MASSEY UNIVERSITY
TE KUNENGA KI PŪREHUROA
UNIVERSITY OF NEW ZEALAND

Whenua Haumanu
Nurturing the land through exploring pastoral farming

Ministry for Primary Industries
Manatū Ahu Matua

Whenua Haumanu soil heath measures

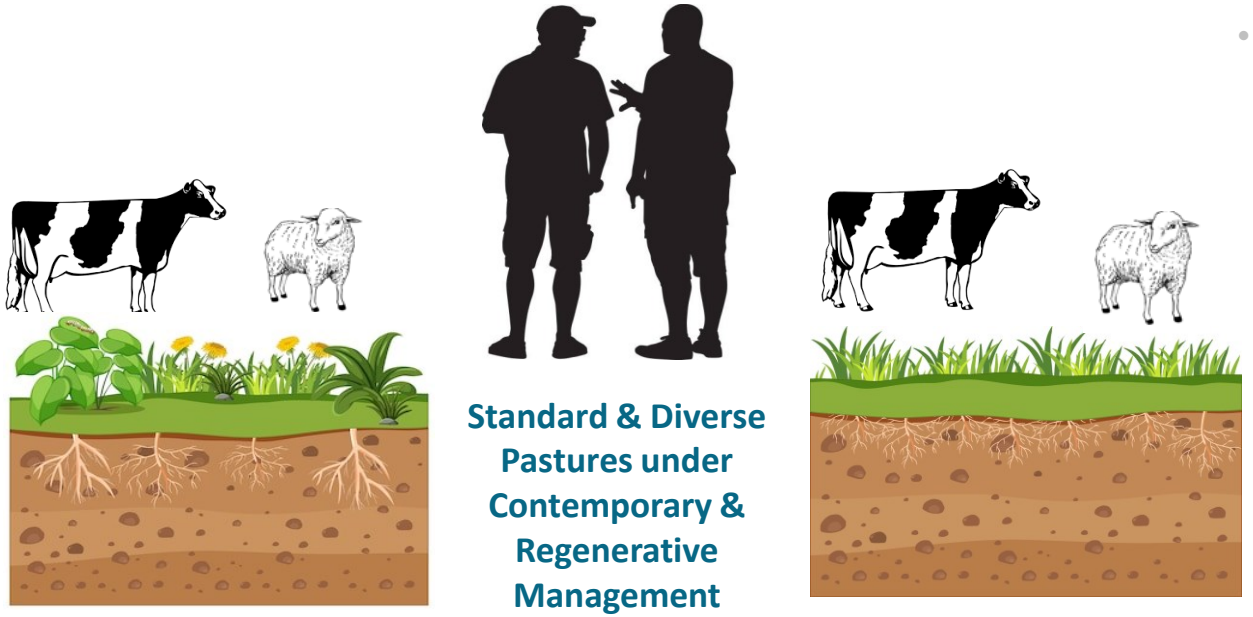
Lucy Burkitt
Maria Minor
Paramsothy Jeyakumar
Callum Rees
Many dedicated Masters and PhD students

Comprehensive research measures: below, on and above the ground

Engagement & Extension
- Farmers, Industry, Iwi & Scientists
- Demonstration farmlet/s
- Science/Industry presentation/publications

Dairy & Sheep Health & Welfare
- Reproduction
- Health & welfare
- Rumen microbiome

Dairy & Sheep Production
- Live weight & BCS
- Milk, Liveweight & Wool production
- N cycling & GHG emissions



Standard & Diverse Pastures under Contemporary & Regenerative Management

Pasture quality & health
- Seasonal quality
- Seasonal composition
- NIR, FITR, NVDI
- Root measurements

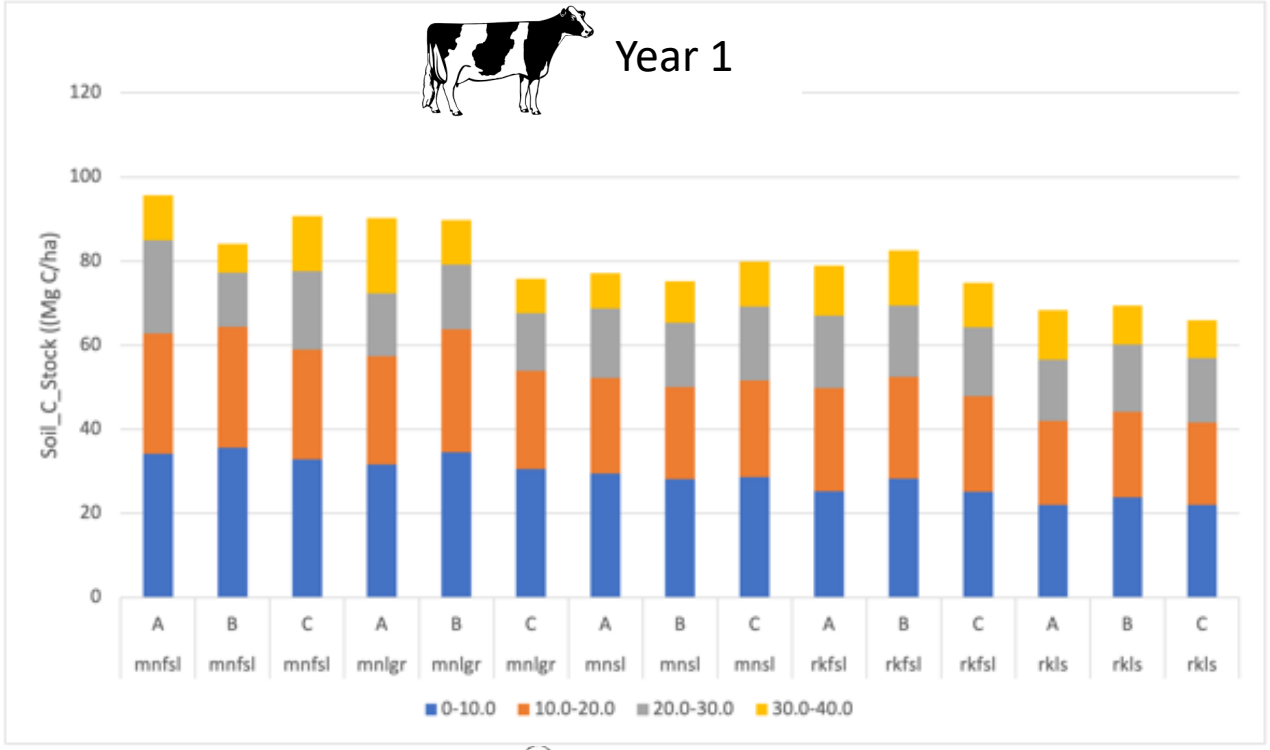
Pasture Production
- Grazing residuals/rotations
- Mass/yields
- Growth rates
- Weeds/pests

