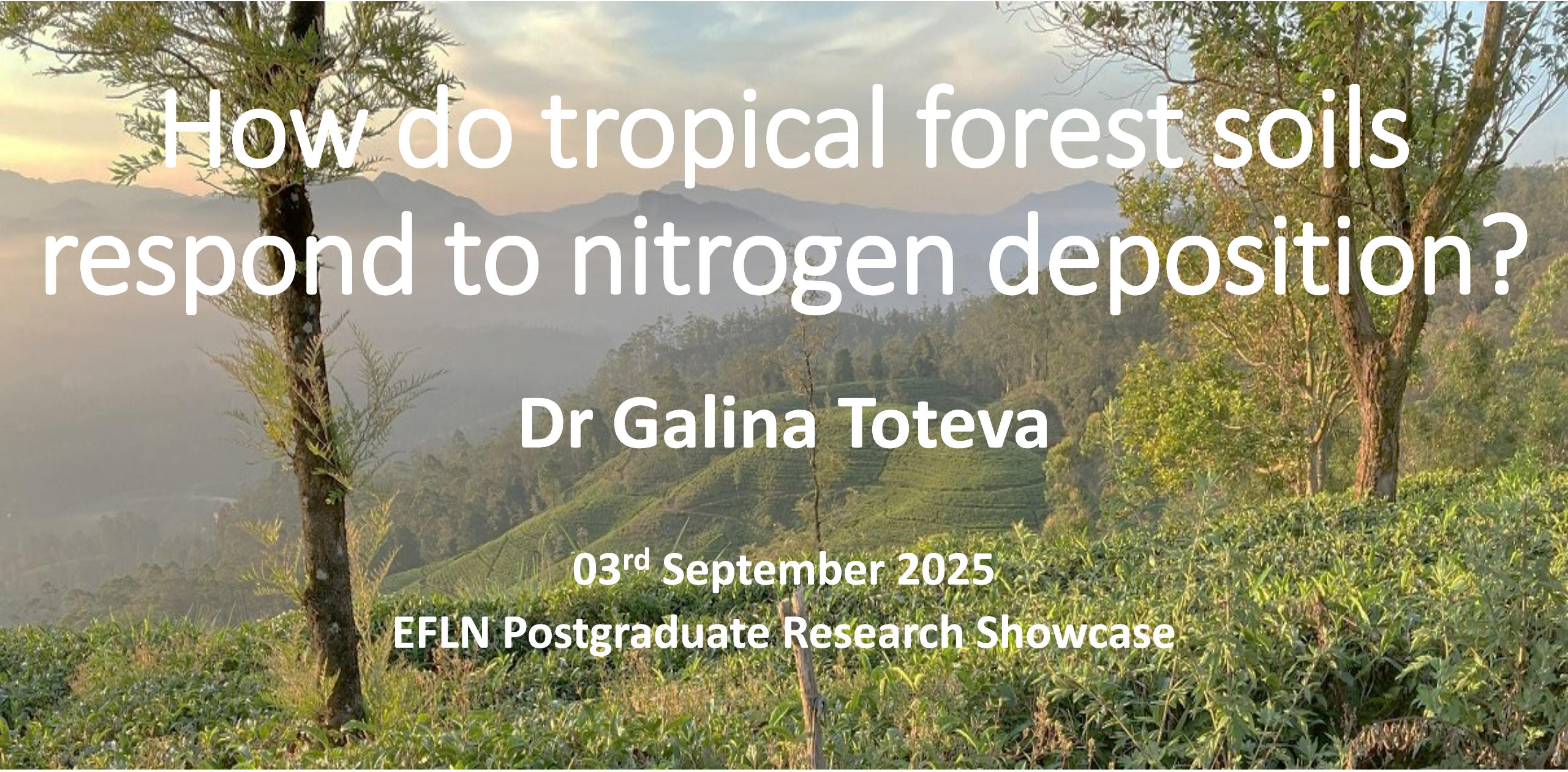

How do tropical forest soils respond to nitrogen deposition?

Dr Galina Toteva

03rd September 2025

EFLN Postgraduate Research Showcase

UK Centre for Ecology & Hydrology

THE UNIVERSITY of EDINBURGH School of GeoSciences

UKRI GCRF South Asian Nitrogen Hub

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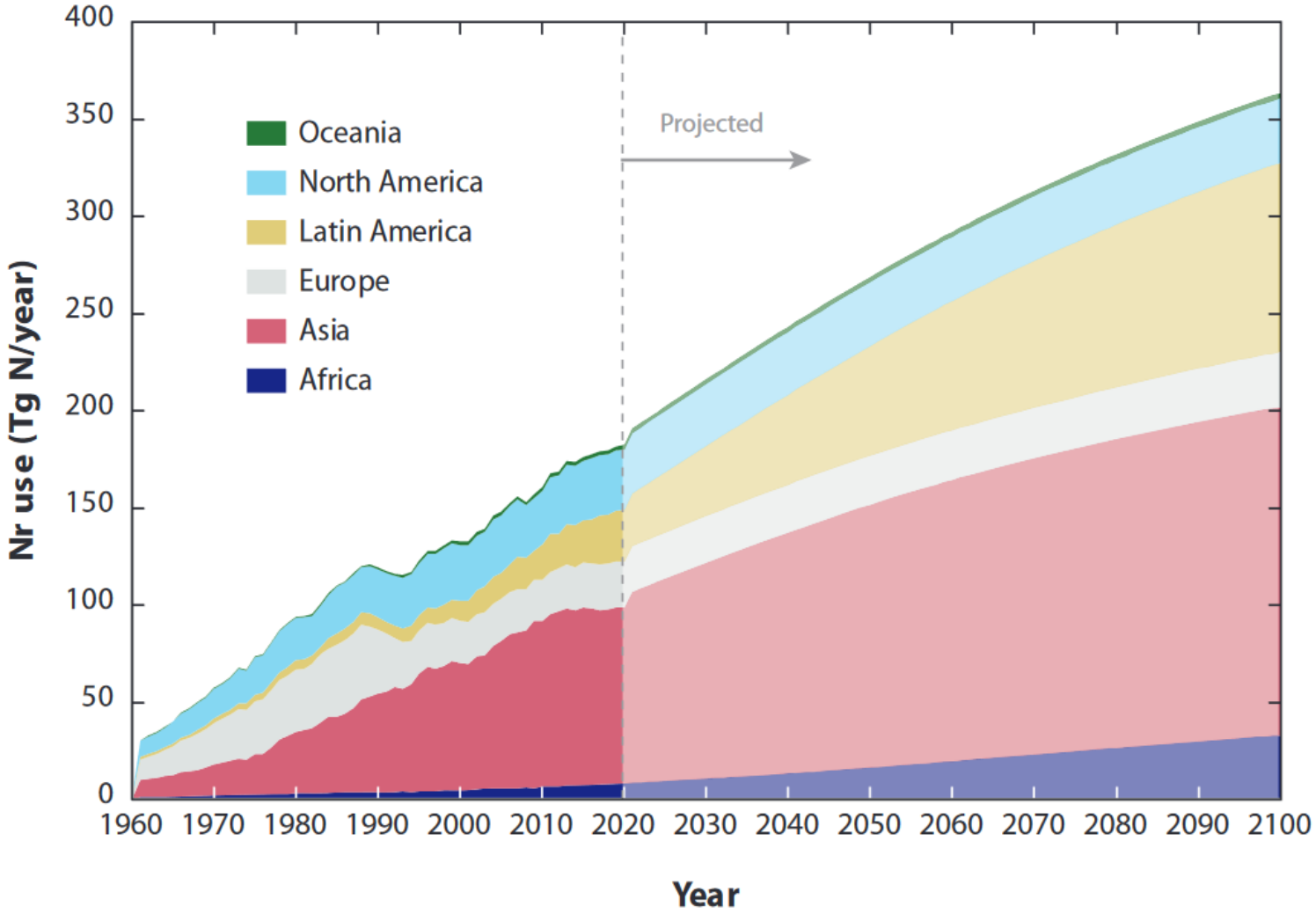
பேராதனைப் பல்கலைக்கழகம்
UNIVERSITY OF PERADENIYA

