



Title	Analysis of N ₂ O emissions and isotopomers to understand nitrogen cycling associated with multispecies grassland swards at a lysimeter scale
Authors(s)	Bracken, Conor, Lanigan, Gary, Richards, Karl, Tracy, Saoirse, Müller, Christoph, Murphy, Paul
Publication date	2020-05-08
Publication information	Bracken, Conor, Gary Lanigan, Karl Richards, Saoirse Tracy, Christoph Müller, and Paul Murphy. "Analysis of N ₂ O Emissions and Isotopomers to Understand Nitrogen Cycling Associated with Multispecies Grassland Swards at a Lysimeter Scale," 2020.
Conference details	The EGU General Assembly, Online, 4-8 May 2020
Item record/more information	http://hdl.handle.net/10197/12424

Downloaded 2023-05-26T05:55:56Z

The UCD community has made this article openly available. Please share how this access benefits you. Your story matters! (@ucd_oa)



© Some rights reserved. For more information

Analysis of N₂O emissions and isotopomers to understand nitrogen cycling associated with multispecies grassland swards at a lysimeter scale.

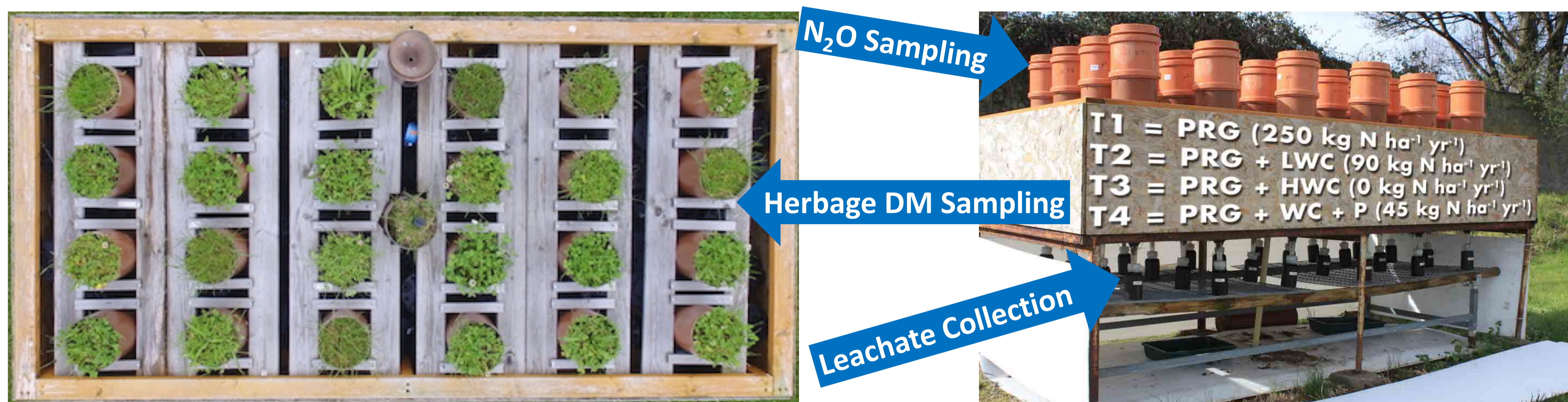
Conor Bracken^{a, b, c}, Gary Lanigan^c, Karl Richards^c, Christoph Müller^{b, d, e}, Saoirse Tracy^{a, b}, Paul Murphy^{a, b}
^aUCD School of Agriculture and Food Science; ^bUCD Earth Institute; ^cTeagasc, Environmental Research Center, Johnstown Castle; ^dInstitute of Plant Ecology, Justus-Liebig University; ^eUCD School of Biology and Environmental Science