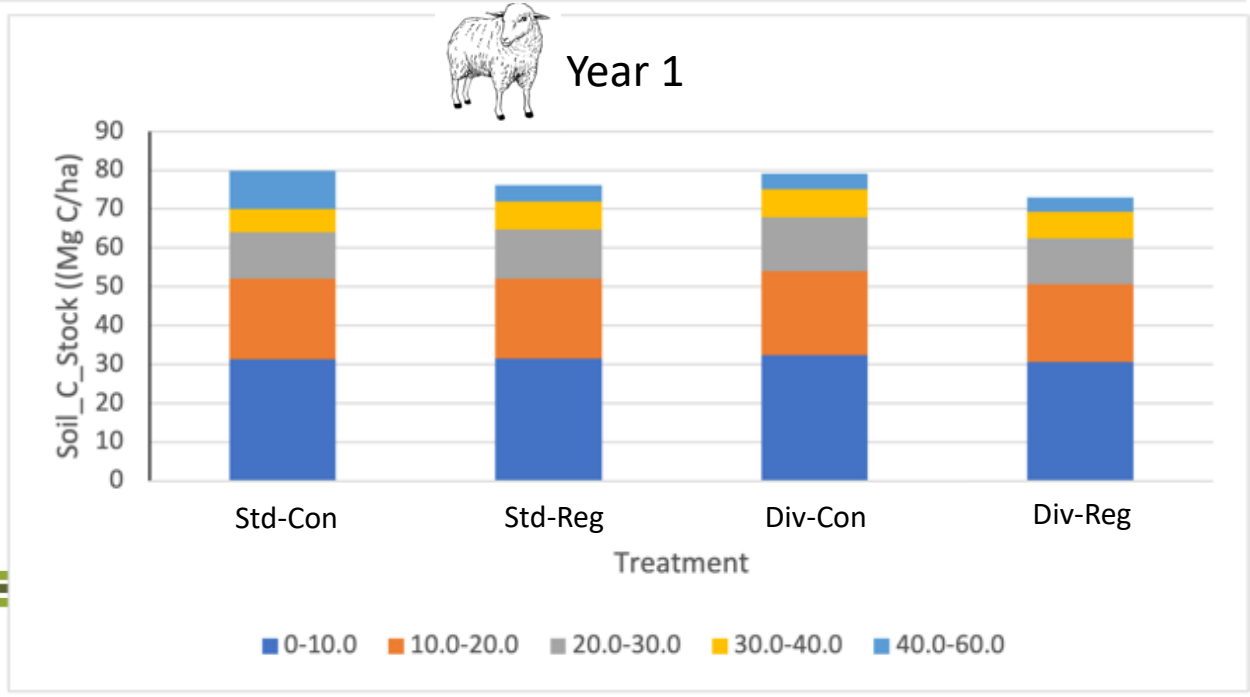
Soil carbon, fertility & biology
- Soil Carbon
- Soil fertility
- Active microbiology
- Microbial DNA
- Microarthropods/mesofauna/earthworms
- Visual soil assessment

Climate & Environment
- Weather/Soil moisture
- Nutrient Leaching
- Nitrous oxide emissions

Soil physical
- Bulk density
- Penetrability/compaction
- Aggregate stability
- Porosity
- Infiltration rates

Soil carbon (years 1, 4 and 7)



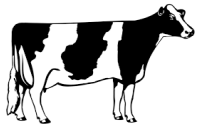


Soil fertility (every year, every paddock)

Soil tests
pH (water)
Olsen phosphorus
Potassium
Calcium
Magnesium
Sodium
Sulphur
Potentially available nitrogen
Anaerobically Mineralisable nitrogen
Labile carbon (hot water extractable)
Total nitrogen
Total phosphorus