Background

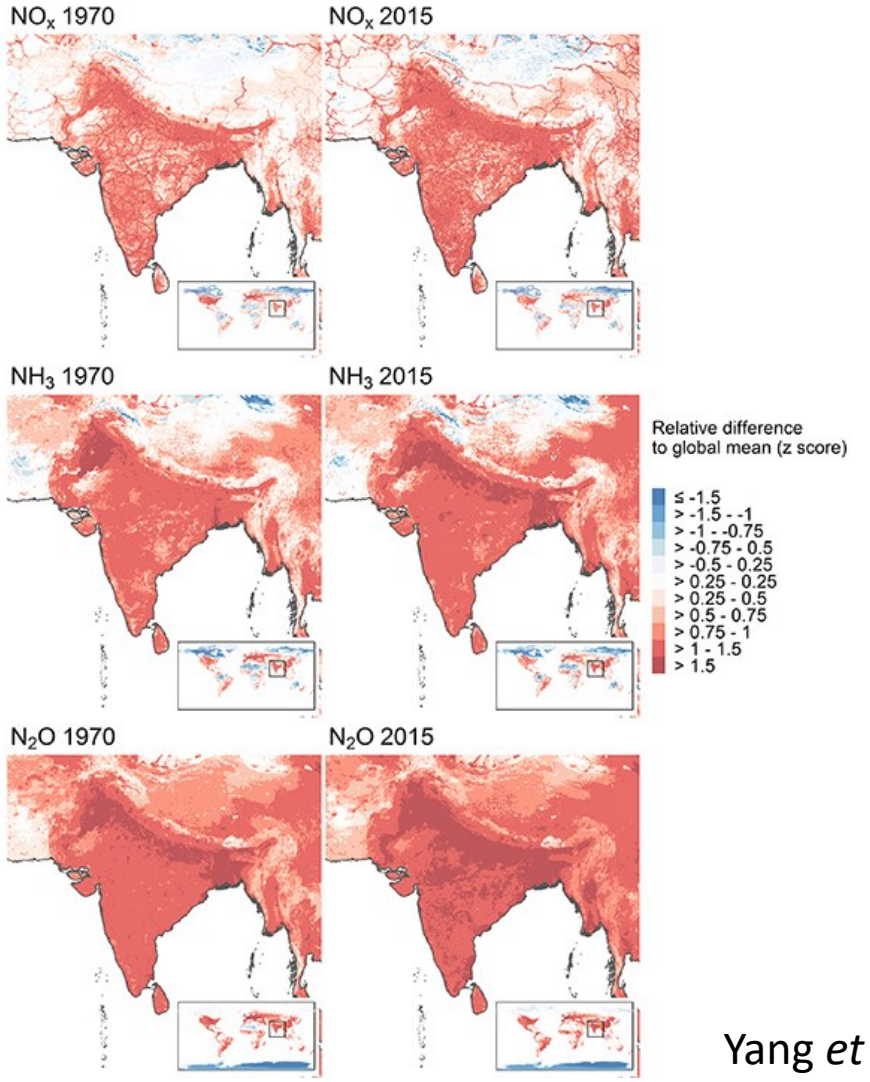


Galloway *et al.* (2021)

Background

Nitrogen pollution in South Asia

Limited greenhouse gas data



Yang *et al.* (2022)

UKRI GCRF South Asian Nitrogen Hub

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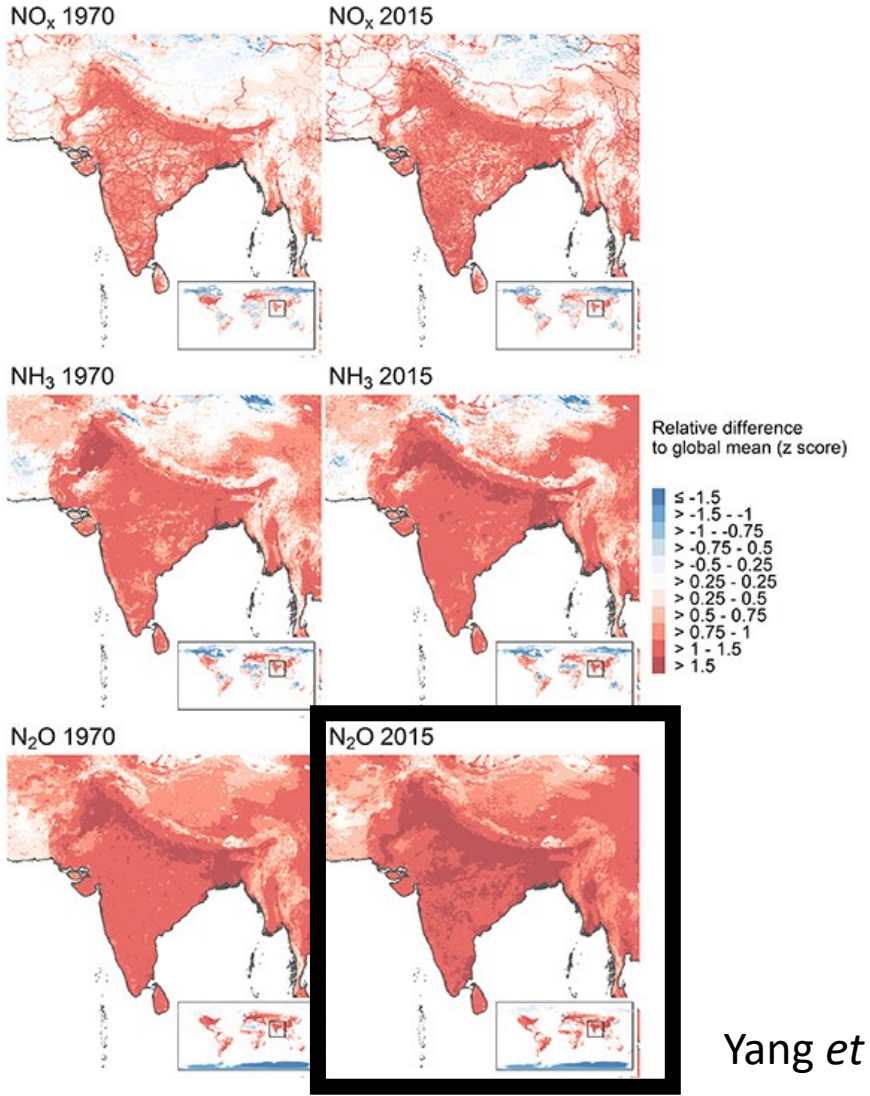


