

Strong effects of grassland sward composition on reducing N₂O emissions and emissions intensity

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Graphical Hypothesis



Background

- Grasslands with high N fertiliser inputs → high N₂O emissions. Swards containing mixtures of grasses, legumes and herbs can increase N use efficiency, improve animal performance, and increase yields.
- Emissions intensity is a useful sustainability metric as it determines the cost of emissions associated with production.
- Project objectives: determine the N₂O emissions and emissions intensity of grassland mixtures and monocultures at plot and systems scale

Methodology

- Field trial:** Annual N₂O emissions measured from different grassland mixtures and monocultures. Emissions intensity was calculated using yield data (emissions/unit yield). A simplex experimental design used to determine diversity effects on responses. Plots received 150N with an additional 300N *L. perenne* reference (Image 1).
- Systems analyses:** N₂O and lamb LWG monitored for 9 months on two contrasting systems on the North Wyke Farm Platform 1) Grass-clover (40N) 2) Grass monoculture (120N) (image 2).

Image 1



Static gas chamber

Image 2



Automated chamber

Key findings – Field trial

- Significantly lower emissions intensity (N yield) from the 6-species mixture than both *L. perenne* monocultures (150 and 300N) (Figure 1).
- Higher N₂O emissions related to increasing legume proportion when N input not reduced to account for BNF (Figure 2).

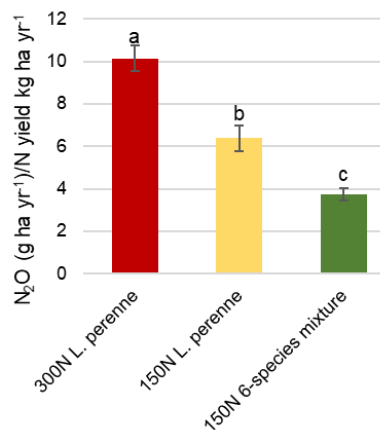


Figure 1

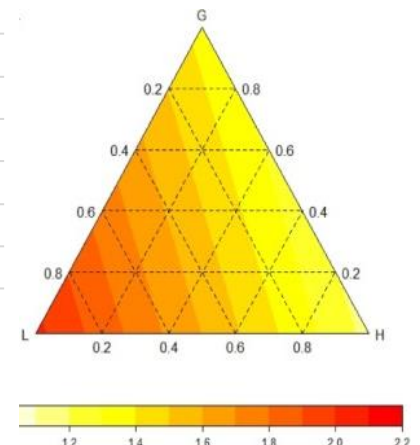
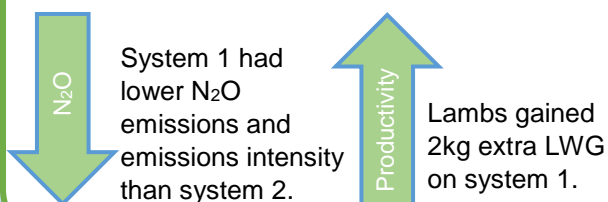


Figure 2

Key findings - Systems analyses



Conclusions

- Grass-legume and multi-species swards receiving moderate N inputs reduced N₂O emissions and emissions intensity and increased lamb productivity relative to monocultures.
- Further evidence from this project solidifies the role of diverse swards in climate-smart production systems.