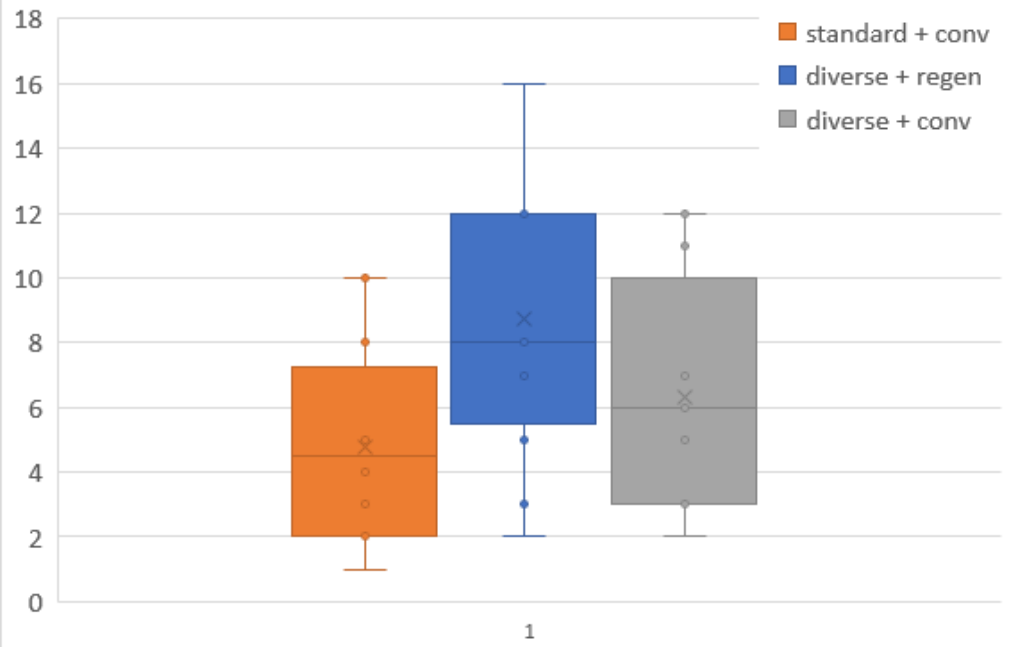
Soil biology

Earthworms – 2023



- The most abundant earthworm species (*A. caliginosa*) was significantly more abundant under treatment B (diverse pasture and regenerative management)

Dairy farmlet – *A. caliginosa* abundance, p<0.05

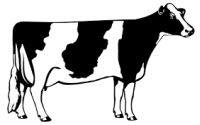


Earthworms – 2024

- No difference between treatments

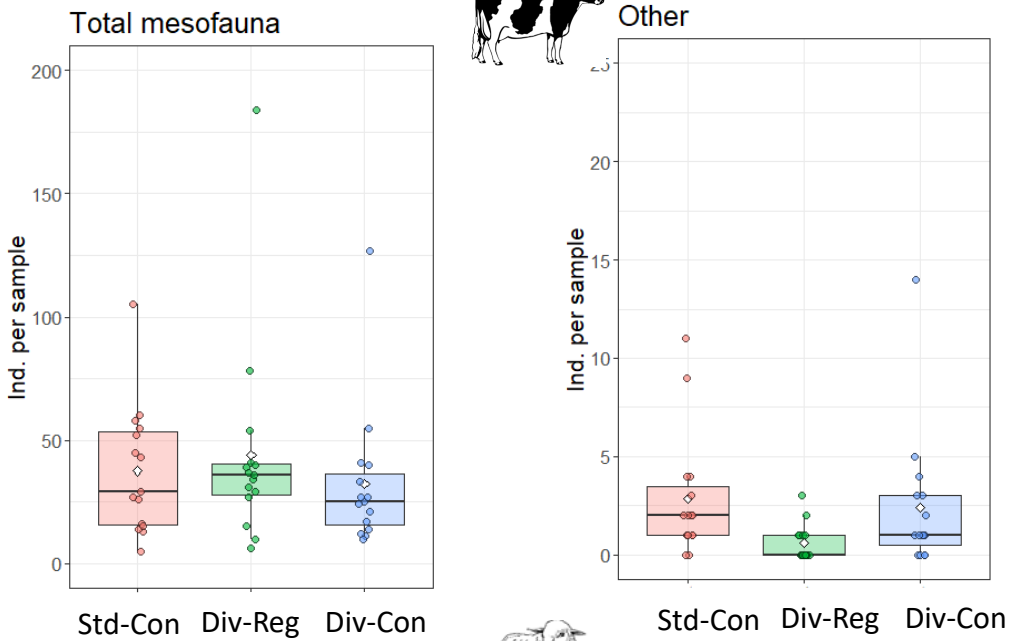
Mesofauna – 2023

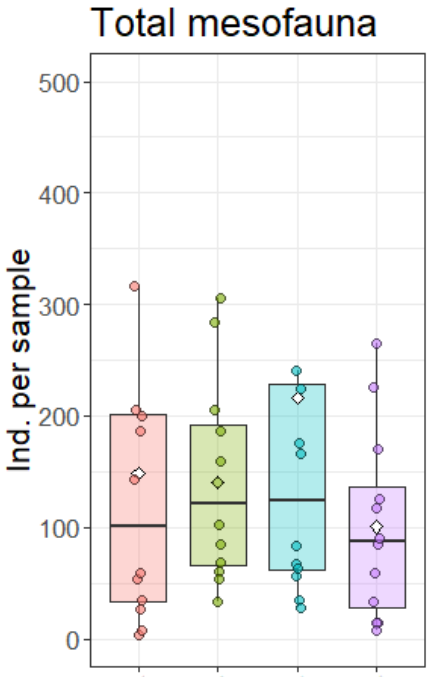
- Total mesofauna abundance was higher under sheep farmlet

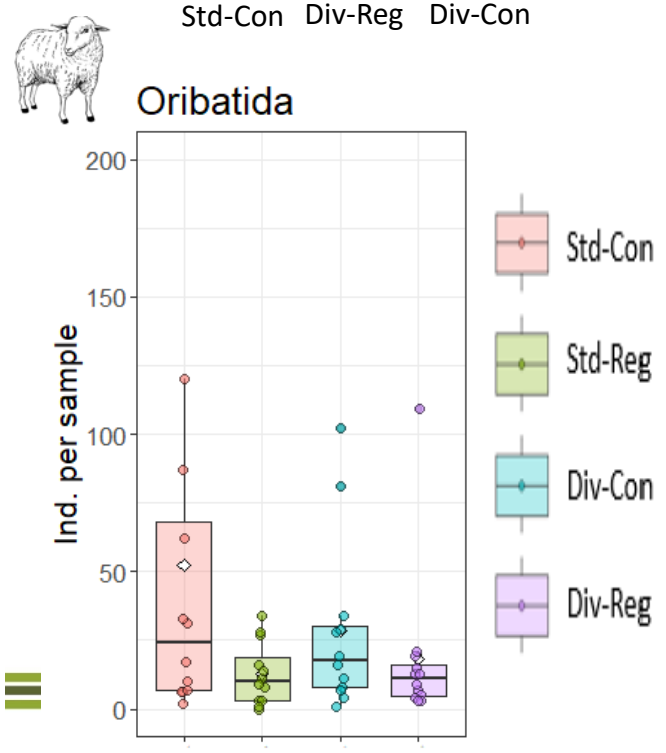


- No effect of soil type or treatment on total mesofauna abundance
- Other mesofauna (mites, potworms etc) were significantly lower under treatment B (diverse pasture and regenerative management)

