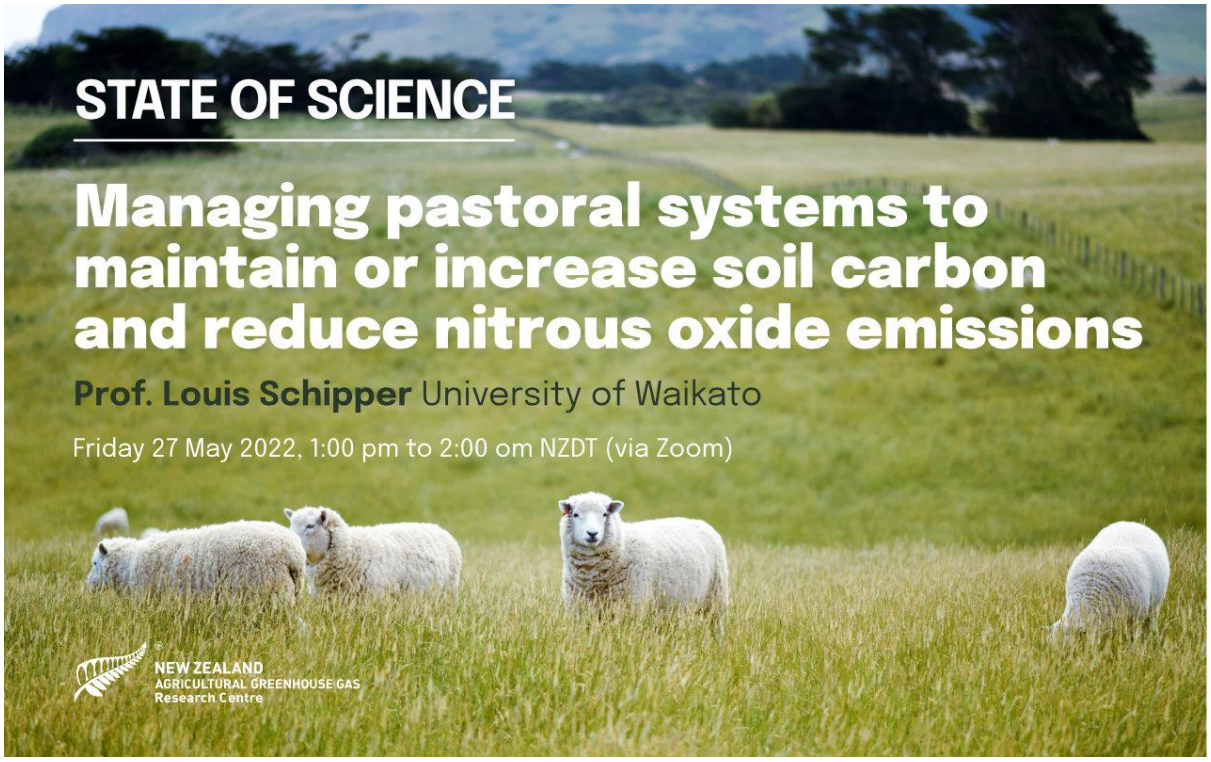

The Presenter

Prof. Louis Schipper (University of Waikato)

Louis is an environmental biogeochemist with research interests in long-term changes in soil organic matter, nitrogen cycling with a focus on denitrification and nitrogen immobilisation, impacts of land use change, carbon fluxes and nutrient cycling in agricultural and indigenous ecosystems including wetlands and soil microbial ecology.

Presentation

Title: Managing pastoral systems to maintain or increase soil carbon and reduce nitrous oxide emissions

YouTube video link: https://www.youtube.com/watch?v=zYYrUqvQ8j0

Question & Answers

Thank you for your participation in the webinar. This document contains the questions that were not able to be answered during the webinar. Please note: these answers are provided by the presenters and do not represent the views of the NZAGRC or MPI.

Could the lack of soil C recovery after the maize at Troughton's be due to the dry summers the last few years?

Very possibly. We are currently preparing a manuscript that will compare the lack of recovery under the former maize to nearby long-term pasture. This should allow us to determine the importance of the dry spells we have had. If true, then this might indicate an increased vulnerability of our pasture/crop systems in areas where drought becomes more frequent.

Would feeding maize (or other high carbon content feeds) have greater C gains on farm vs increased use of fertilisers to drive farm C production? Or little difference in fert vs feeds used to drive C intensity? Or is greatest impact from ground prep/crop establishment?

This is an excellent question that deserves full exploration. The trade-offs (including consequences for all greenhouse gases) between different management practices is a relatively underexplored area, in part because we have so little information about the components that contribute to the overall GHG emissions. It requires careful consideration of the boundaries for which a land owner is responsible.

I suspect that the greatest losses due to feed production occur due to removal of carbon grown on site, reductions in roots inputs to soil. Reduction in root inputs occur because we grow crops that allocate more captured carbon to above ground growth and less to below ground in comparison to perennial pastures.

Further, when not fed on the paddock on which the crop is grown there is then also no return of dung (which contains carbon) back to the soil.

Why do think the C was not recovering following maize production after return to permanent pasture? Pasture renewal usually leads to increased DMP, so potentially greater C returns. Other studies have shown that a single season of forage crop production followed return to permanent pasture does not lead to net soil C losses and some measurement and modelling studies indicate the potential for significant C gains for full inversion tillage pasture renewal. How do you reconcile the different results?

Lack of recovery: probably in part drought which as described above we will explore in a paper to be completed in the next few months.

Pasture renewal increased DMP: Yes, certainly correct but focusses on above ground, whether below ground inputs also increase is not known. Pasture to pasture probably recovers the carbon loss during short fallow. Different story when going through a crop when losses are greater.

Single season of forage crop increasing C: not sure which papers are being referred to here. It would be reasonable to argue that if fed on site as a forage crop then there would be dung returns to the soil which could maintain carbon stocks or at least reduce losses. This deserves further exploration, and we are currently looking at the carbon balance of a summer grazed turnip crop and will compare against maize.

Full inversion tillage: Indeed, full inversion tillage has had some good results in New Zealand, and it will be interesting to follow the full carbon balance through time.

Are you concerned about the impact of temperature, northerly warmer than southerly, could bias the comparison?

Good point. This is something that we look at on a site-by-site basis and hasn't been a problem at our sites in the Waikato.

How much of a role does soil type play in GHG emissions under different management systems?

This is a very big question, almost certainly soil type plays a big role in the size of potential emissions.

Could forage production be counted as one type of C sink?

I don't think so. The forage is eaten and converted back to CO2 rapidly either by the animal or subsequently when the product is consumed (within the year) meanwhile it is likely that soil carbon has been lost. Other GHGs are also likely emitted.

Do you have livestock grazed on the pasture during your balance trial?

Yes, this is critical. Their presence needs to be included in the way that the data is handled.

Would it be possible to get the for reference to this grasslands paper please?

Wall, A.; Goodrich, J.; Schipper, L.A. (2021) Importance of resilient pastures for New Zealand's agricultural soil C stocks. Journal of New Zealand Grasslands. 7:191-200.

Please feel free to contact me if you need a copy.

On what basis you evaluate for the proper mixed forage species? Like plantain, why you will choose.

Excellent question. We consult with the farmers as we are working on their farms, but we also consider (i) results from existing trials (e.g., reductions in N2O and nitrate leaching with Plantain in the sward), (ii) commonly considered management practices (e.g., maize), (iii) practicality.