The effect of different stocking densities and cattle urine on soil nitrous oxide emissions and compaction on a temperate pasture

Katerina Dauksta

Laura Cardenas, Alejandro Romero-Ruiz, Fotis Sgouridis,
Jane Memmott and Daniel Enriquez-Hidalgo

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EGU General Assembly 2025

Abstract QR:

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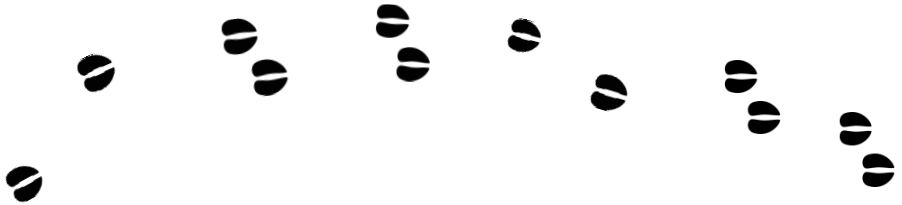
Context



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Above = Thomas Woolworth
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- Extensive (and degraded) European pasturelands

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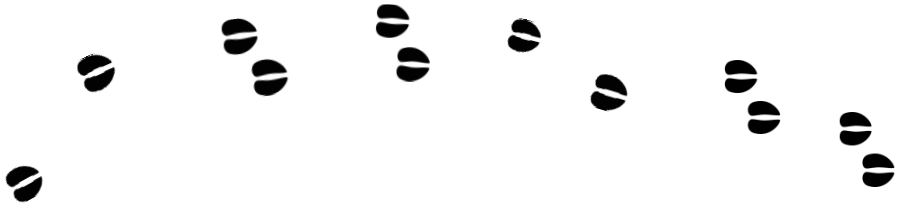

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- Extensive (and degraded) European pasturelands
- Requirement to reduce overall emissions from livestock sector

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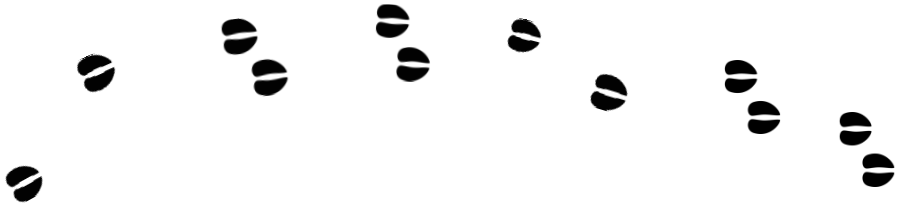

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So ….what can livestock farmers do?

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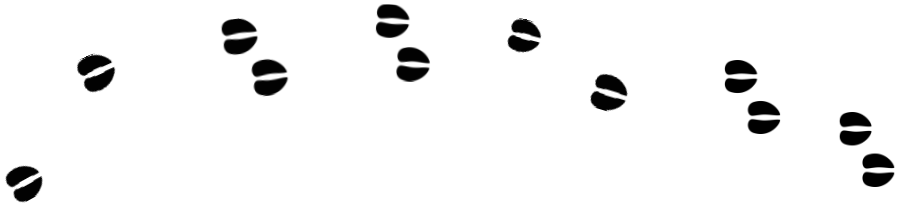

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Number of animals/area/time-period

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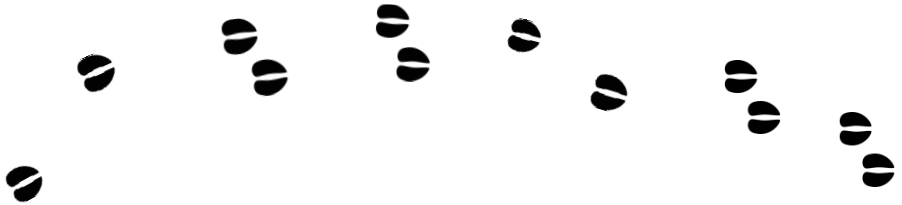

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How does compaction from animal treading vary under different stocking densities, and how does this effect soil N_2O emissions when treated with/without urine?