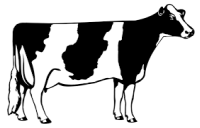
- No effect of treatment on total mesofauna abundance
- Oribatida mites (microbivores and detritivores) were significantly higher under treatment A (standard pasture and contemporary management)





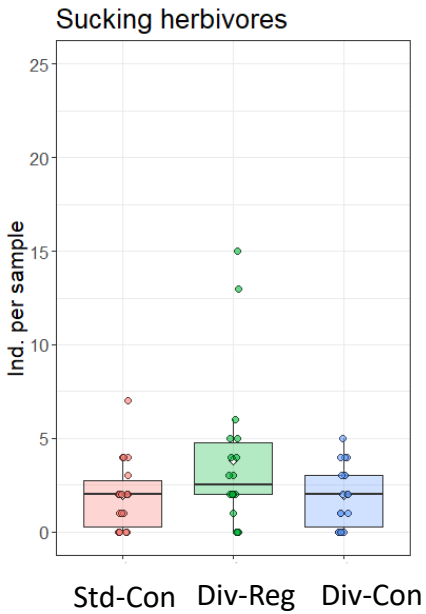


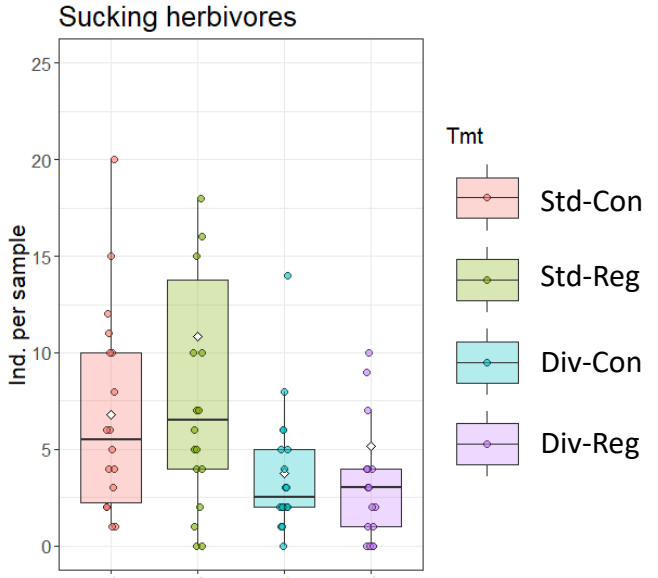
Ground arthropods – 2023



- No effect of treatment on ground arthropods

- The number of sucking herbivores (aphids, thrips and mealybugs) were higher under standard pasture (ryegrass/white clover)
- No effect of treatment on other predators or diptera (flies, mosquitoes, midges).

