

Assessing soil carbon changes associated with land management and land use practice changes

Keywords: land management; soil carbon; manure; nitrous oxide

Brief project outline:

This thesis will seek to couple soil sampling and eddy covariance techniques to determine how land management practices alter carbon stocks of grazed pastures with an overall aim to increase carbon stocks or minimise losses. For example, the PhD candidate will initially measure differences in soil carbon stocks under fencelines and adjacent paddocks to determine the contribution of manure returns to the paddock on carbon stocks. Another possible comparison could be grazed pastures versus harvested (cut and carry) pastures. We have demonstrated that manure returns are critical for increasing/maintaining soil carbon stocks and seek to determine this relationship quantitatively. Nitrous oxide flux comparisons between fence lines and paddock centers may also be made using chamber measurements. With sufficient progress by the PhD candidate, we would look to include using eddy covariance approaches for building more detailed mechanistic understanding of carbon balances or specific management practices.

Example projects using these approaches can be found in:

[Mudge et al. 2017. Irrigating grazed pasture decreases soil carbon and nitrogen stocks. *Global Change Biology* 23, 945-954.](#)

[Wall et al. 2019. Carbon budget of an intensively grazed temperate grassland with large quantities of imported supplemental feed. *Agriculture Ecosystems & Environment* 281, 1-15.](#)

Preferred candidate skills or experience:

- **Meet PhD entry requirements at the University of Waikato .**
See: [Entry requirements at Waikato University](#)
- Good understanding of carbon cycling, particularly in agricultural systems
- Ability to conduct independent fieldwork and experience, preferably soil sampling and/or eddy covariance and chamber techniques. Drivers license
- Laboratory experience (e.g., soil processing, gas analysis)
- Experience in handling large datasets, including using programming languages (e.g., Matlab, R studio)
- Able to work independently and in a team

Host institute(s) and location(s): University of Waikato, Manaaki Whenua – Landcare Research

Project leader(s)/research supervisor: Professor Louis Schipper (University of Waikato), Dr Aaron Wall (University of Waikato), Dr Paul Mudge (Manaaki Whenua – Landcare Research). Website waiber.com.