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Methods

STUDY DESIGN:

- complete block design
- repeated measures (12-weeks)
- 1 grazing event
- split plots: urine/no urine

Sampling plots and static chambers

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Control = no cows

Low = 10 cows/ha/day

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Heifers grazing the plots

Mean weight: ~**500kg**

Minimum static pressure per hoof: ~**130 kPa**

Urine N application rate = **36.3 kg N/ha**

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DATA COLLECTION:

- **soil greenhouse gas emissions**
- **penetrometer resistance**
- soil nutrients (TN, DOC, NH_4, NO_3, NO_2)
- soil moisture
- soil pH
- plant nitrogen
- plate meter readings
- meteorological data

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Results: Compaction (0-10cm)

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Urine Treatment
— urine
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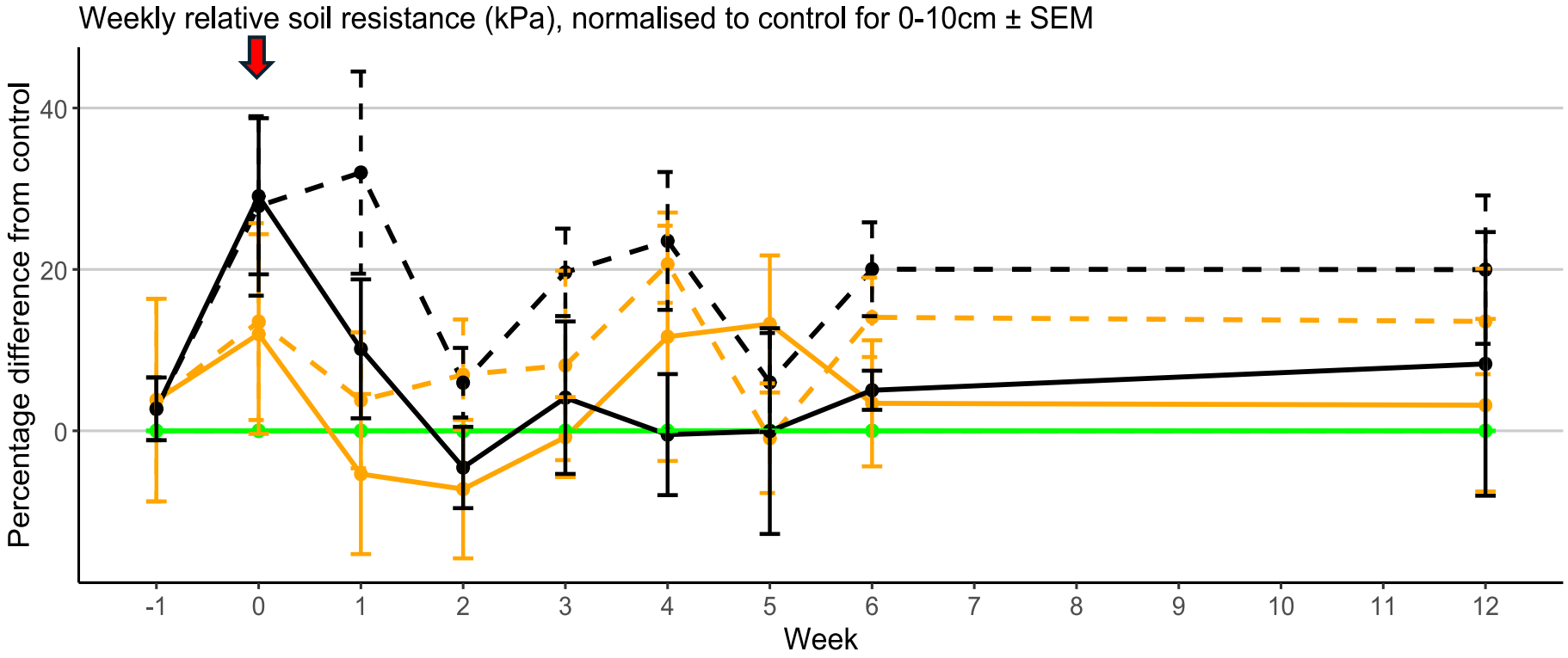
Heifers grazing our plots, July 2024