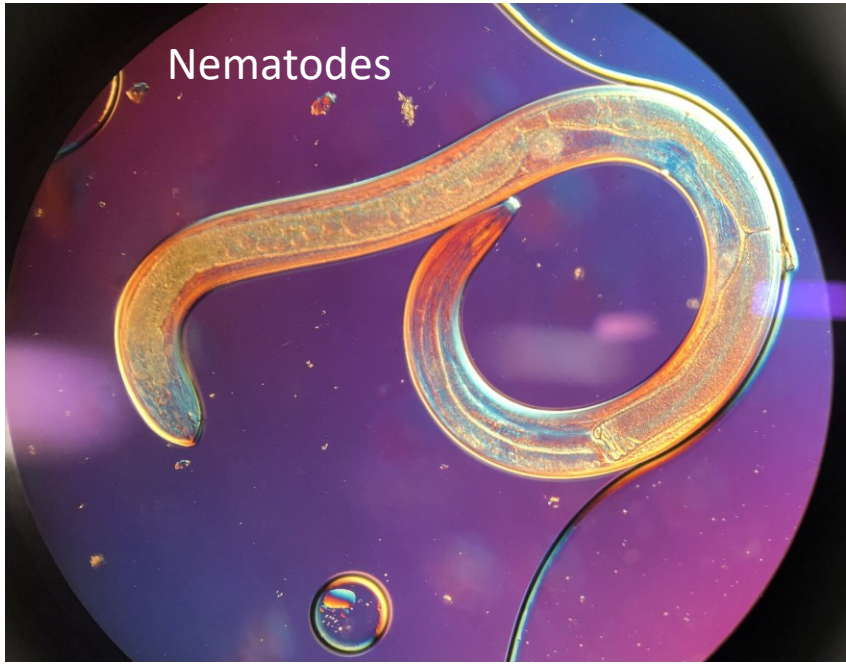




Soil biology

2023 (sheep) - no difference in diversity

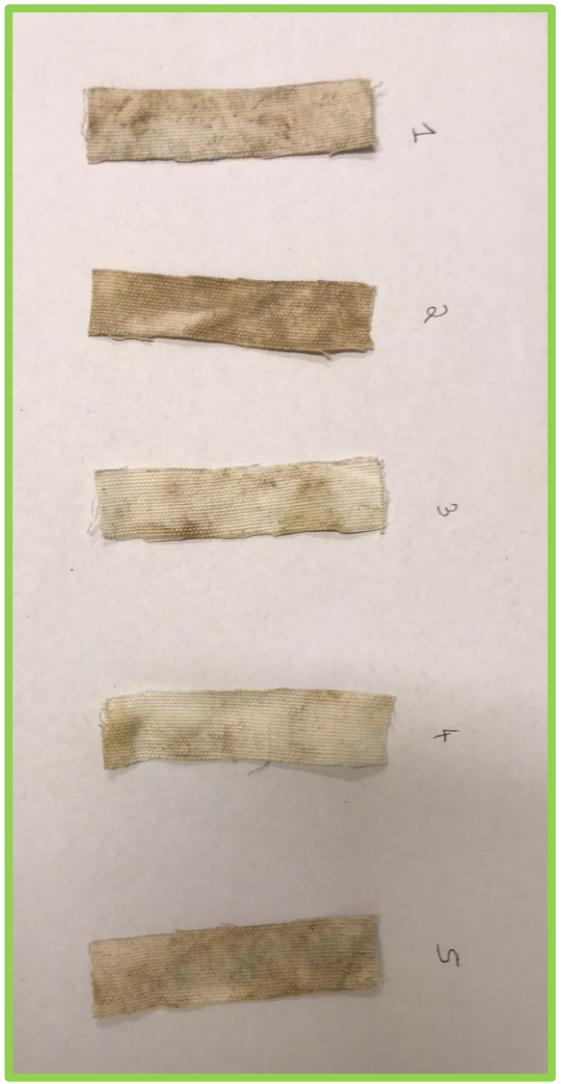
No results yet



No results yet

Soil biology

Paddock 54A

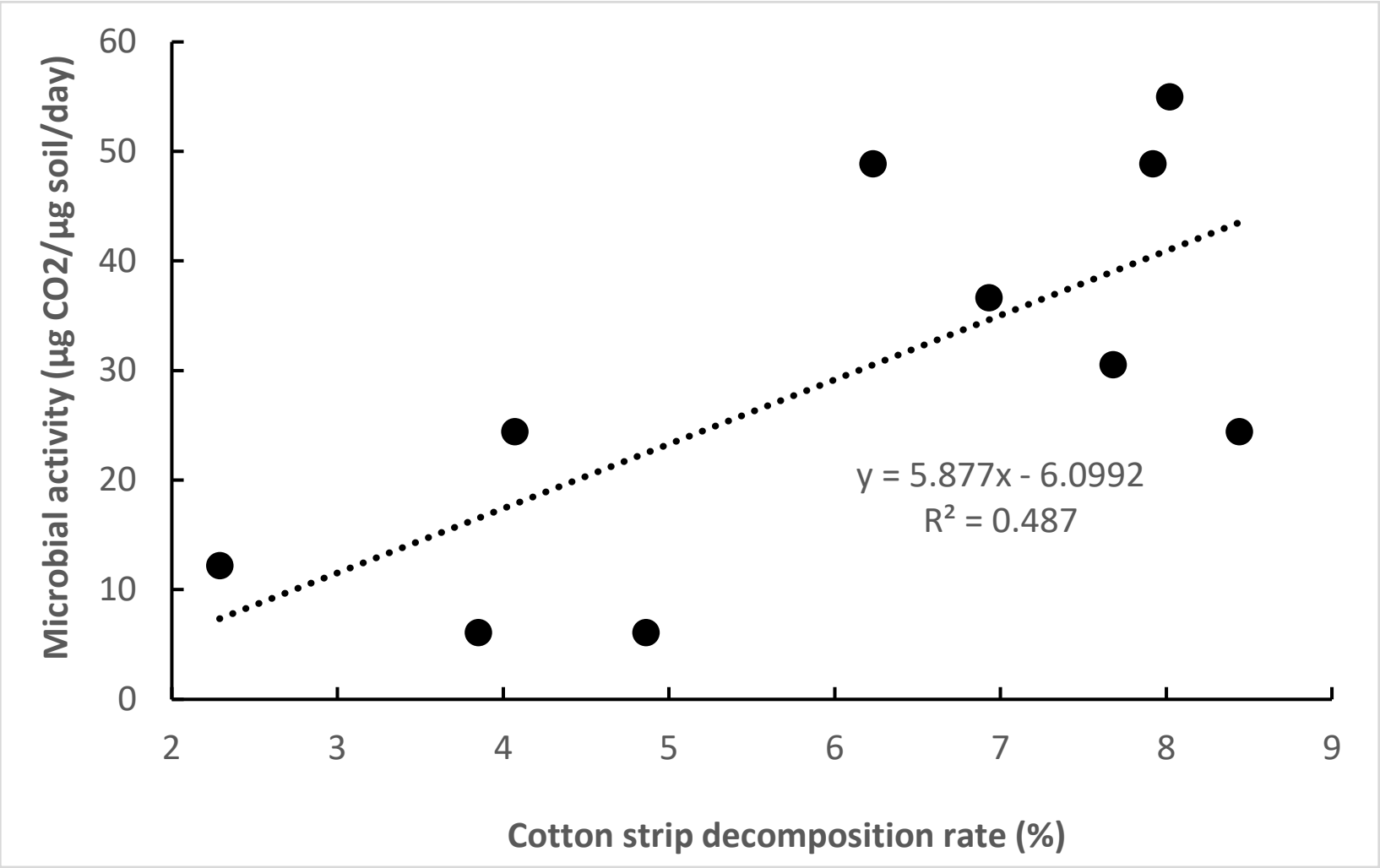