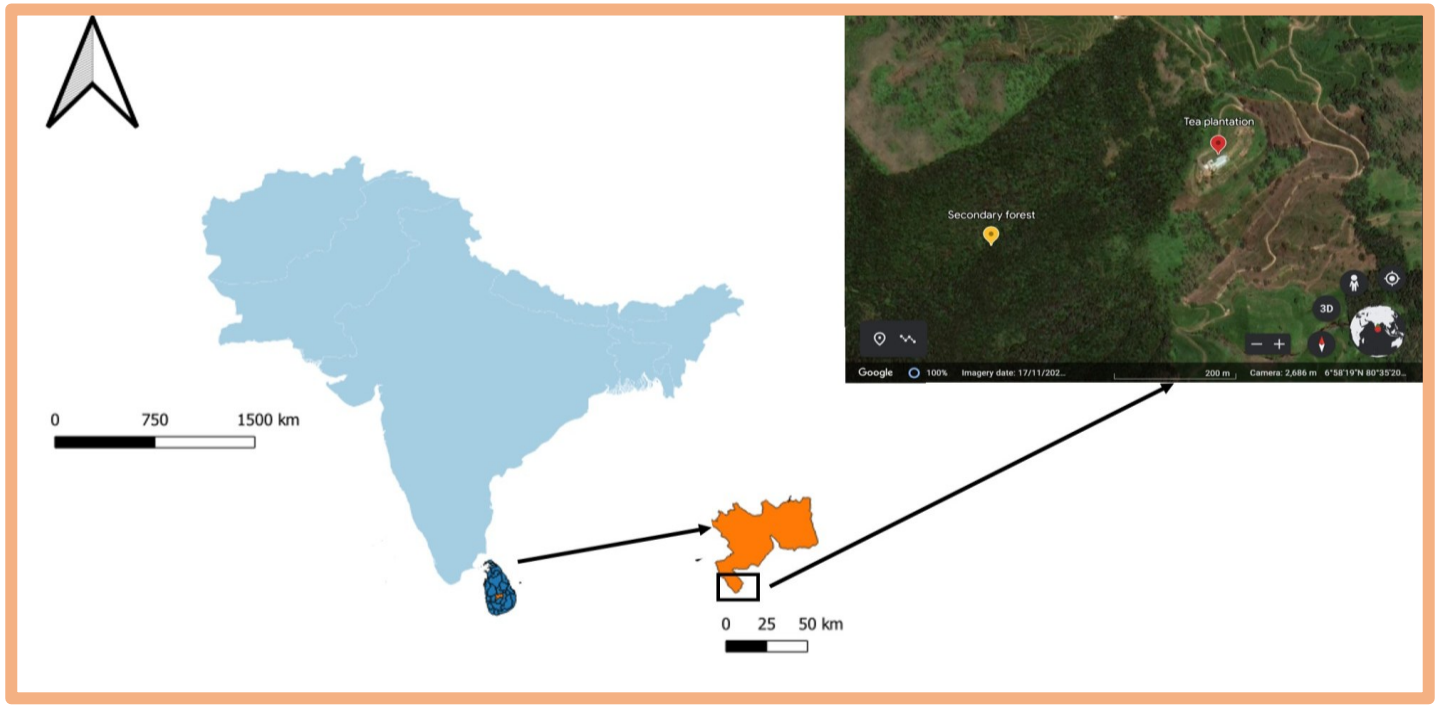
Yang *et al.* (2022)

UKRI GCRF South Asian Nitrogen Hub

Research Questions

1. How does enhanced N deposition affect N_2O emissions from tropical soils in Sri Lanka?

2. How does the response differ between land uses?



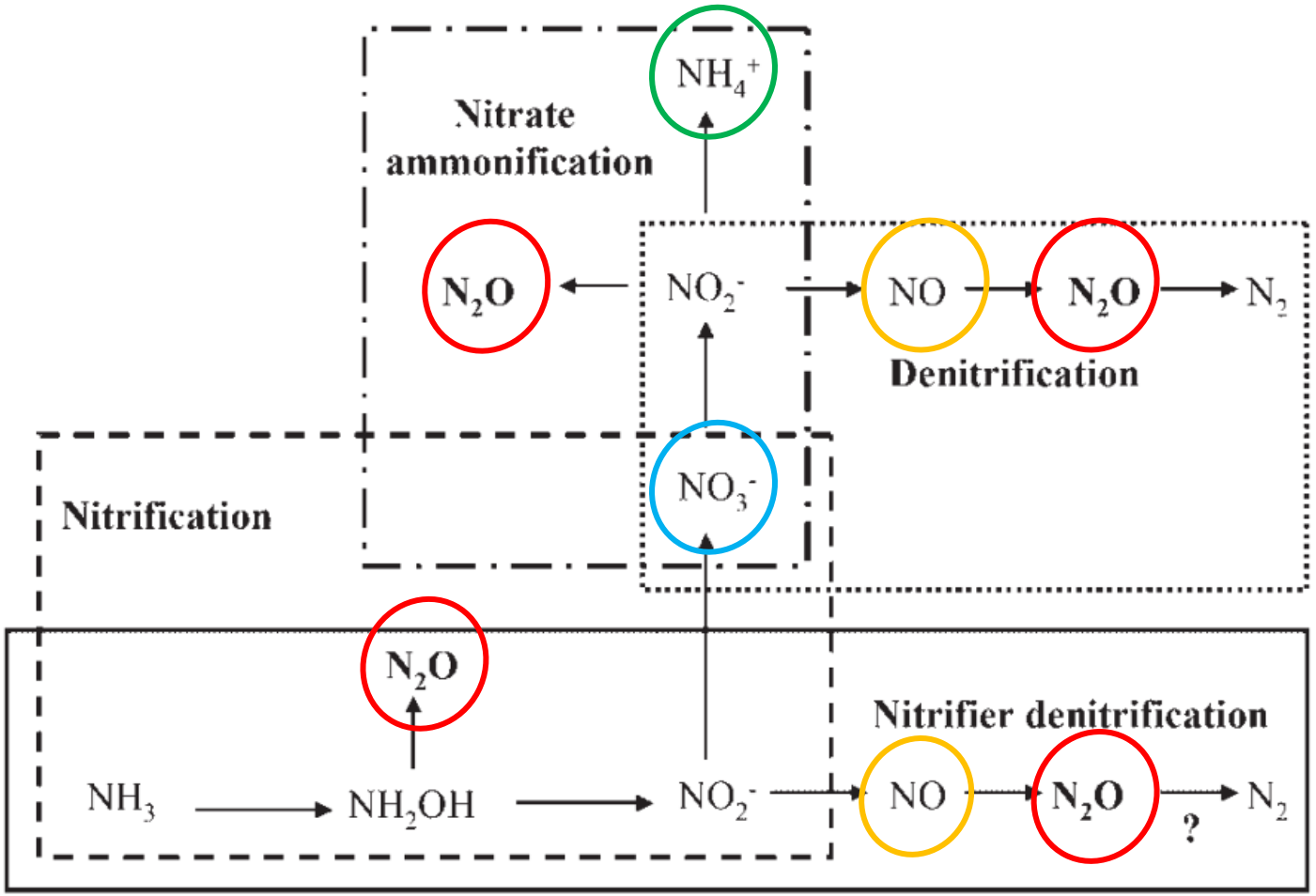
Toteva, G.Y., Reay, D., Jones, M.R., Cowan, N., Deshpande, A., Weerakoon, B., Nissanka, S., Drewer, J., 2024. Nitrous oxide and nitric oxide fluxes differ from tea plantation and tropical forest soils after nitrogen addition. Front. For. Glob. Change 7. https://doi.org/10.3389/ffgc.2024.1335775

