CTF can lower N_2O emissions from cropping fields.

Better for the planet, and saves fertiliser too!

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The poster, and this abstract, discuss some of the 1st year results of a three year project to measure emissions of nitrous oxide gas (N_2O) from the wheel tracks and un-trafficked crop beds of controlled traffic farming (CTF) fields in Queensland, Victoria and Western Australia. The results from Inverleigh in Victoria are reported here.

WHY WE ARE DOING THE WORK

N_2O is a very harmful "greenhouse gas (GHG)" for the earth's atmosphere, perhaps 300 times more harmful per tonne than carbon dioxide (CO_2). We think much more N_2O (and another harmful gas, methane) is emitted from compacted farm soils than from well structured and aerated soils.

If this is so, then fields cropped using CTF systems, which generally have better soil structure because only a small proportion of their area is compacted wheel tracks, would emit much less greenhouse gas than conventionally cropped fields. In Australia, CTF fields usually have about 15% of their area affected by machinery wheels. Conventional fields can have 50% or sometimes more.

The Australian Controlled Farming Association (ACTFA Inc.) received funding from the Action on the Ground program of the Australian Government Department of Agriculture to test this theory. If CTF cropping does greatly reduce GHG emissions, it would be a good reason to encourage wider adoption of CTF systems in the Australian grains, horticulture, sugar and cotton industries.

WHAT WE DO

Installing the tops on chambers

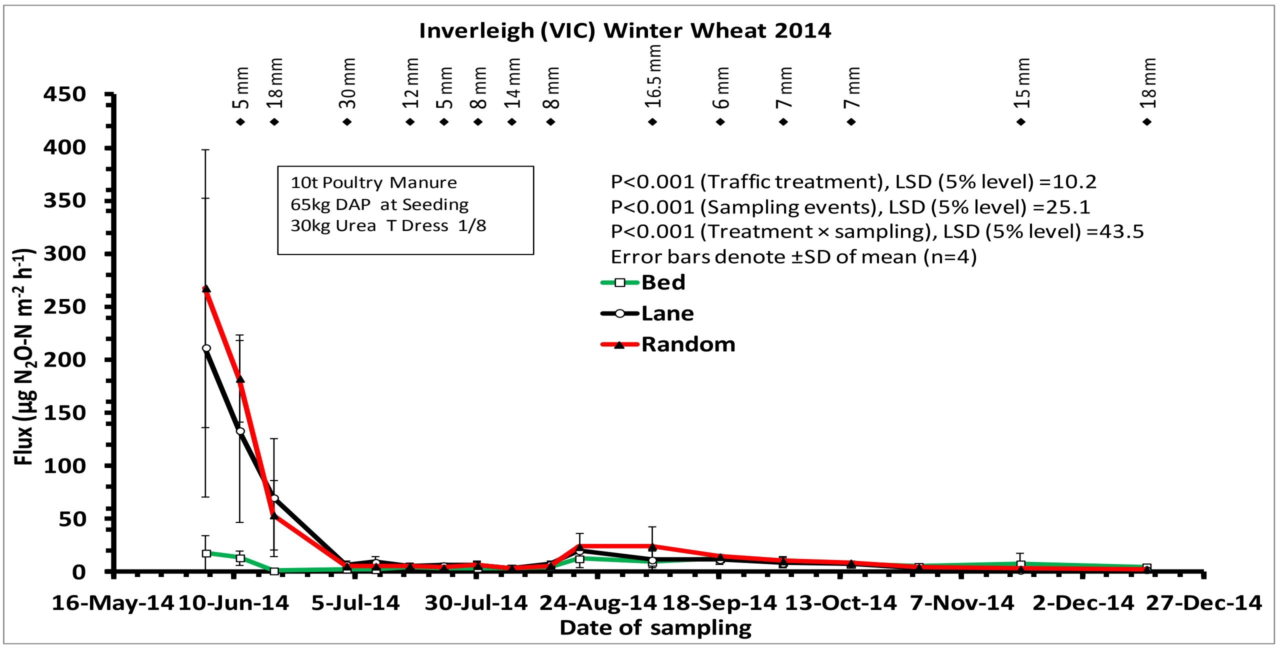
The gas collection chambers pictured are placed on un-trafficked crop beds, permanent wheel tracks and a "random" wheel track imposed on a bed. For sampling, the chamber tops are fitted and four gas samples are taken at intervals of 0, 30, 60 and 90 minutes. A gas chromatograph analyser measures the concentration of N2O in each sample and rates of emission over time (fluxes) are calculated.

At Inverleigh and Horsham in Victoria rainfall was good before crop seeding and during early winter, but late winter and spring were very dry. Growing season rainfall was below 200mm.

WHAT WE FOUND OUT IN 2014

The chart shows the un-trafficked beds did indeed emit much less N_2O than the wheel tracks, and topdressing nitrogen (N) fertiliser caused a spike in emissions, again higher from the wheel tracks.

We also showed that N fertiliser placement and wheel track compaction interact. Permanent tracks are seeded and fertilised at Inverleigh, but not at Horsham, where we found that both the bed *and* the permanent track produced 25% of the emissions from the seeded and fertilised "random" track.



Overall average of our measurements		Loss from a CTF paddock with 15% permanent lanes		Loss from a non-CTF paddock with 50% random wheelings		CTF effect: reduction in emissions and N loss		If N costs $1.50/kg
Wheeling Treatment	Emissions N_2O-N ug/m^2.h	CO_2-e*	Fertiliser N**	CO_2-e	Fertiliser N	CO_2-e	Fertiliser N	CTF Saving
		kg/ha	kg/ha	kg/ha	kg/ha	Emissions	Nitrogen	$/ha
Random	35.3							
Lane	29.4	259.8	16.5	527	33.6	267.5	17.0	25.55
Bed	7.1							

** CO_2-e = CO_2 equivalent. **Research estimates of N loss range from 20 to 40. 30 is used here. More sampling at wet times increases these estimates.*

There are many assumptions in these calculations, and they are 1st year results, but they show what can be achieved

These initial results show that changing a field from 50% wheel trafficked to 15% (CTF) can reduce N_2O emissions from 527 kg/ha CO_2-e (N_2O converted to CO_2 equivalent) to 260 kg/ha. This calculates as a reduction in N fertiliser loss from 34 kg/ha to 17 kg/ha, a cost saving of $26/ha.

The trials are being repeated in 2015 and 2016, at two sites per year in Victoria, two per year in Queensland and one per year in Western Australia.

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