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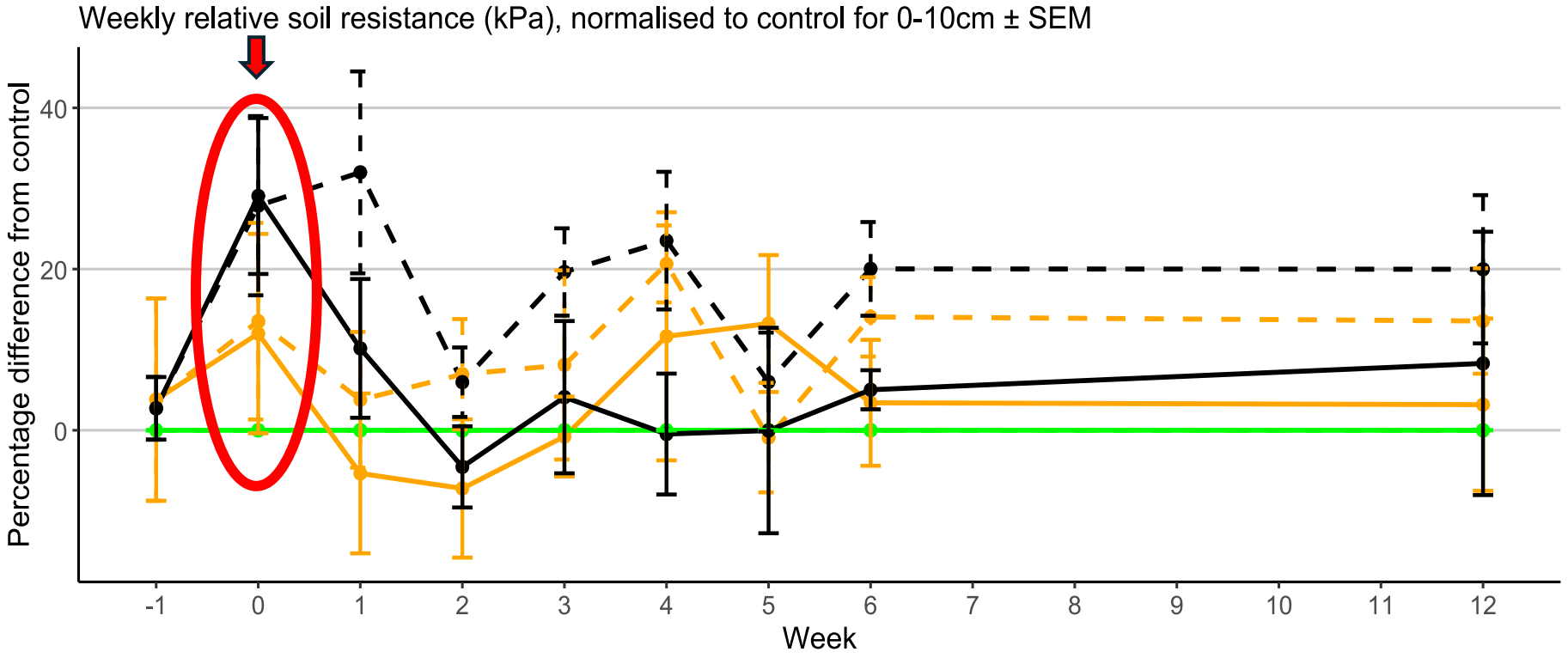

