



Research Repository UCD

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 2024-03-29T04:02:15Z

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

Bracken, Conor; Lanigan, Gary; Richards, Karl; Tracy, Saoirse; Müller, Christoph; Murphy, Paul

Abstract

Nitrous oxide (N₂O) is a potent greenhouse gas associated with nitrogen fertiliser inputs to agricultural production systems. Minimising N₂O emissions is important to improving the efficiency and sustainability of grassland agriculture. Multispecies grassland swards composed of plants from different functional groups (grasses, legumes, herbs) have been considered as a management strategy to achieve this goal. Numerous soil nitrogen transformation pathways can lead to the production of N₂O emissions. These transformation pathways are regulated by soil microbial communities and the environmental conditions and management practices that impact on them. Much research has been carried out on N cycling and N₂O emissions from predominantly grass monoculture systems. However, there is a lot yet to understand about how agricultural grasslands with diverse plant communities influence soil N cycling and N₂O emissions. A lysimeter experiment was set up as a completely randomised block design and carried out over a full year to investigate N₂O production, and nitrogen cycling associated with four sward types. The swards four swards were: perennial ryegrass (PRG, *Lolium perenne*); PRG and low white clover (PRG + LWC, *Trifolium repens*); PRG and high white clover (PRG + HWC); PRG, WC and ribwort plantain (PRG + WC + PLAN, *Plantago lanceolata*) managed at 250, 90, 0, and 45 kg N ha⁻¹yr⁻¹, respectively. Fertiliser N was applied by syringe as urea in splits at suitable timings to meet grass growth demands. N₂O fluxes were measured using a static chamber technique and additional samples were taken after the final flux sample to measure the associated N₂O isotopomers using a novel Cavity Ring Down Spectroscopy technique. Leachate volumes were measured on a weekly basis and composite monthly samples were used to determine the total amount of N leached from each treatment over the full year. Herbage was harvested on a monthly basis to measure DM yield (kg DM ha⁻¹), total N (%) and N yield (kg N ha⁻¹). This work reports on the N₂O emissions and N leaching associated with the four sward treatments and related these N losses to the treatments DM yields and N uptake as an estimation of the efficiency of these differing grassland management strategies. N₂O isotopomer measurements were used to indicate N transformation pathways driving N loss over the growing season particularly around periods of peak N₂O emissions.