15 Days after burial

29 Days after burial

50 Days after burial

Comparing cotton strips to lab measures of microbial activity



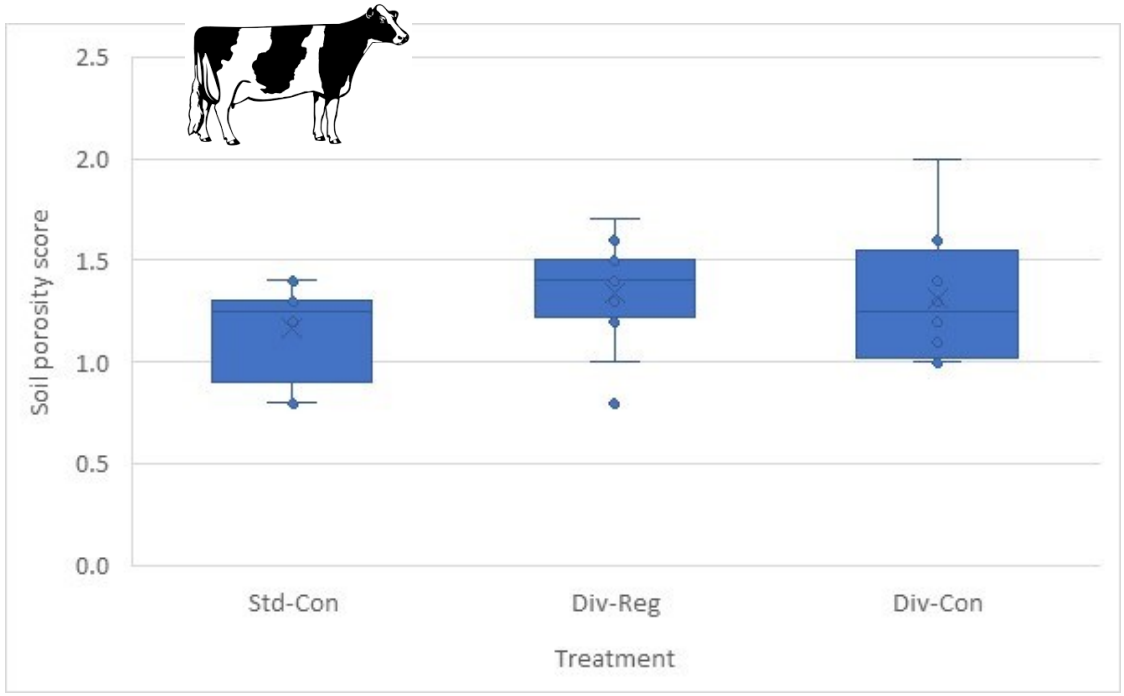
- More data are needed to be confident in this relationship