Study Sites

Secondary tropical forest, Queensberry, Sri Lanka

Tea plantation, Queensberry, Sri Lanka

Nitrogen Transformations & Measured Compounds



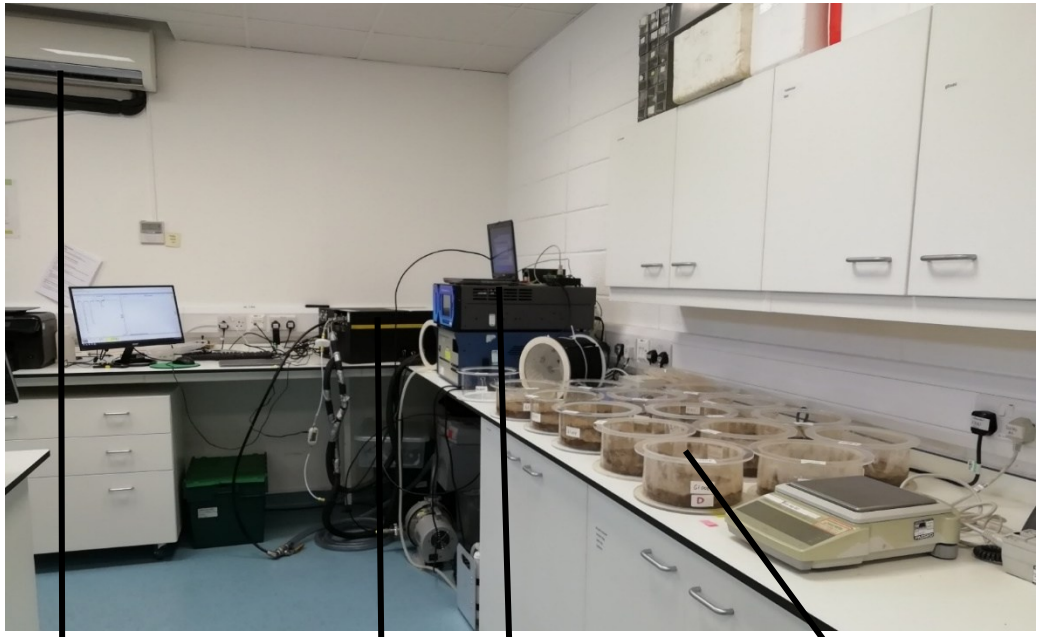
Baggs (2008)

Laboratory Setup

Dried and
sieved soils

Laboratory Setup

Dried and
sieved soils



Air conditioning

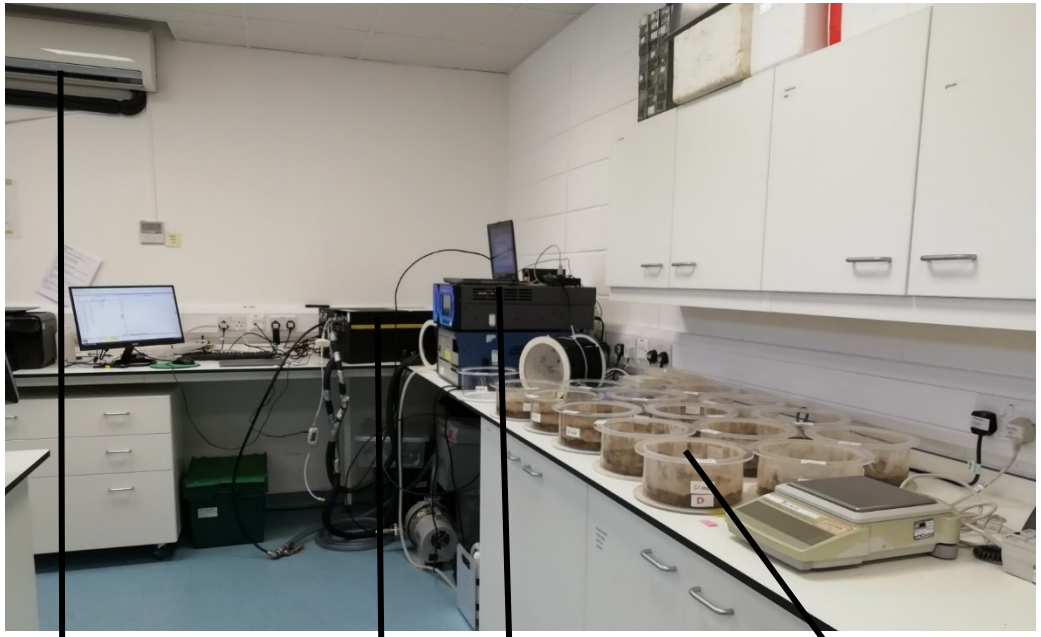
Quantum cascade laser

NOx analyser

Soil cores

Laboratory Setup

Dried and sieved soils



Air conditioning

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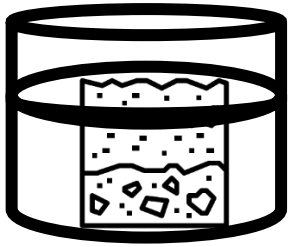
NOx analyser

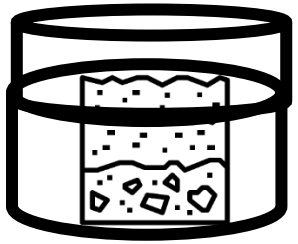
Soil cores

KCl extractions and colorimetric analysis for NH_4^+ and NO_3^-

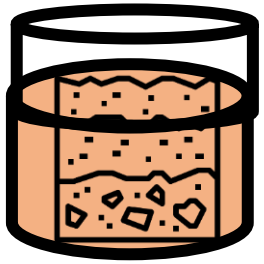
Experimental Treatments



Control forest

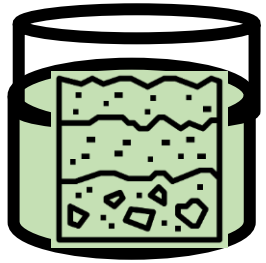


Control tea



NH4* 40N forest**

NH4 100N forest



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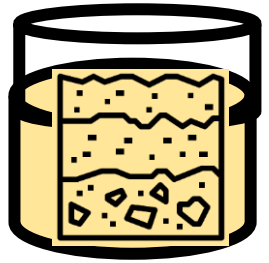
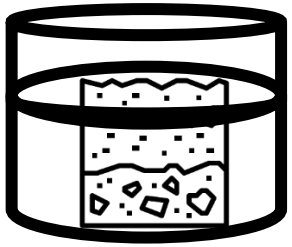