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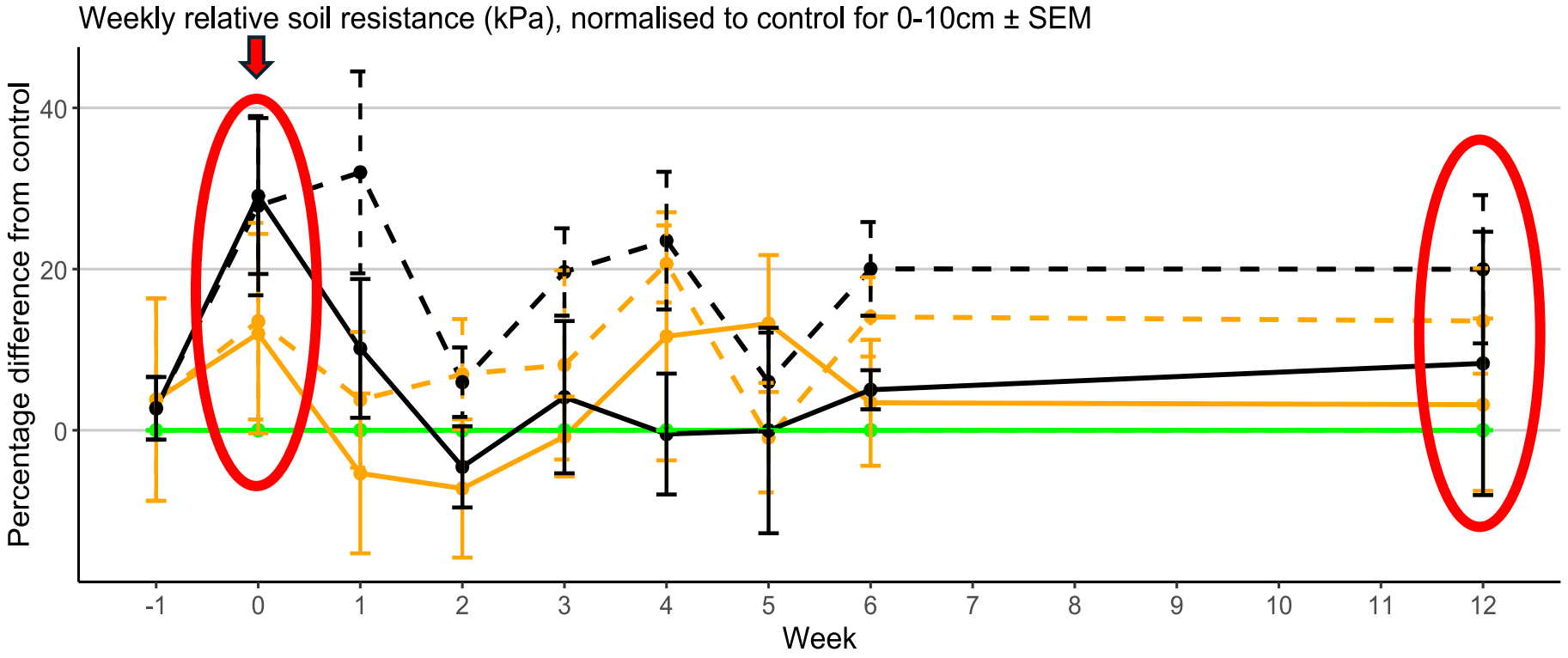

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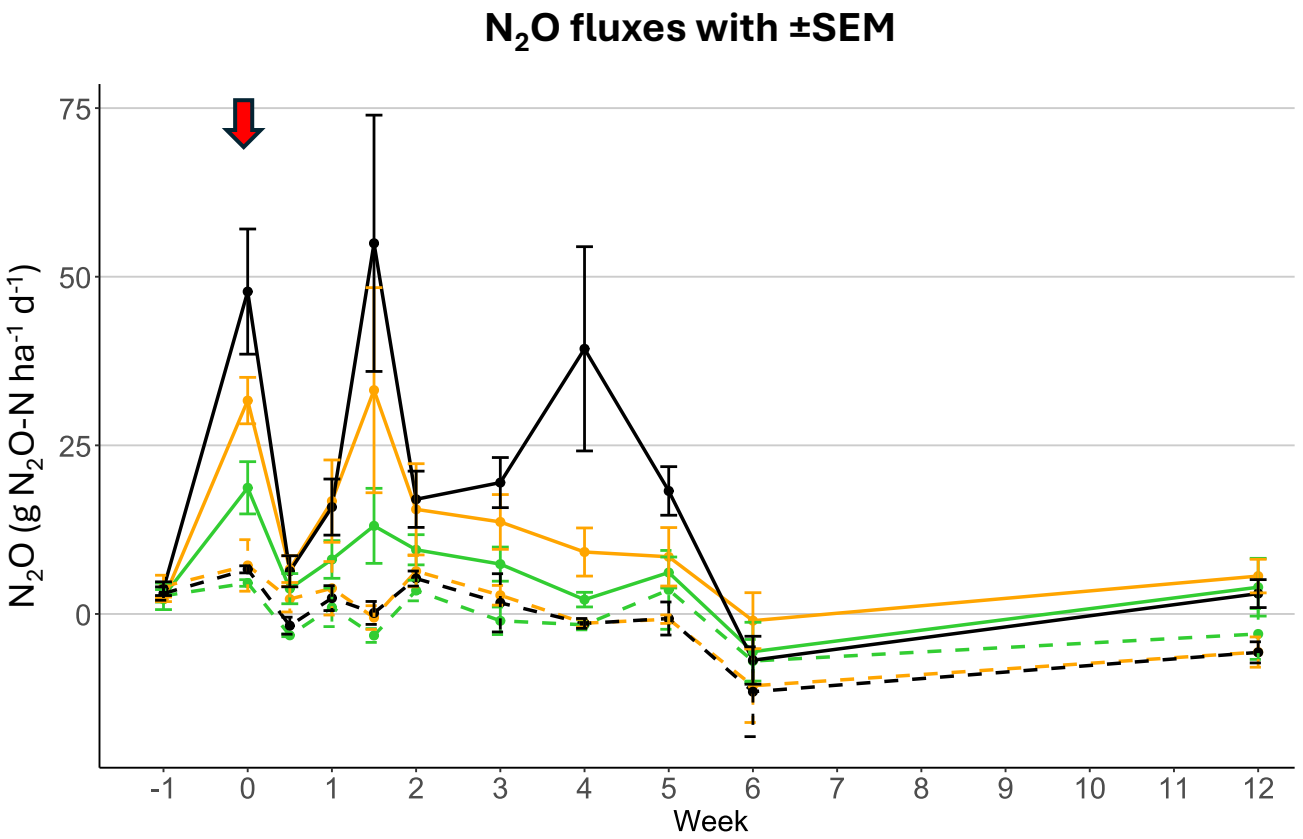