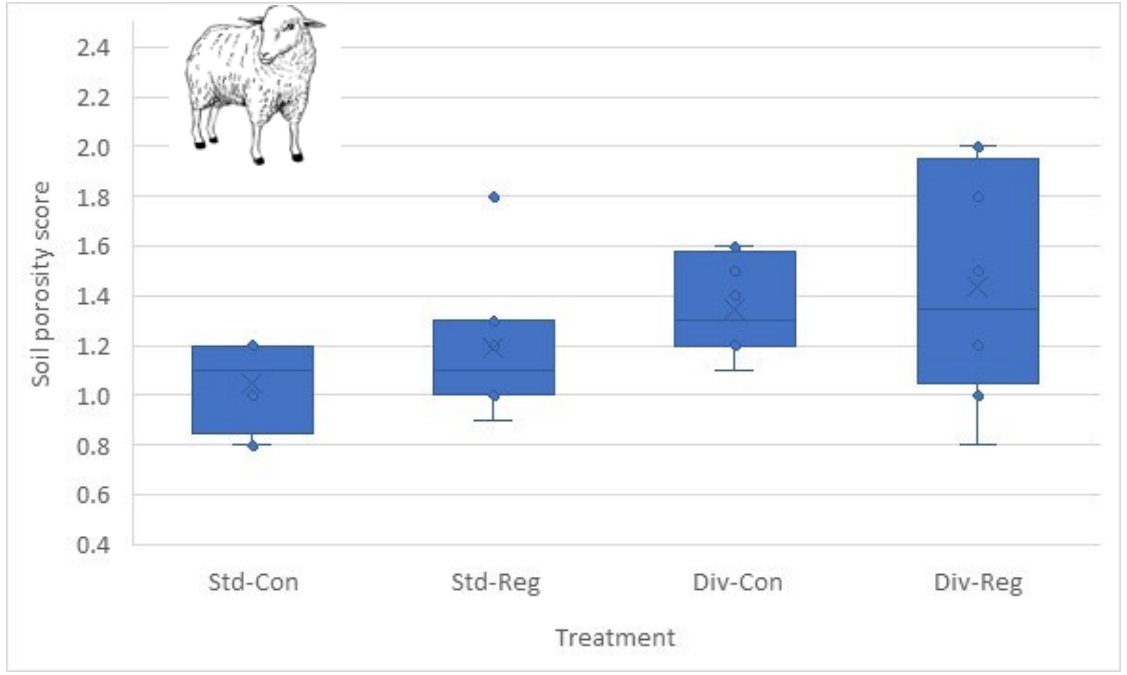
Soil physics

Soil visual assessment

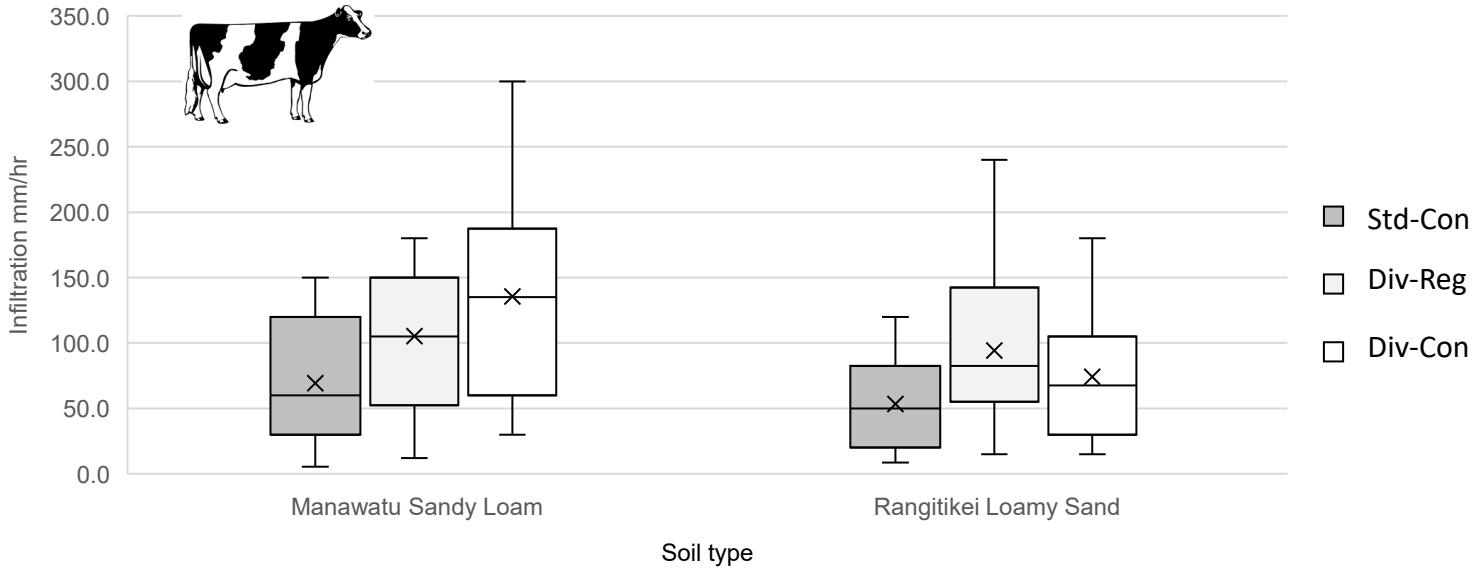
Soil visual soil assessment

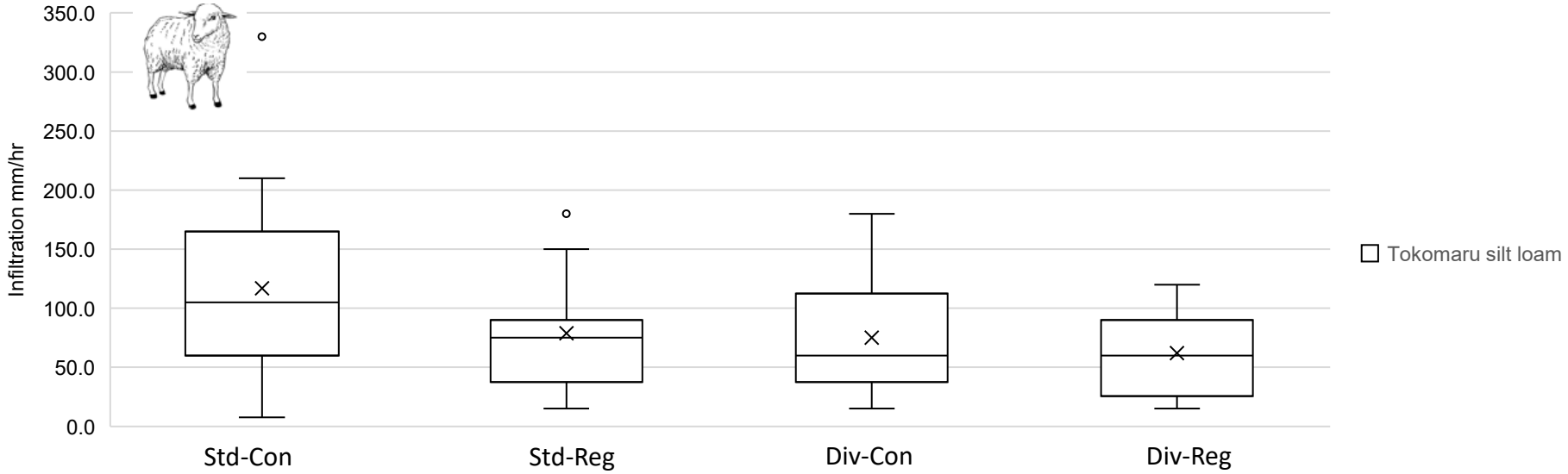
2024



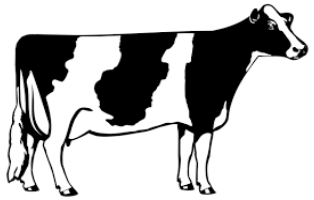


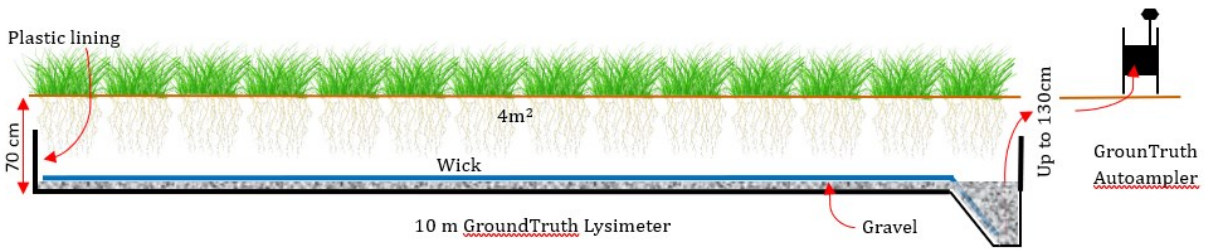
Soil physics – infiltration capacity



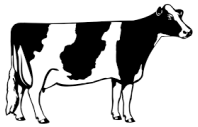


Nitrate leaching





Nitrate leaching

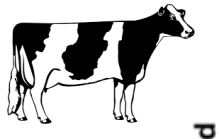


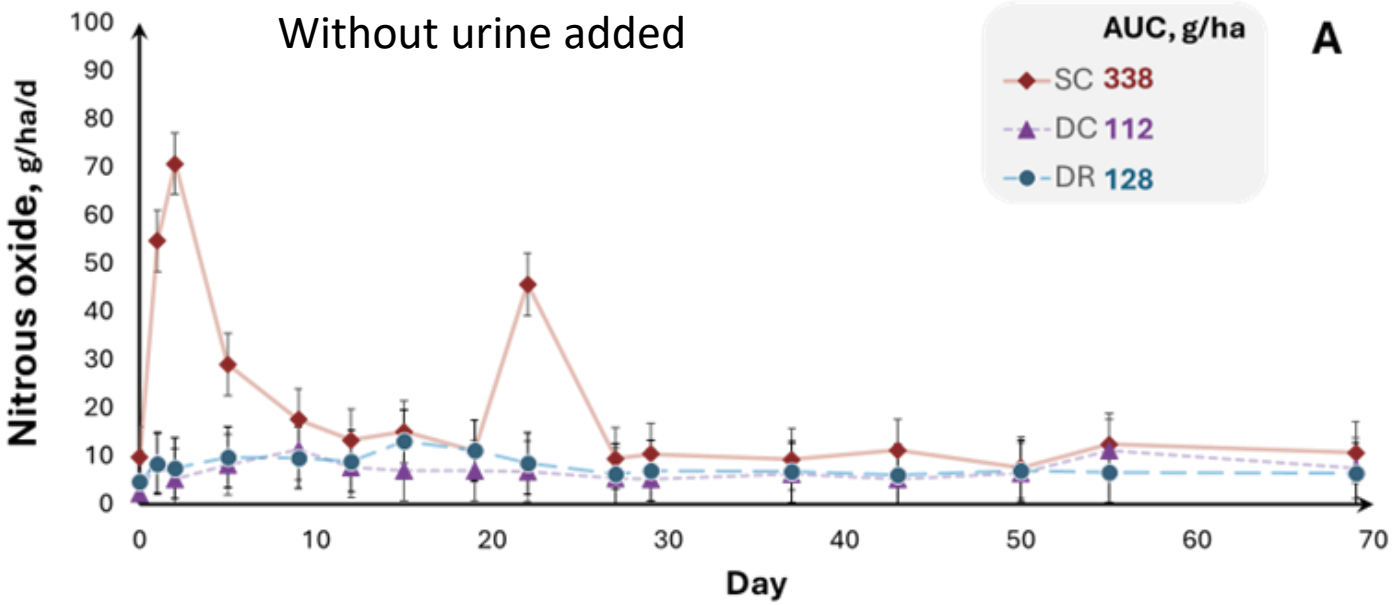