Introduction

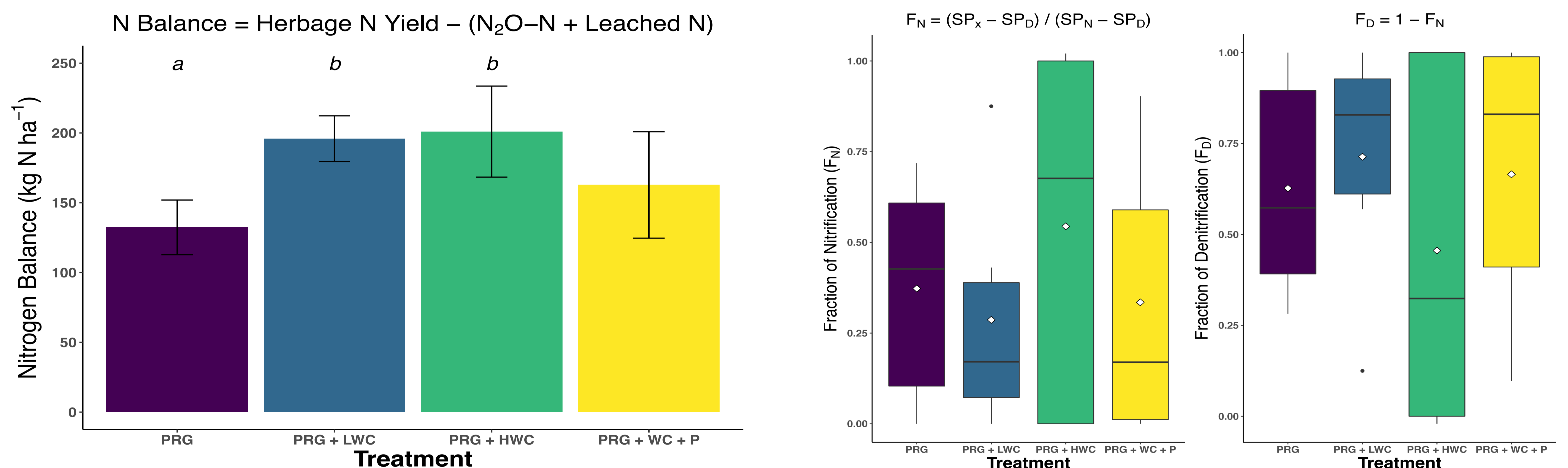
N₂O is a potent GHG associated with N fertiliser inputs and management practices.¹ N₂O isotopomers are useful indicators of N₂O source pathways.^{2,3} Minimising N losses is key to improving the efficiency and sustainability of grassland agriculture systems.⁴ Multispecies swards have been considered as an option to reduce N fertiliser inputs, maintain yields and mitigate N losses.

Materials and Methods

Completely randomised block design. 4 treatments: Perennial ryegrass only (PRG, 250 kg N ha⁻¹ yr⁻¹), PRG + low white clover (PRG+LWC, 90 kg N ha⁻¹ yr⁻¹), PRG + high WC (PRG+HWC, 0 kg N ha⁻¹ yr⁻¹) and PRG + WC + ribwort plantain (PRG+WC+P, 45 kg N ha⁻¹ yr⁻¹).



Results and Conclusions



Nitrogen balances were significantly greater from PRG+LWC and PRG+HWC than PRG only. Both required less annual fertiliser N to sustain DM production. There were no significant differences in cumulative N₂O emissions or total leached N among treatments. No significant difference in the fraction of nitrification (F_N) or denitrification (F_D) was detected between treatments around peak N₂O fluxes linked to fertiliser application.

References

- Liang et al., 2016. Multivariate regulation of soil CO₂ and N₂O pulse emissions from agricultural soils. *Global Change Biology*, 22: 1286-98.
- Friedman and Bigeleisen, 1950. Oxygen and nitrogen isotope effects in the decomposition of ammonium nitrate. *The Journal of Chemical Physics*, 18: 1325-1331.
- Toyoda and Yoshida, 1999. Determination of nitrogen isotopomers of nitrous oxide on a modified isotope ratio mass spectrometer. *Analytical Chemistry*, 71: 4711-4718.
- Hoekstra et al., 2020. Scenarios to limit environmental nitrogen losses from dairy expansion. *Science of the Total Environment*, 707: 1 - 15.

Acknowledgements

The authors would like to thank the Teagasc Walsh Scholarship and the UCD Seed Funding Schemes for financially supporting this work. Many thanks to all those who contributed technical advice and support to this work.