

N₂ emissions are a major loss pathway for tropical forests

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Context, problem statement, Question and method

- ❖ **Context:** Contrasting N fluxes in the Congo Basin under high atmospheric N inputs (Bauters et al. 2019, Barthel et al., 2022)
- ❖ **Problem:** Soil N₂ emissions can play a key role in the N budget (Yu et al., 2023), but remain unquantified in the Congo Basin
- ❖ **Question:** Can N₂ emissions balance atmospheric N inputs from biomass burning in the Congo Basin?
- ❖ **Methods:** Throughfall and lysimeter network and 45 manual static chambers for in-situ N₂O emissions weekly sampled during 1 year and lab-based He/ O₂ incubation for direct measurement of N₂ and N₂O

Study area

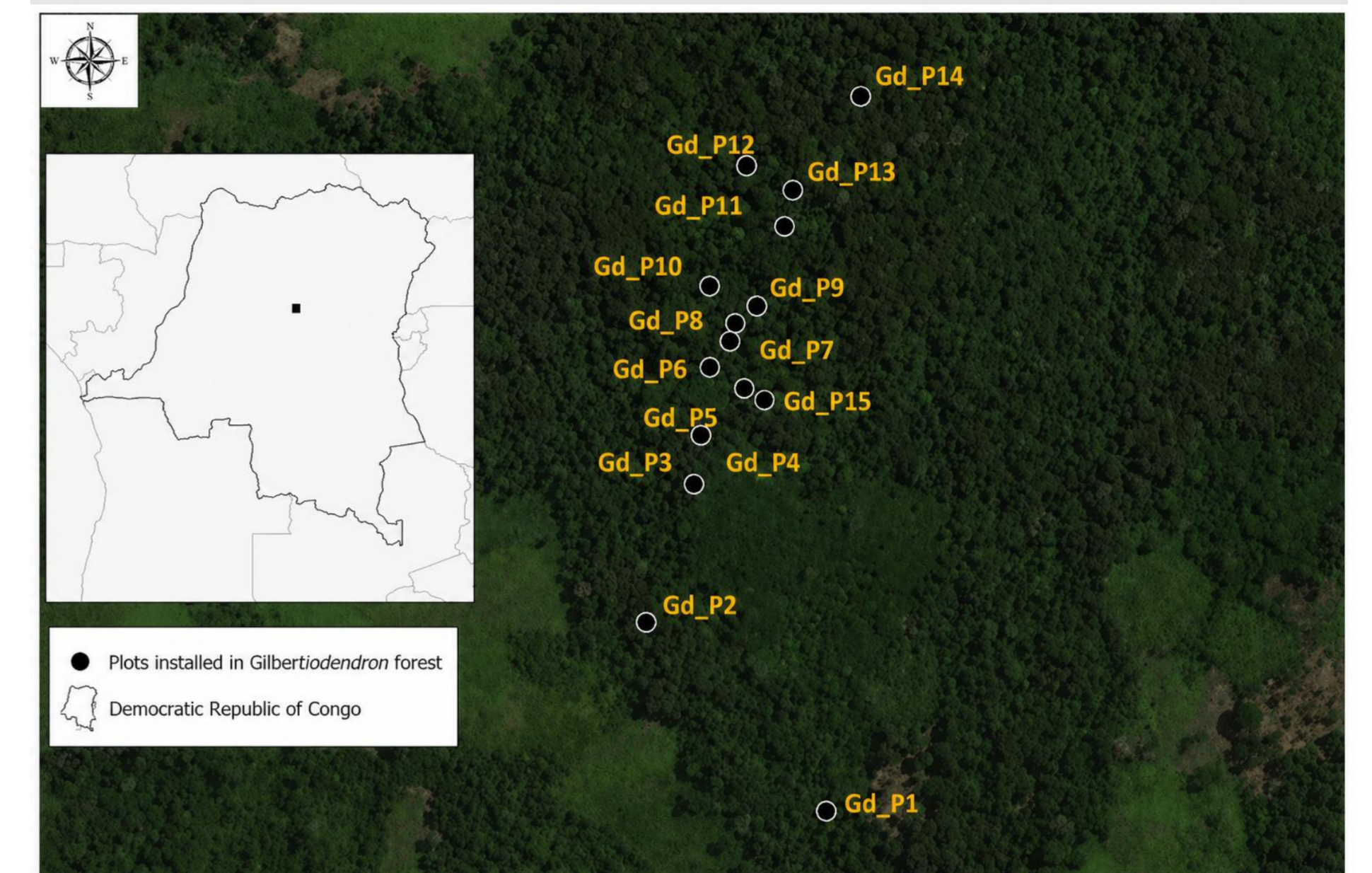
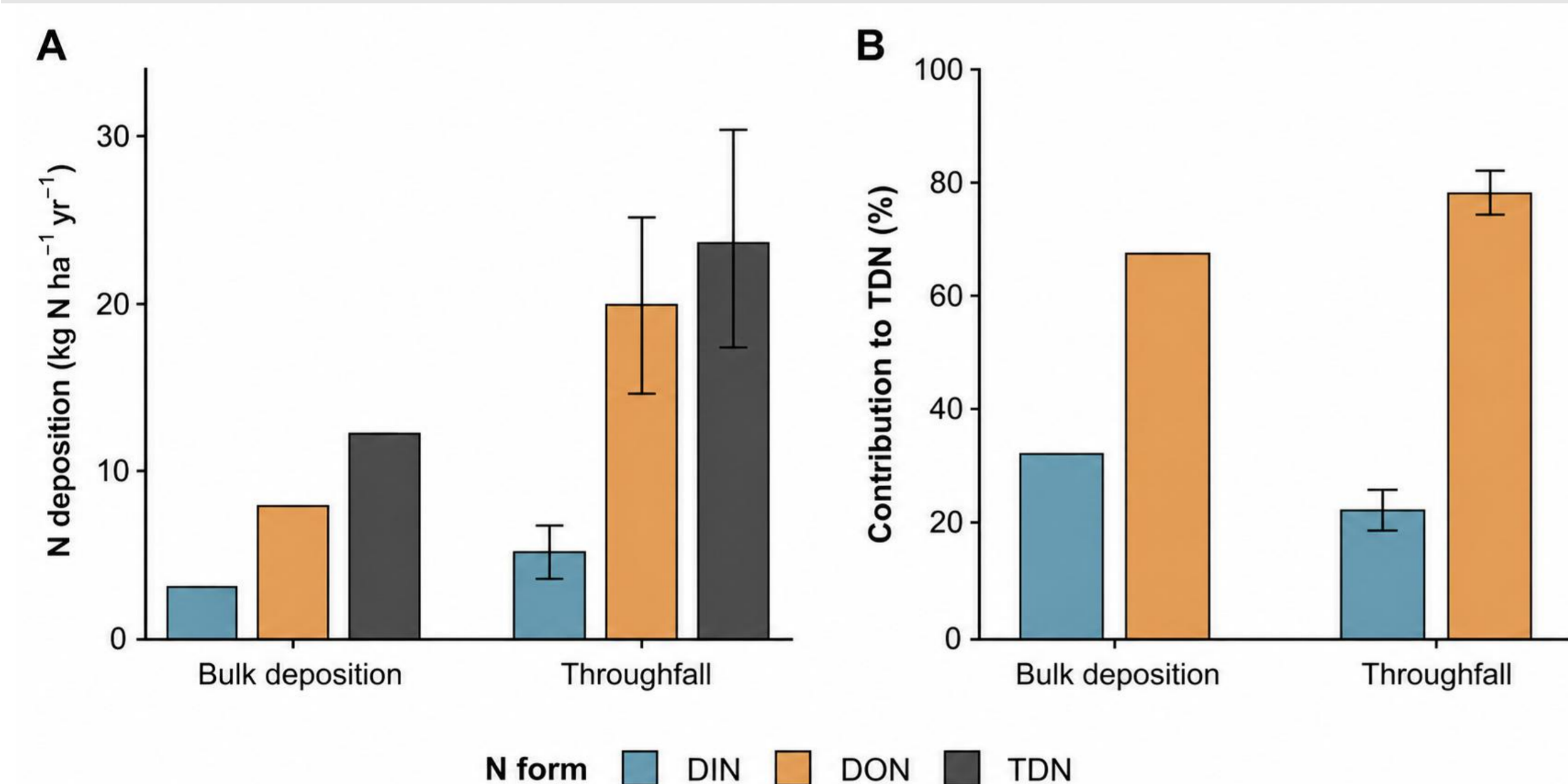