Treatment	Nitrate-N leaching loss (kg/ha/yr)	
	2023	2024
Std -Con	13.67[b]	24.11[b]
Div - Reg	3.3[b]	5.42[c]

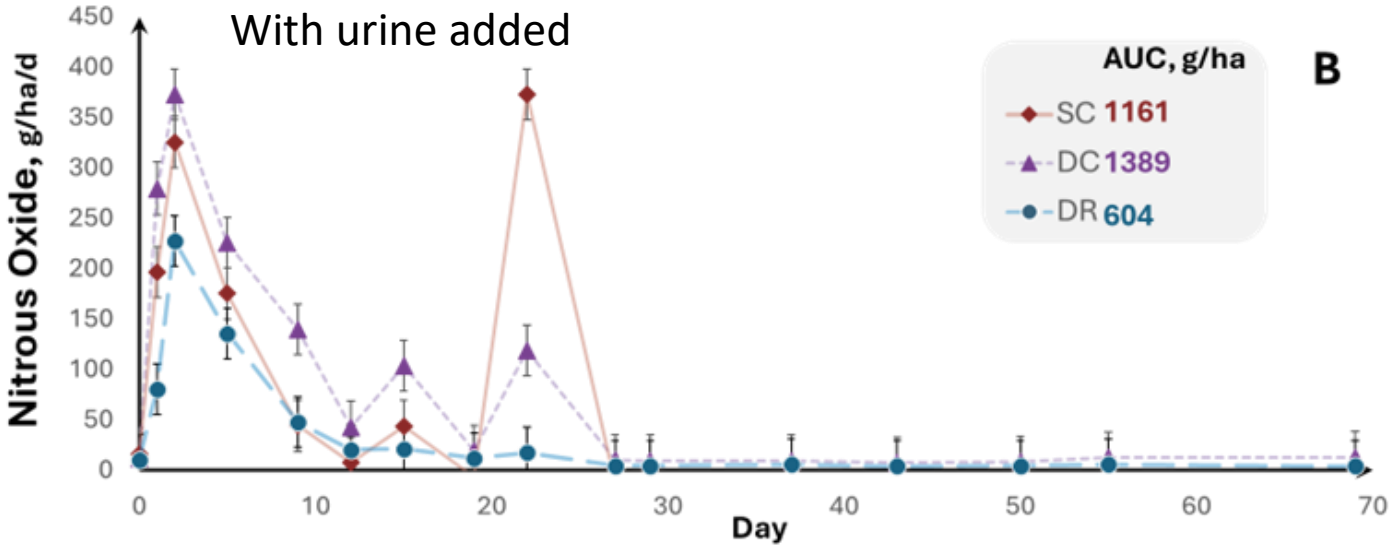
Nitrate leaching

Treatment	Nitrate-N leaching loss (kg/ha/yr)
	2023
Standard	1.04[a]
Diverse	0.73[b]

Nitrous oxide emissions 2023







Nitrous oxide emissions under standard pastures and contemporary management were at least 65% higher than diverse pastures, regardless of management

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