NH4 100N tea

*Cowan *et al.* (2024)

** kg N ha^{-1} yr^{-1}

Experimental Treatments



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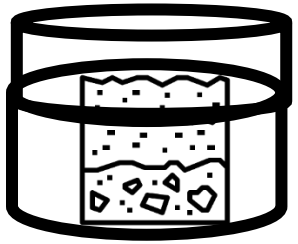

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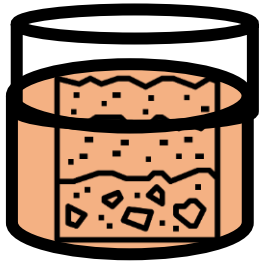

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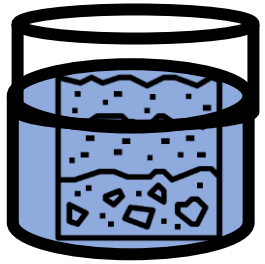

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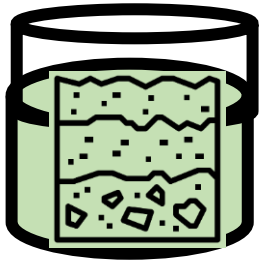

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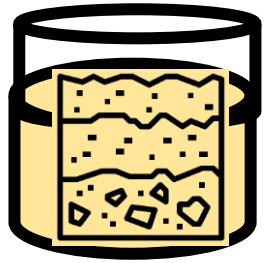

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24 cores in total
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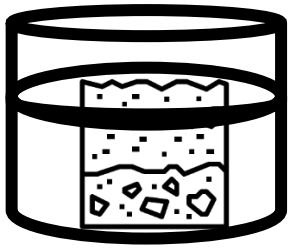

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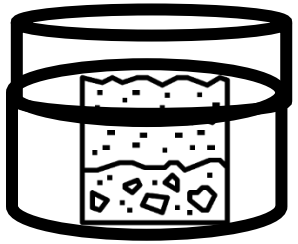

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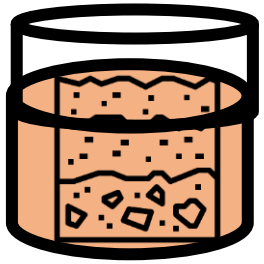

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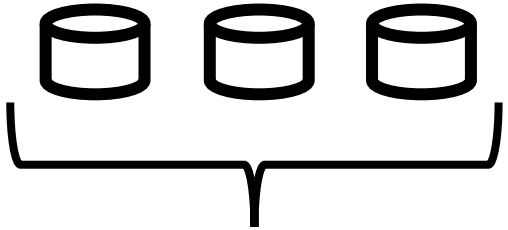
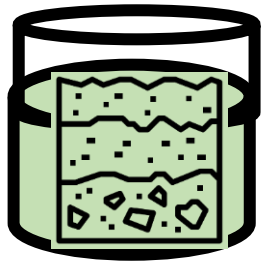


N_2O concentrations
NOx concentrations



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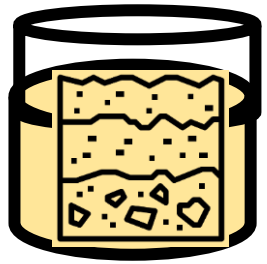

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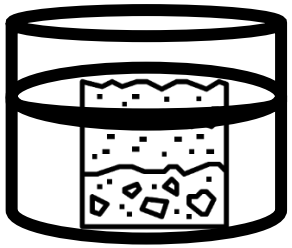
3 replicates (for gases) + 1 destructive core (for soil) per treatment level



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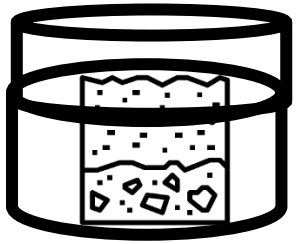

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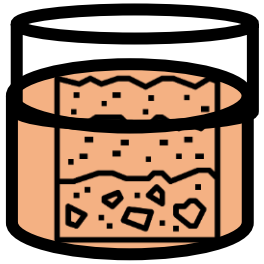

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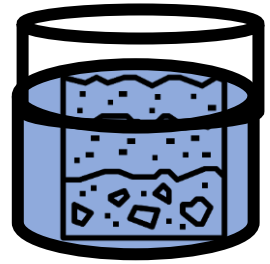

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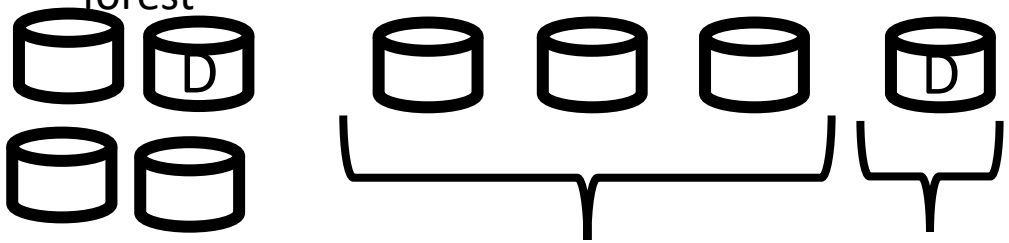
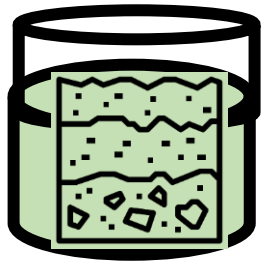


N_2O concentrations
NOx concentrations

Inorganic N
Total CN
pH



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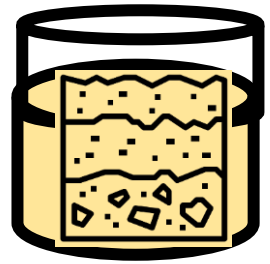

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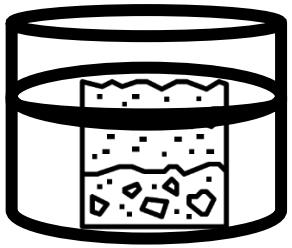

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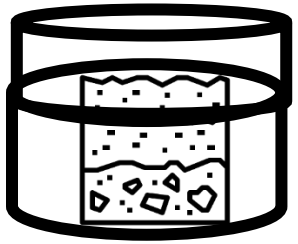

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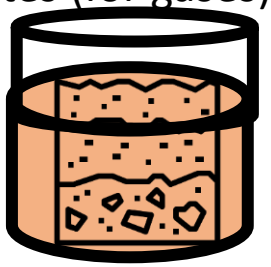