Fig 1. *Gilbertiodendron dewevrei* forest

High N deposition with a strong contribution of dissolved organic nitrogen (DON)



Low in-situ N₂O emissions from the Congo Basin soils

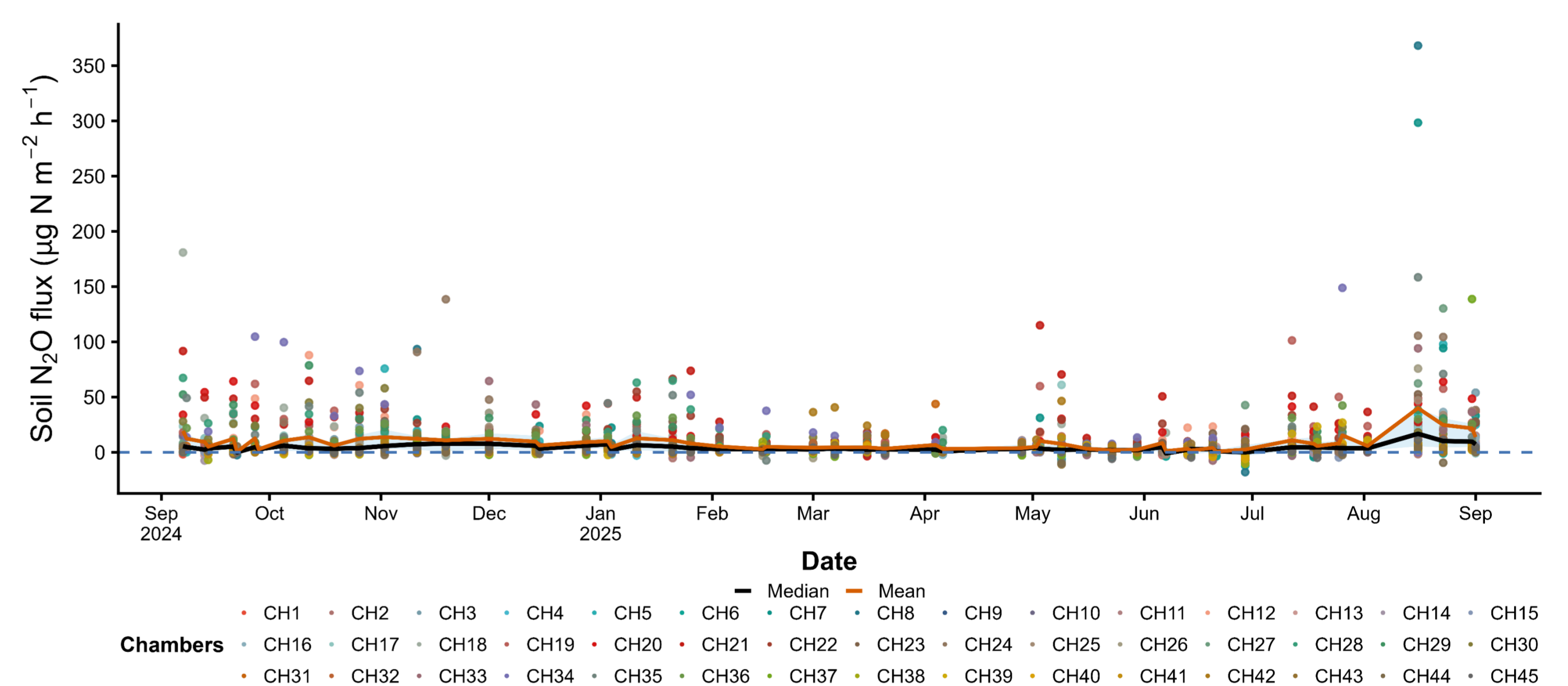


Fig 2. Wet (Bulk) and Throughfall N deposition in the *Gilbertiodendron* forest

