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Lab Members

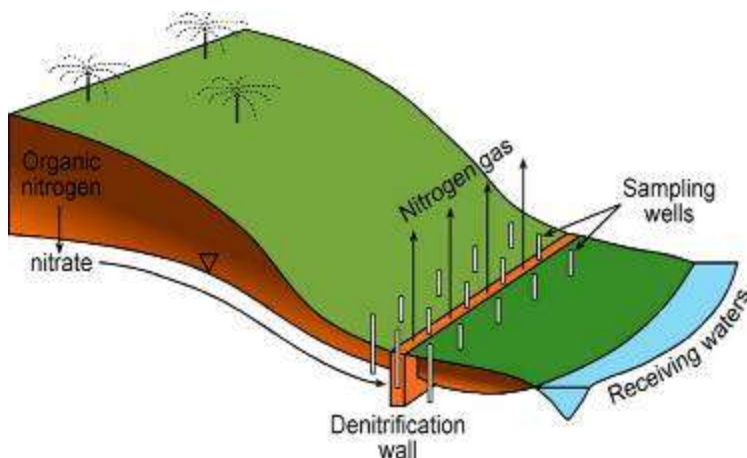


Jacinta Parenzee is the technician in charge of the Soil's laboratory in the department. Jacinta is responsible for organising labs for undergraduate teaching, training graduates in appropriate techniques, method development and research.

Dr Graham Sparling is a long time collaborator, who pretends to be retired, but works one day a week in the soils lab on a range of projects. He is currently focussed on fractionation of soil carbon, carbon losses from agriculture, and soil quality.

Current Research Overview

Denitrification walls



A denitrification wall uses sawdust to enhance microbial denitrification and strip nitrate out of groundwater. See: Schipper et al (2005). Upper limits of nitrate removal in a denitrification wall. *Journal of Environmental Quality* 34: 1270-1276.

Denitrification beds

In conjunction with WaikatoLink, GNS Science and Landcare Research

Denitrification beds at Kinloch subdivision (right) have demonstrated total nitrate removal from treated effluent for more than two years. See: Schipper, L.A. Cameron S. (2004) Denitrification beds: getting rid of that last bit of nitrogen. Water and Wastes in New Zealand November, Issue 137: 28.



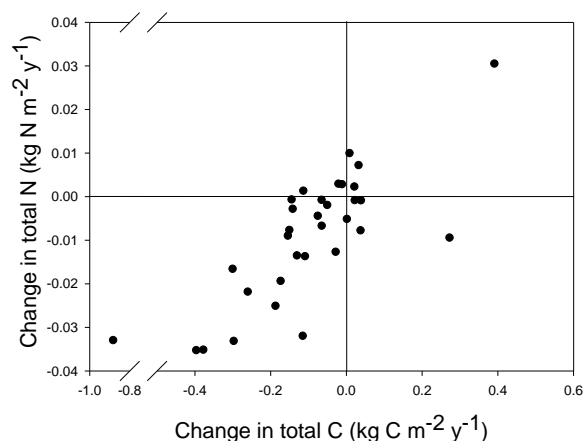
Above - large denitrification bed for treating discharge from a hydroponic glasshouse. 140 m long by 6 m wide and 2 m deep.

Stewart Cameron (GNS Science) is conducting a PhD study on the flow of effluent through denitrification beds. Stewart is using a combination of field and large scale barrel trials to determine the nitrate removal and hydraulic flows in a range of carbon substrates and will model the importance of bed design.

Soeren Warneke is studying the microbial ecology of denitrification beds for his PhD thesis. Initially, he will determine the environmental factors that control denitrification and nitrous oxide emissions. In conjunction with Stewart Cameron, he will try to identify management approaches that enhance denitrification while minimising nitrous oxide losses. Soeren is funded by WaikatoLink

