)
- Improved pasture management (= better pasture quality)
- Increased ME yield and reduced N intake (= home grown maize silage)

In Overseer® one more strategy was added:

- Application of nitrification inhibitors (DCD).

## RESULTS

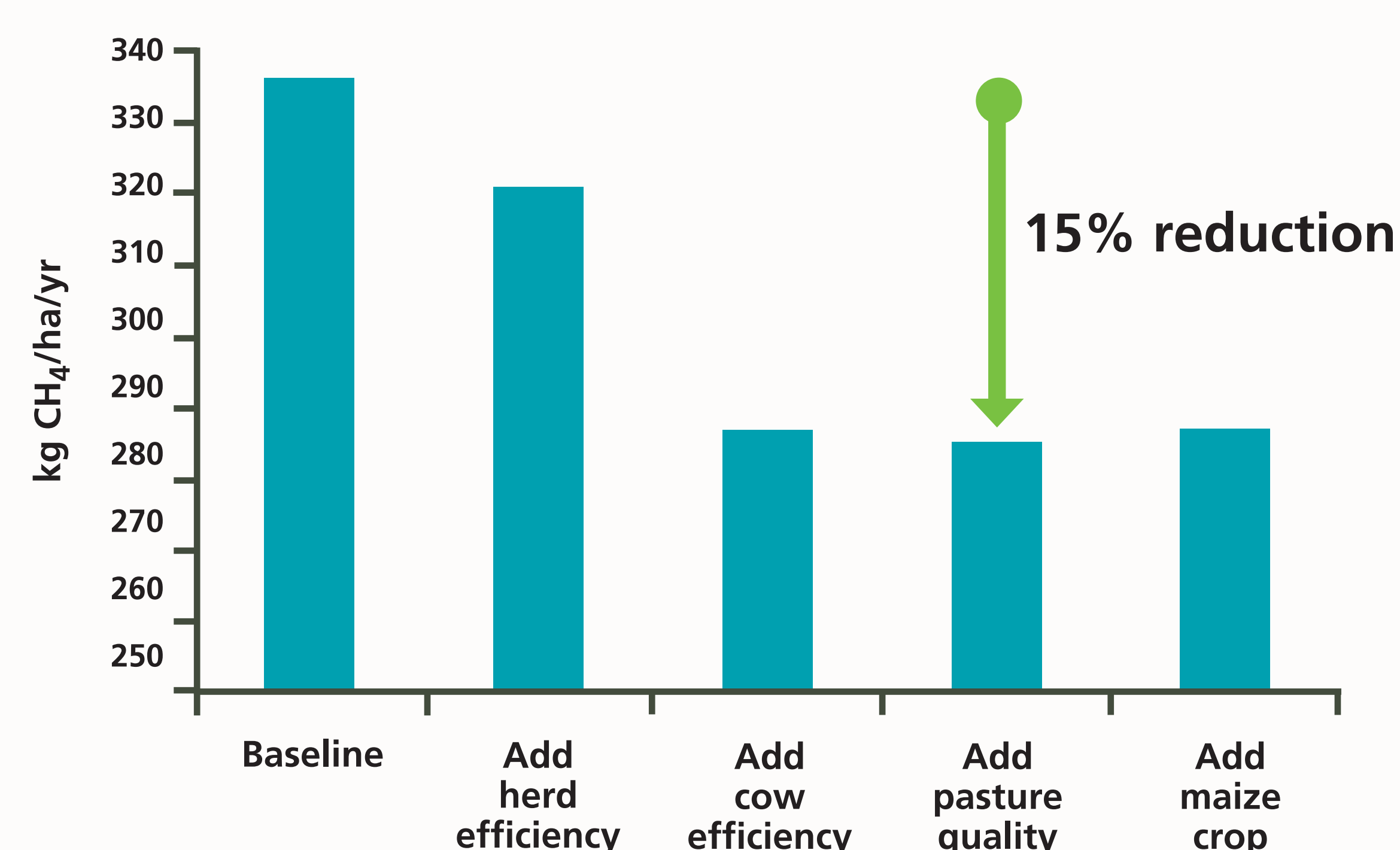


Figure 1: Reduction in CH<sub>4</sub> emissions per unit of area according to predictions of WFM and Molly

