Title	**Mitigating N_2O emissions by optimising irrigation management**
Project Timeframe	Aug 2017 – Sep 2020
Countries Involved	New Zealand (Lincoln University) Australia (Queensland University of Technology)
Aim	To understand how irrigation can be effectively managed to maximise soil diffusivity (Dp/Do) to mitigate N_2O emissions.
Research Highlights	• A set of five experiments were carried out, including controlled laboratory tests, an initial field irrigation experiment, lysimeter and summer field irrigation experiments. • It was found that applying irrigation based on soil gas diffusivity has the potential to decrease nitrous oxide emissions from soil (by up to 30%). • Two of the field experiments showed that there was no decrease in pasture dry matter production when irrigation was controlled to maintain soil gas diffusivity in zones that were less favourable for N_2O production. • Another experiment indicated that nitrate leaching might be enhanced if irrigation was managed to optimise soil gas diffusivity to limit N_2O emissions. • This project has been an international collaboration with Queensland University of Technology (QUT), Australia.
Future Work	• Linkages to plant physiology modelling with linkages to irrigation modelling tools should be made to model potential scenarios in line with soil gas diffusivity. • Examine what stage in the urinary N cycle irrigation matters most in terms of reducing N_2O emissions. • A proposal for NZAGRC's Innovation fund funding call is being prepared, along with QUT. • Future research should explore the interval between irrigation events in terms of maintaining N_2O reductase activity and model N_2O based on soil water supply and plant demand/growth.
Key Research Output(s)	<u>Journal article(s)</u> Camille, R., Clough, T.J., Grace, P.R., Rowlings, D.W., Scheer, C. (2020) Soil type, bulk density and drainage effects on relative gas diffusivity and N_2O emissions. *Soil Research*. Camille, R., Clough, T.J., Grace, P.R., Rowlings, D.W., Scheer, C. (Under Review) Can pasture irrigation be scheduled using soil gas diffusivity: implications for urinary-N derived N_2O fluxes, leaching and plant N uptake. *New Zealand Journal of Agricultural Research.*

	Camille, R., Clough, T.J., Grace, P.R., Rowlings, D.W., Scheer, C. (Under Review) Soil wetting-drainage cycles effect on relative gas diffusivity and N2O emissions. *Geoderma*. Camille, R., Clough, T.J., Grace, P.R., Rowlings, D.W., Scheer, C. (Under Review) Soil gas diffusivity as an irrigation tool to mitigate N_2O emissions in a urine-affected pasture. *New Zealand Journal of Agricultural Research.* Camille, R., Clough, T.J., Grace, P.R., Rowlings, D.W., Scheer, C. (In Prep.) Working title – Mitigating N_2O by optimising irrigation. <u>Conference presentation(s)</u> Camille, R., Clough, T.J., Grace, P.R., Rowlings, D.W., Scheer, C. Accepted for a PICO[1] presentation. Mitigating nitrous oxide emissions and nitrate leaching by optimising irrigation management in fertilised pasturelands. *Eurosoil Congress*, Geneva. 23-27 August 2021. Camille, R., Clough, T.J., Grace, P.R., Rowlings, D.W., Scheer, C. Accepted for a PICO presentation. Effect of irrigation scheduling on nitrous oxide emissions and nitrate leaching: a lysimeter study. *Eurosoil Congress*, Geneva. 23-27 August 2021. Camille, R., Clough, T.J., Grace, P.R., Rowlings, D.W., Scheer, C. Effect of irrigation scheduling on nitrous oxide emissions and plant biomass: a field study. *Soil Science Society of Australia and the New Zealand Soil Science Society Combined Conference*, Cairns. 27 June – 2 July 2021.

[1] *PICO – Presenting I*nteractive *CO*ntent – is a type of scientific presentation that combines the advantages of oral and poster presentations. After the two-minute talks, the audience can explore each presentation on touch screens, where authors are available to answer questions and discuss their research in more detail.