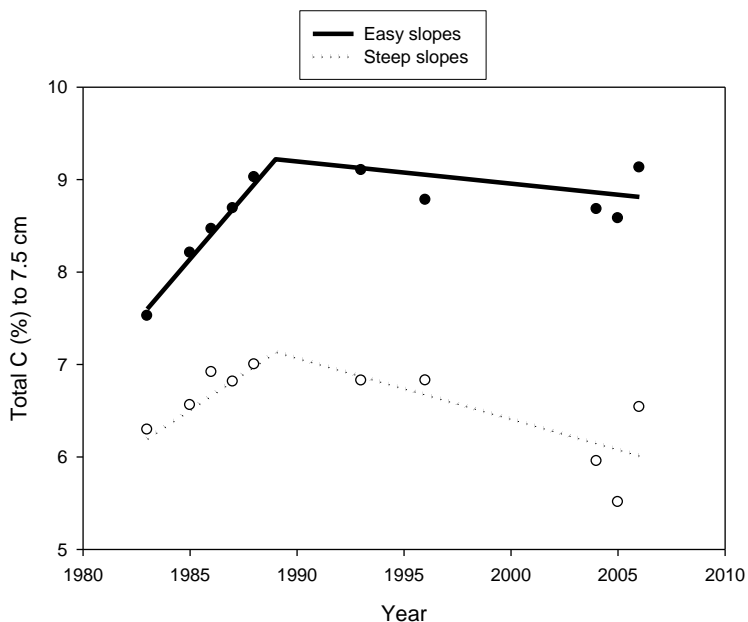


Long-term changes in soil carbon and nitrogen in pastures



Recent re-sampling of pasture soil have demonstrated large losses of total C and N from the profile. Assuming linear declines between sampling times (around 20 years) indicates losses of about 1 t C ha⁻¹ y⁻¹ and 90 kg N ha⁻¹ y⁻¹. Fate of this C and N is not known. See: Schipper, L.A.; Parfitt, R.; Ross, C.; Baisden, W.T (2007) Changes in total carbon and nitrogen in New Zealand pasture soils during the past 20 years. *Global Change Biology*, 13:1138-1144. In conjunction with Landcare Research

We also have a focus on analysis of soil carbon and nitrogen trends from long-term pasture trials, including a phosphorus rate trial at Whatawhata (see right: Schipper et al., submitted – Biogeochemistry) showing multi year trends in response to a series of summer droughts in the 1990s. Funding from FRST via Landcare Research in collaboration with AgResearch.



Urine impacts on soil carbon

One possible explanation for organic matter loss from soil is increased mobilisation of organic matter by urine patches deposited by stock. Suzanne Lambie (PhD candidate) is investigating whether urine application can increase the degradation and/or leaching of soil organic matter derived from forestry or pastures. Suzanne is undertaking her PhD part-time while working at Landcare Research, Palmerston North and is jointly supervised by Troy Baisden (GNS Science).



Controls on degradation of organic matter

Suus Rutledge (PhD Candidate) is measuring controls of microbial degradation and photodegradation of peat at hectare scales. See: Nieveen, J.P.; Campbell, D.I.; Schipper L.A.; Blair, I. (2005) Carbon exchange of grazed pasture on a drained peat soil. *Global Change Biology*. 11: 607-618. Co-supervised by Dave Campbell in with funding from Waikato University, Landcare Research and DairyNZ.

Controls of carbon balance in intensive pasture

Paul Mudge (now complete) and Dirk Wallace are conducting MSc studies into how physical impacts (cultivation and pugging) alter the carbon balance of intensively-grazed pasture. They are using a combination of chamber and eddy co-variance techniques at the Scott research farm managed by Dairy NZ. The project is receiving funding from DairyNZ and Landcare Research and the University of Waikato.



15N isotopes as indicators of pasture development status

Following completion of his MSc, Paul Mudge is now looking at testing the utility of 15N as an indicator of pasture development to improve models N cycling. Funding from FRST via GNS in collaboration with AgResearch.

Supervision

Current (chief supervisor)

- P. Mudge (PhD 2009-present) ¹⁵N enrichment as an indicator of pasture soil development.
- B. Welton (PhD 2009 –present) Nitrification inhibitors.
- D. Wallace (MSc 2009-present) Carbon losses following cultivation of pasture soils.
- S. Warneke (PhD 2007-Present) Microbial ecology of denitrification beds.
- S. Cameron (PhD 2006–Present) Nitrate removal potential and hydraulic performance of carbon media for denitrification reactors.
- S. Lambie (PhD 2006–Present, part-time) Soil Organic Matter Loss Under Pasture and Pine: Responses to Urine Addition.
- S. Rutledge (PhD 2005–present) Controls of organic matter degradation.

Completed

- P. Mudge (MSc completed 2009) Annual carbon balance of an intensively grazed pasture: magnitude and controls.
- S. Fraser (PhD completed 2007) Effects on Forest Ecosystems due to Application to Soil of Pulp and Paper Waste Solid Residuals.
- N. Watkins (MSc completed 2007) Nitrification inhibitors and denitrification. University of Waikato, NZ
- B. Clarkson (PhD completed 2005) Restiad peat bog development, with emphasis on nutrition and mineral use efficiency of dominant species. University of Waikato, NZ
- J. Smith (PhD completed 2003). Water and carbon budgets of Waikato peat bogs. University of Waikato, NZ
- L. Barton (PhD completed 1998). Denitrification in a land treatment system. University of Waikato, NZ
- L. Duncan (MSc completed 1999). Controls of microbial functional diversity. University of Waikato, NZ