Fig 3. In-situ soil N₂O fluxes in the *Gilbertiodendron* forest

High soil N₂ emissions with a low denitrification ratio in the Congo Basin

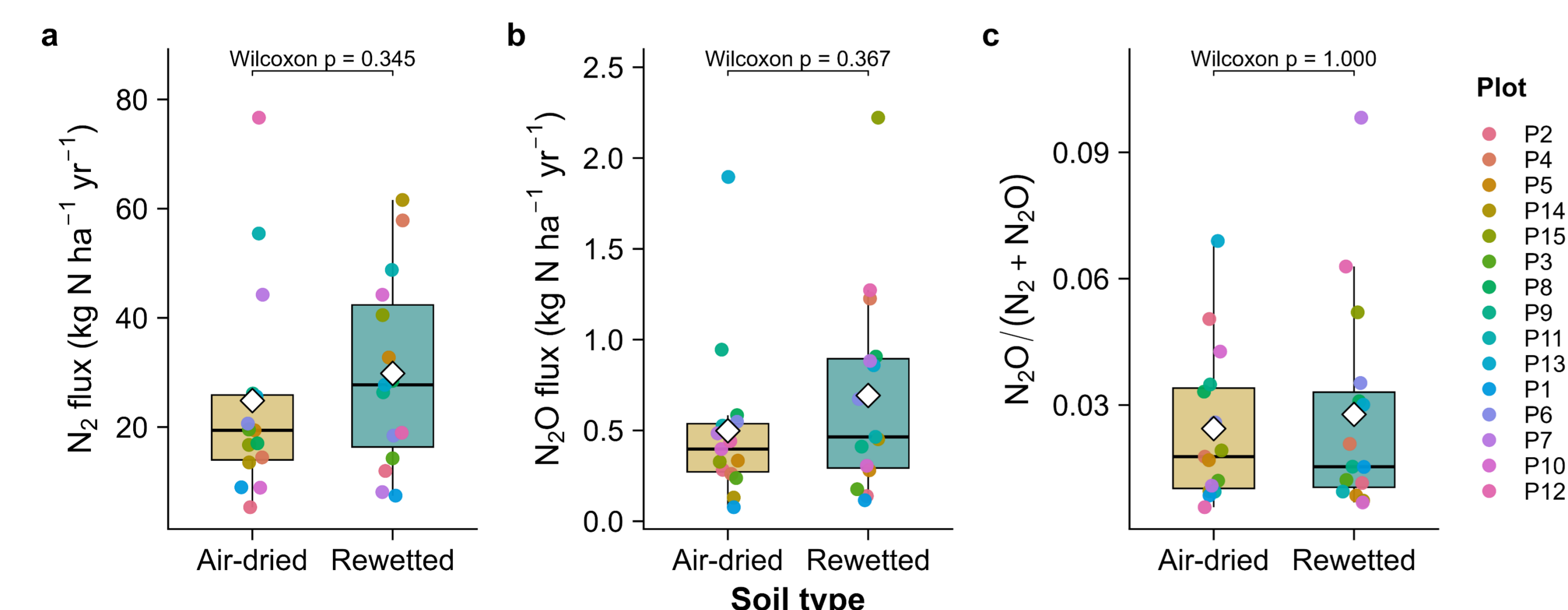


Fig 4. Lab-based Incubation N₂ and N₂O fluxes and denitrification ratio
Air-dried soil (WFPS = 6%) and rewetted soil (WFPS = 24%)