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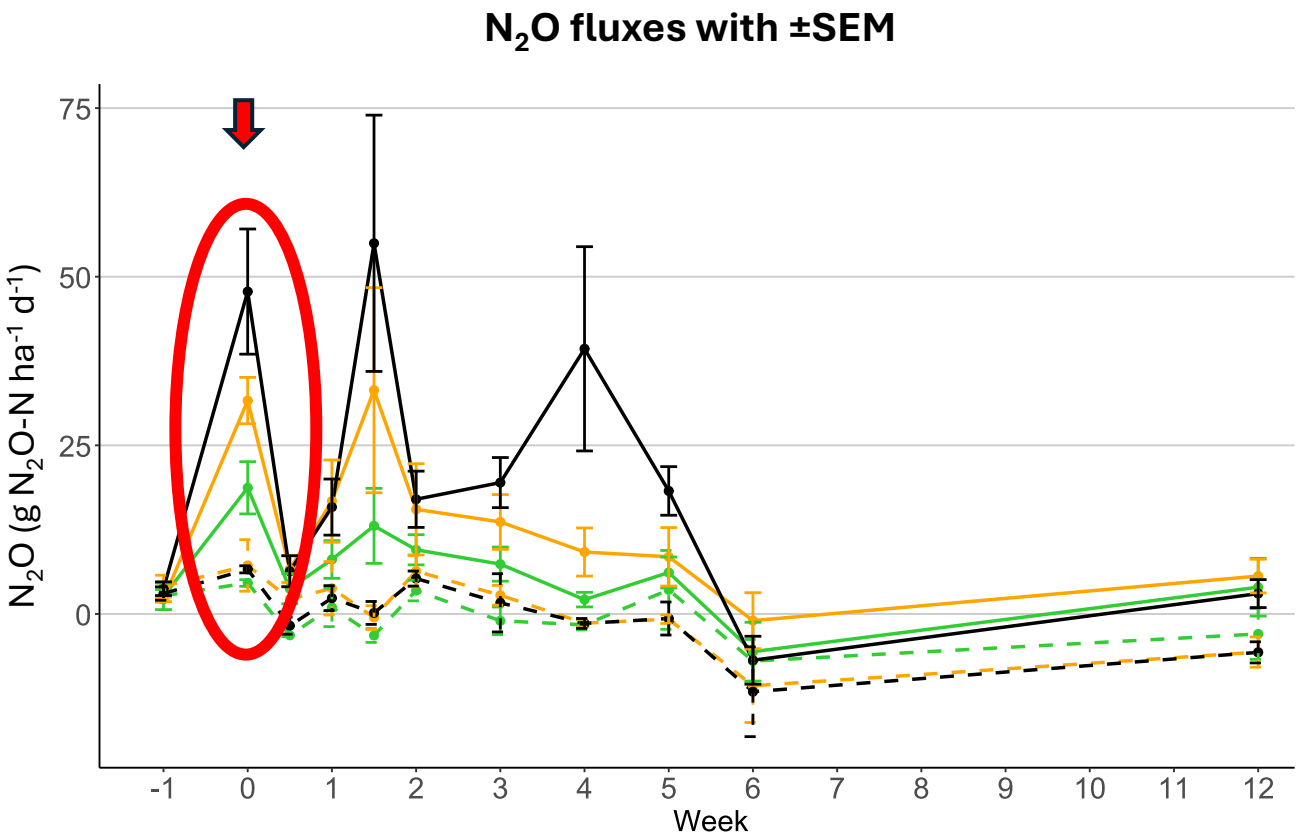