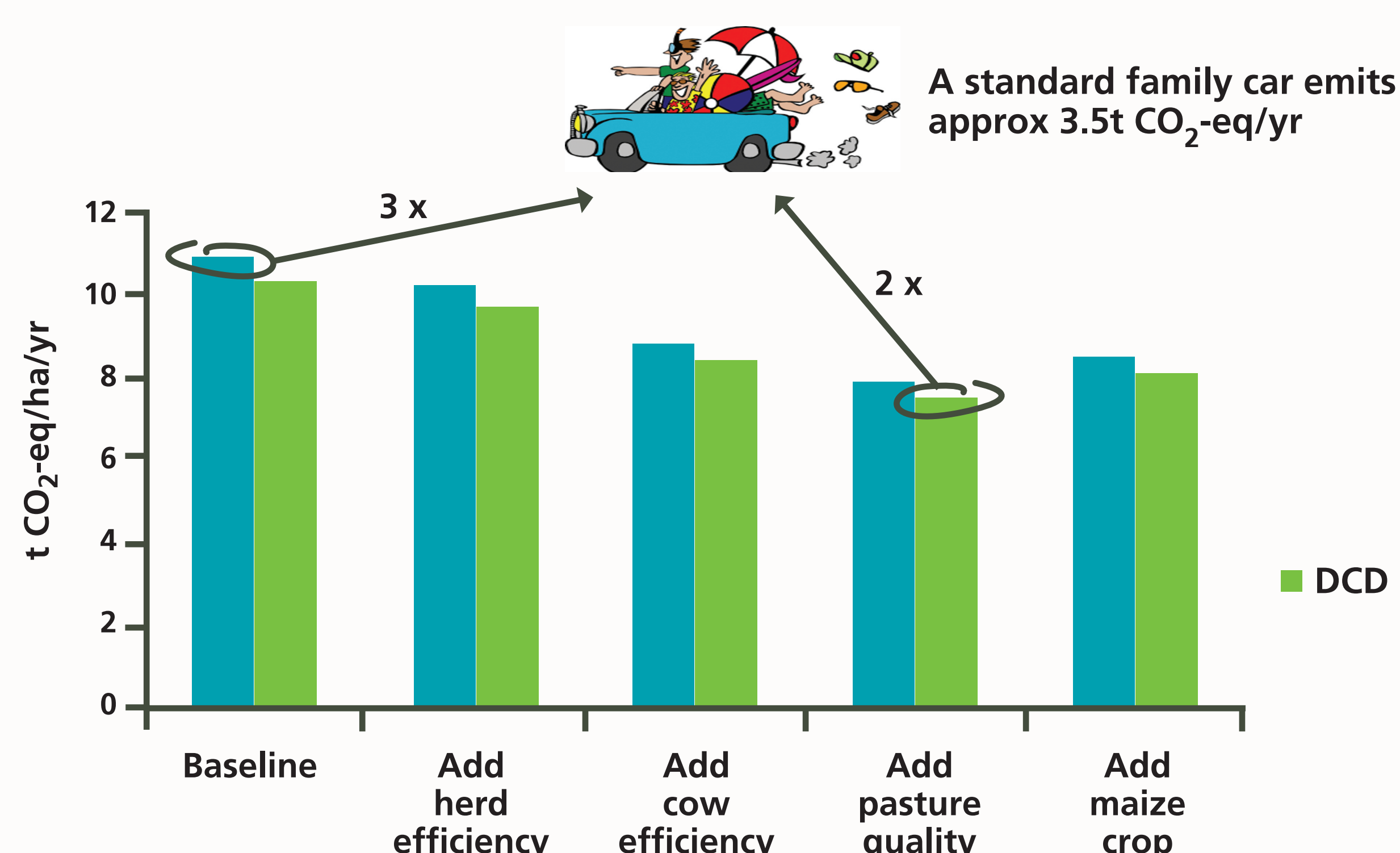


Figure 2: Reduction in total farm emissions (CO<sub>2</sub> equivalents/ha/year) according to Overseer® predictions. DCD = with nitrification inhibitors.



## CONCLUSIONS

- There is potential to decrease greenhouse gas emissions by 27-32% whilst maintaining production/ha by:
  - lowering replacement rate (<20%)
  - using high genetic merit crossbred cows (potential 430+ kgMS/cow/yr)
  - reducing stocking rate (from 3.0 to 2.3 cows/ha)
  - increasing average pasture quality (+1 MJME/kgDM)
  - reducing N fertiliser use (≤50kg N/ha/yr)
  - using nitrification inhibitors.
- There is opportunity to increase profitability by reducing cow and fertiliser costs.

### Acknowledgements

This project was supported by the New Zealand dairy farmers. We thank them and the DairyNZ staff for their invaluable help.