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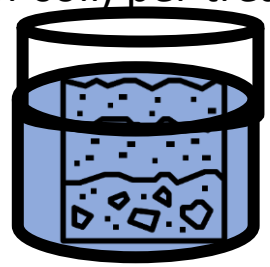

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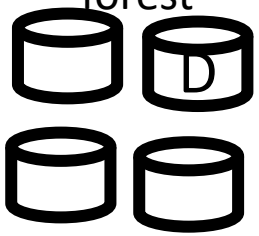
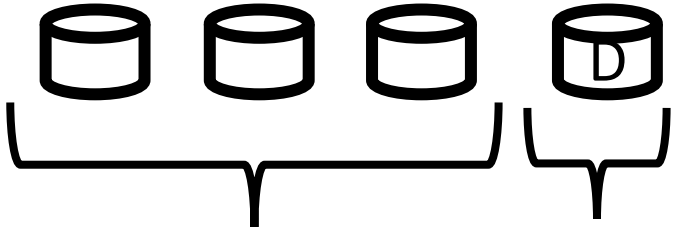
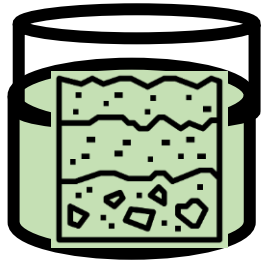




N_2O concentrations
NOx concentrations

Inorganic N
Total CN
pH

Weight of core
Height of core



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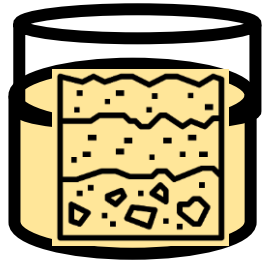

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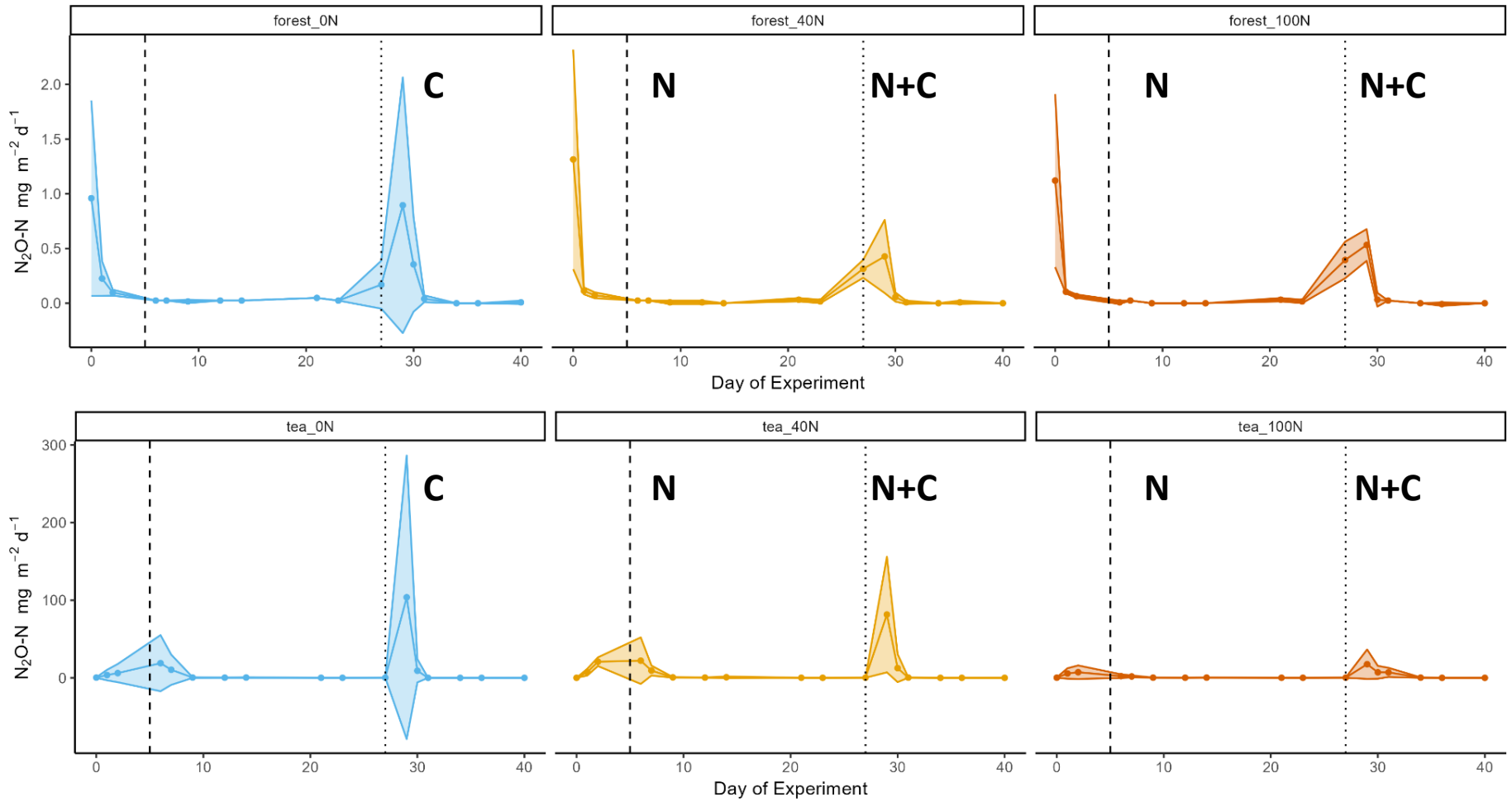
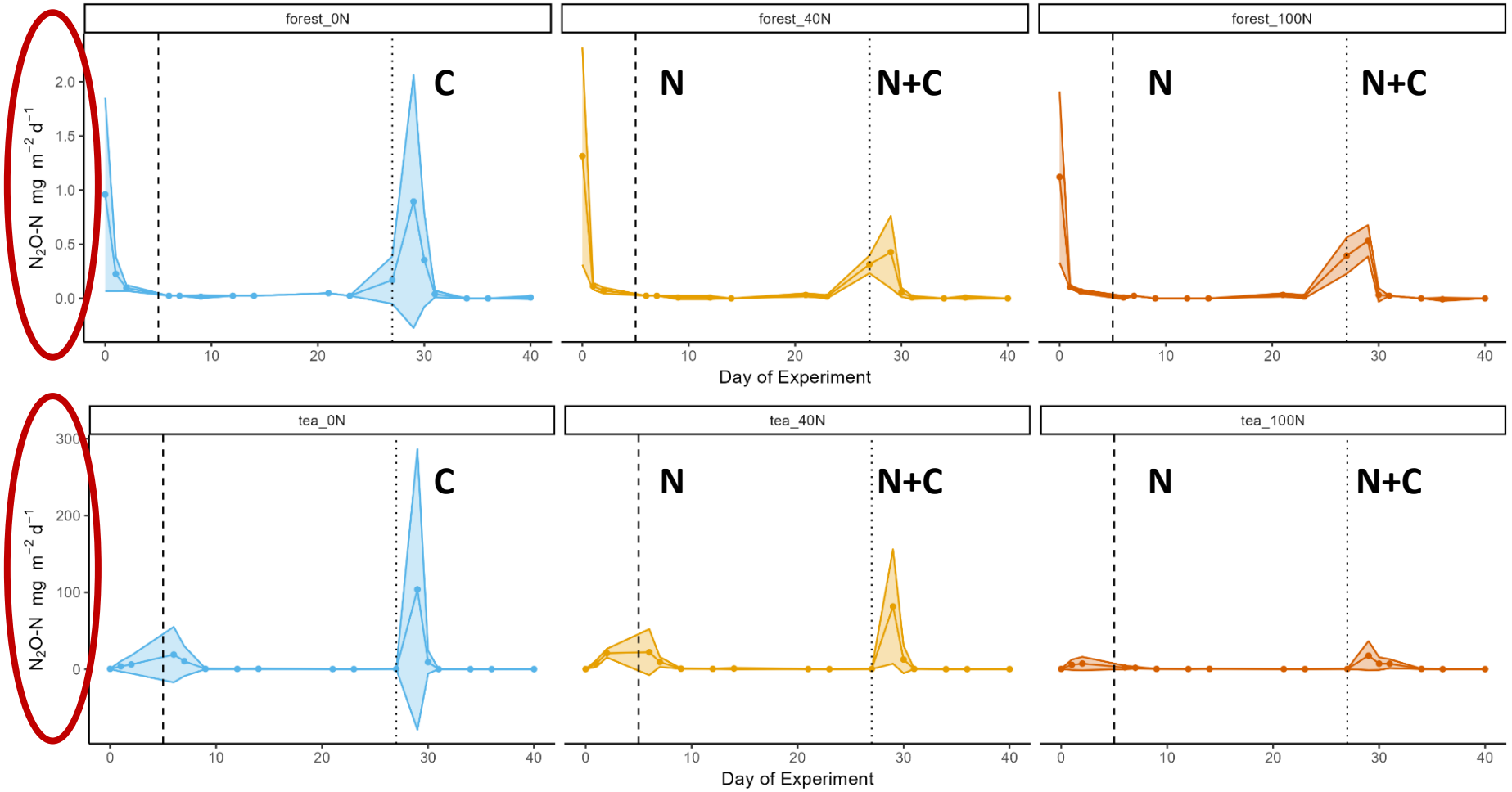
Results Highlights: N_2O Fluxes