Soil N₂ is the dominant N loss pathway in the Congo Basin

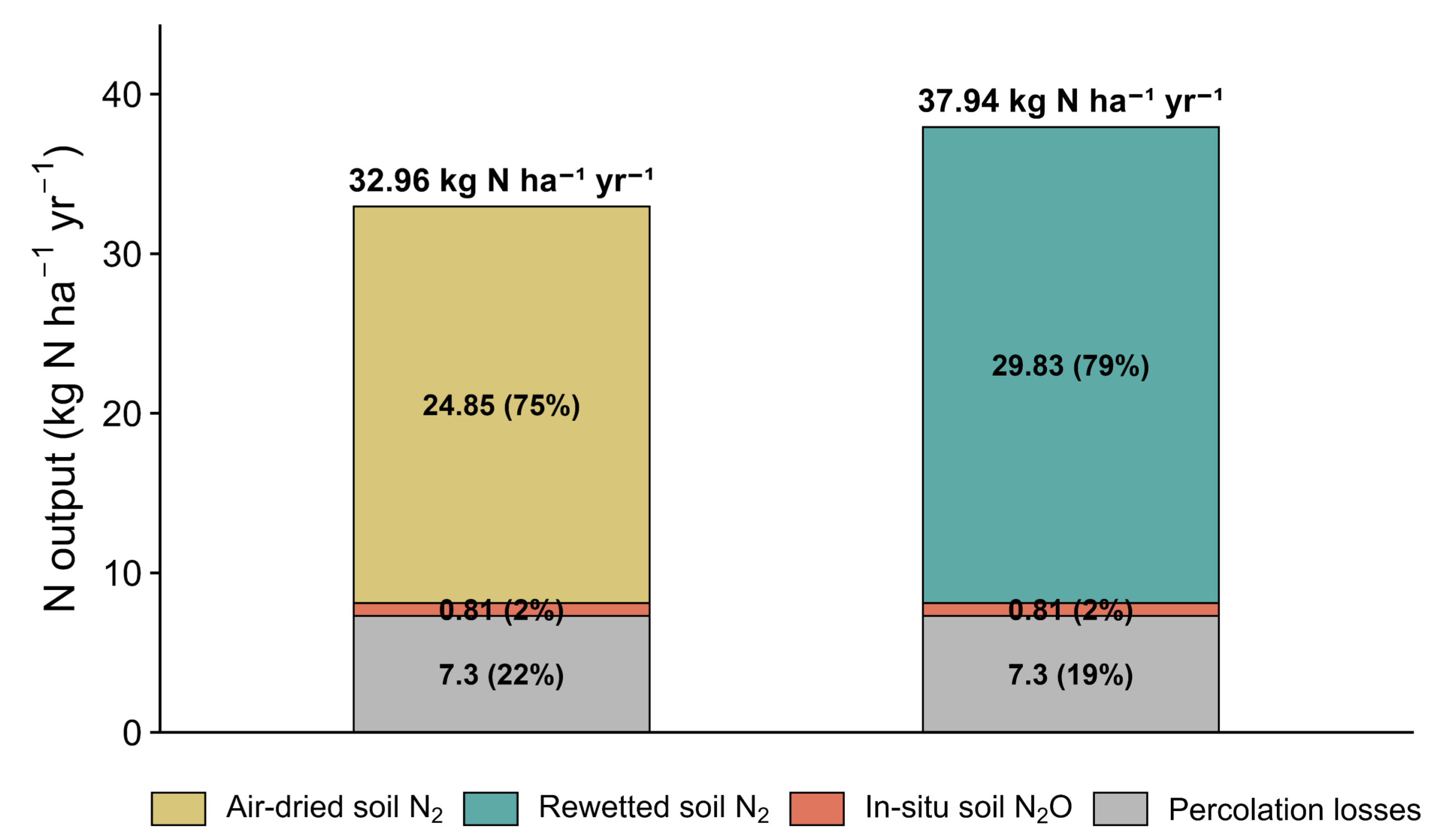


Fig 5. Comparing soil N loss pathways in the Congo Basin

Conclusion

Elevated fire-derived N deposition is balanced by substantial soil N₂ emissions in the Congo Basin

References

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