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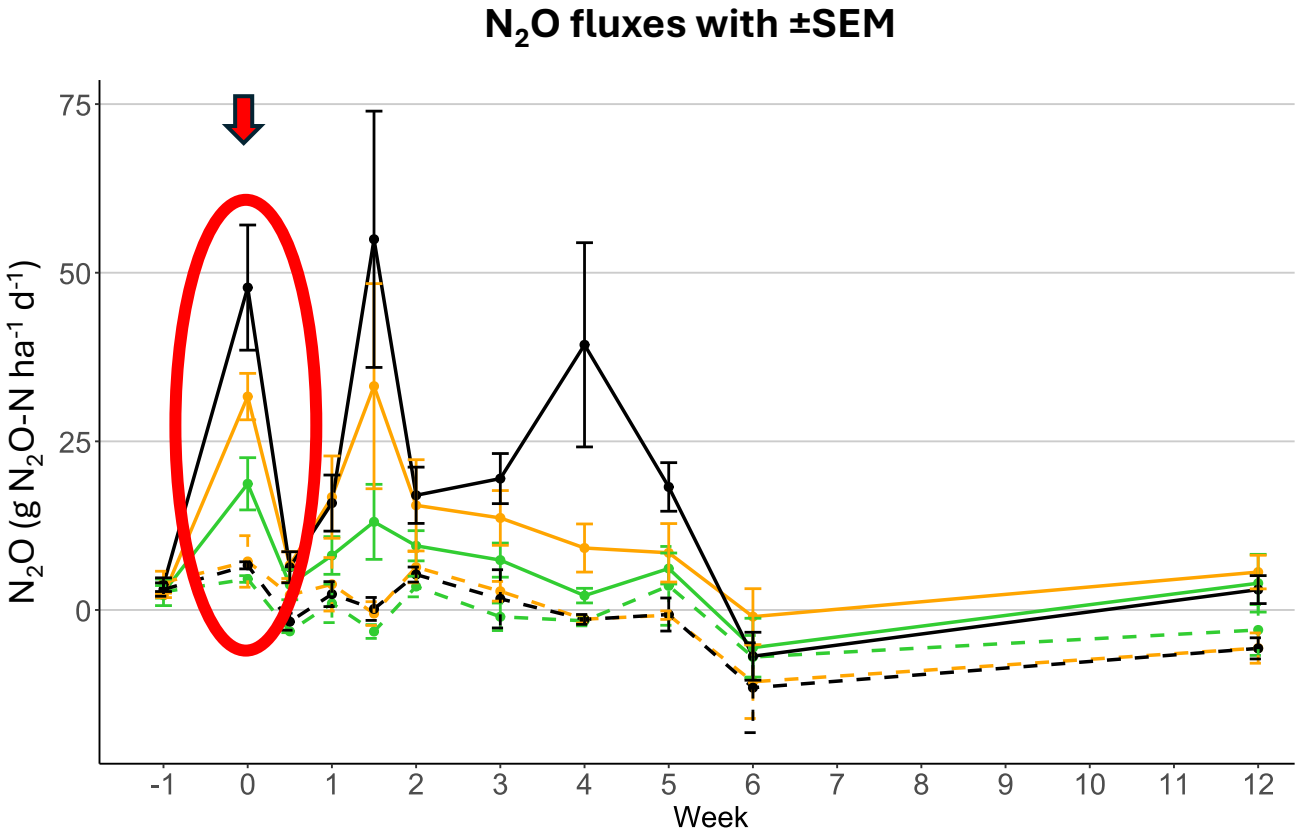