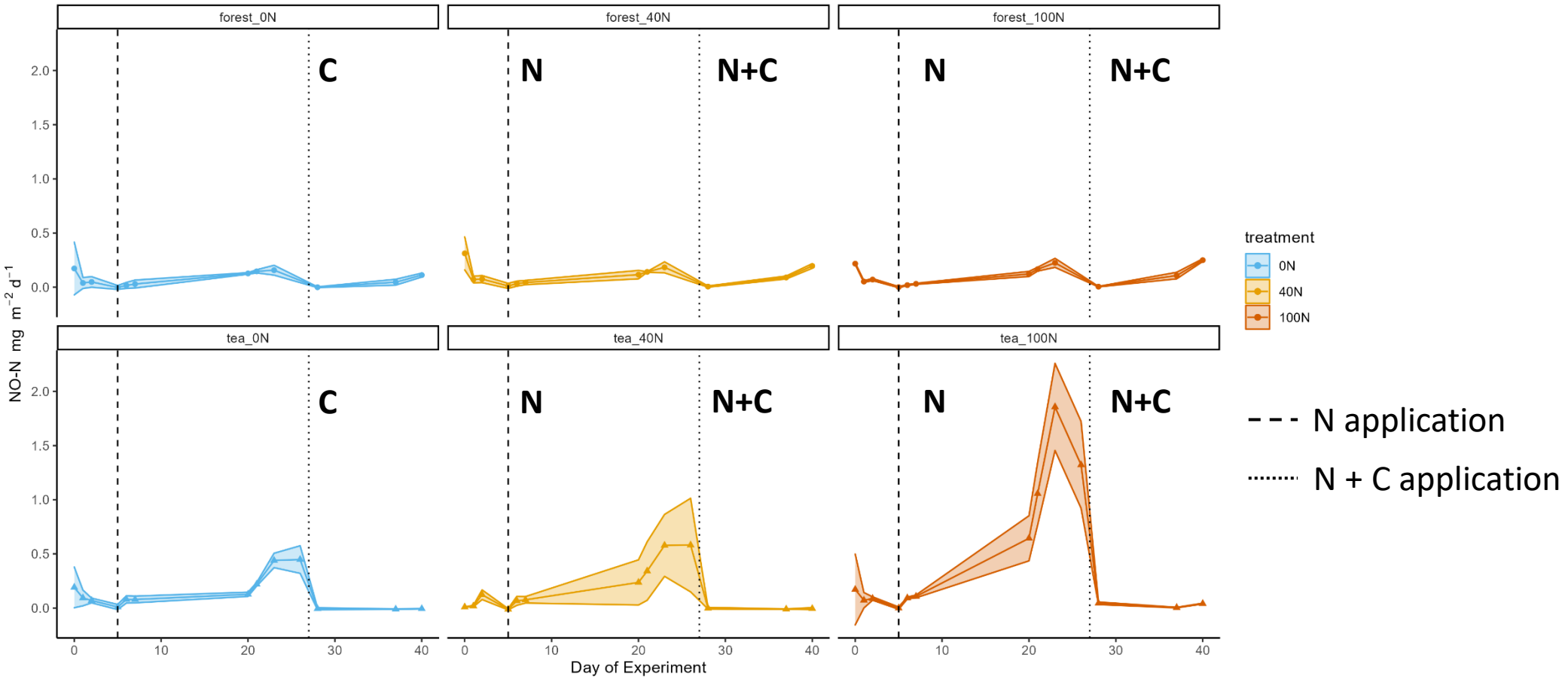
Toteva *et al.* (2024)

Results Highlights: N_2O Fluxes



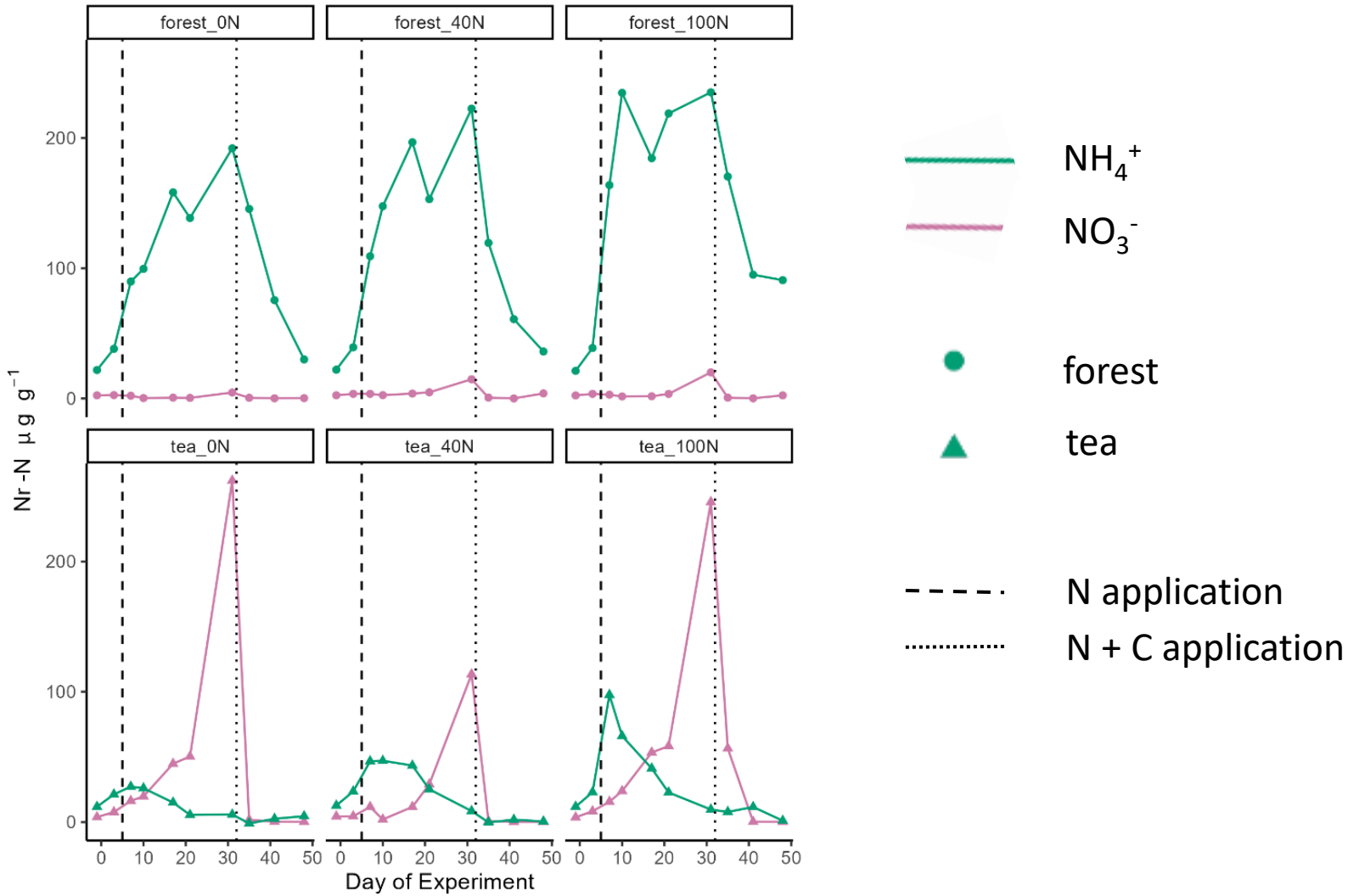
Toteva *et al.* (2024)

Results Highlights: NO Fluxes



Toteva *et al.* (2024)

Results Highlights: Mineral N



Toteva *et al.* (2024)

Conclusions

- Higher N fluxes from tea plantation soils

Toteva *et al.* (2024)

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- Carbon availability might modulate N_2O emissions

Toteva *et al.* (2024)

Conclusions

- Higher N fluxes from tea plantation soils
- Carbon availability might modulate N_2O emissions
- Increase in N availability might affect N_2O emissions from natural forest ecosystems in the long-term

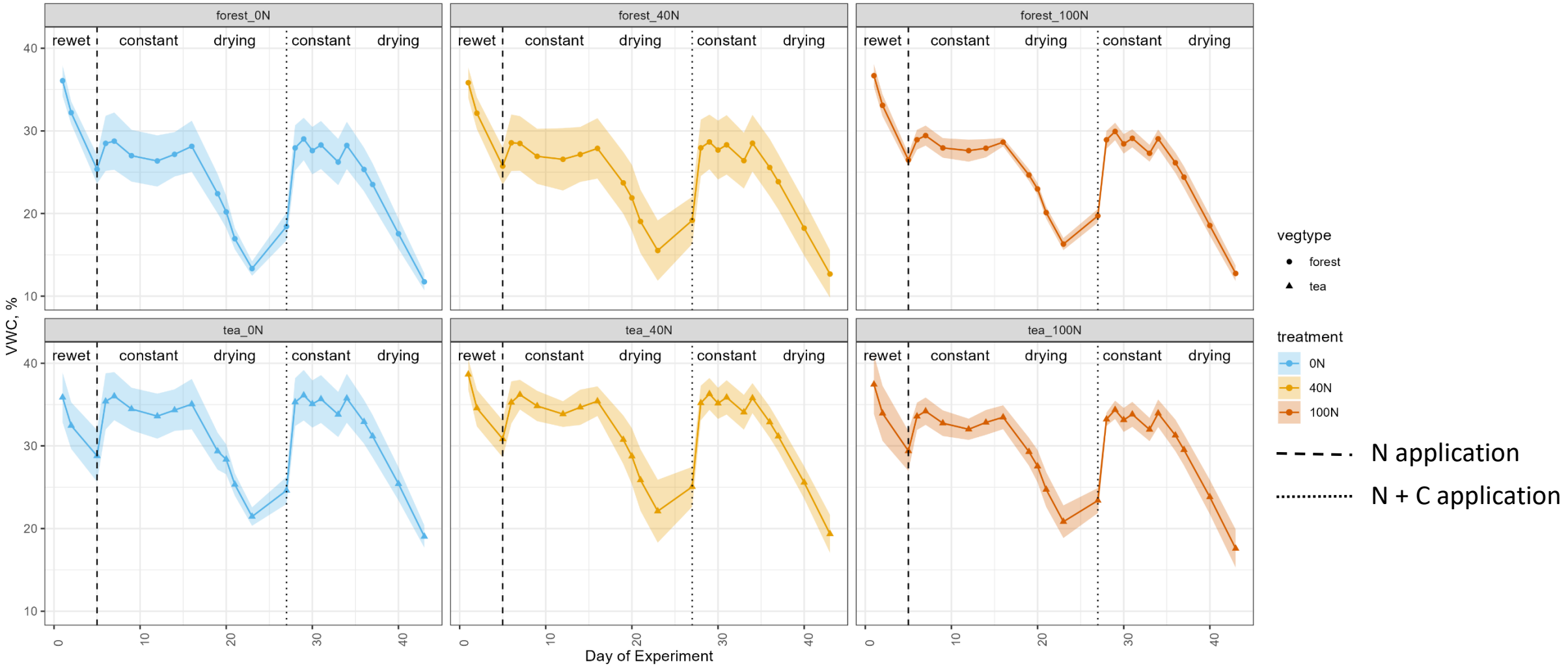
Toteva *et al.* (2024)

Acknowledgements

- Supervisors: Dr Julia Drewer, Prof Dave Reay and Dr Matthew Jones
- Co-Authors: Dr Nicholas Cowan, Dr Ajinkya Deshpande, Buddhika Weerakoon, Prof Sarath Nissanka
- All colleagues at UKCEH, University of Edinburgh, University of Peradeniya and SANH who were involved with this project
- UKRI GCRF for funding this research

Questions???

Changes in Soil Moisture



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