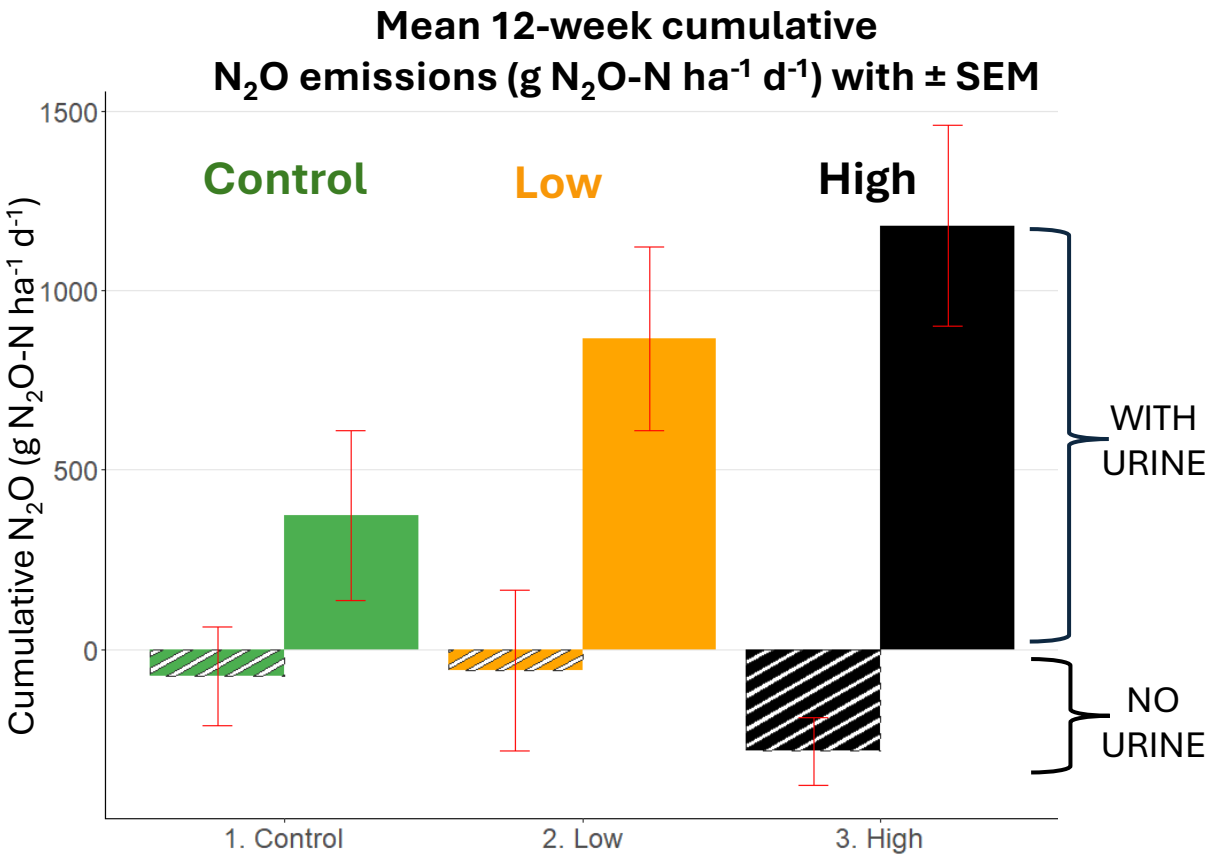

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Concluding remarks

Presenter's own photo

Conclusions:

- Highest compaction under high SD
- Highest soil N_2O emissions under high SD with urine
- The data will used in an agroecological compaction focused model to assess recovery over time and associated N_2O emissions

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Limitations:

- This was a controlled experiment, future work will consider the full grazing season

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Acknowledgements

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