XIVth STICS seminar, 17-19 March 2026, organized by ULiege-GxABT & INRAE

Cereal–cowpea intercropping to close the yield gap while reducing N inputs under climate variability and climate change in West Africa

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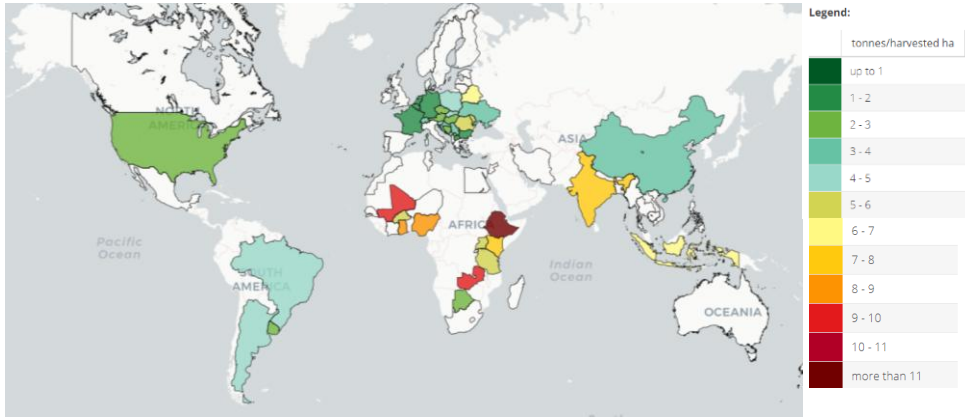
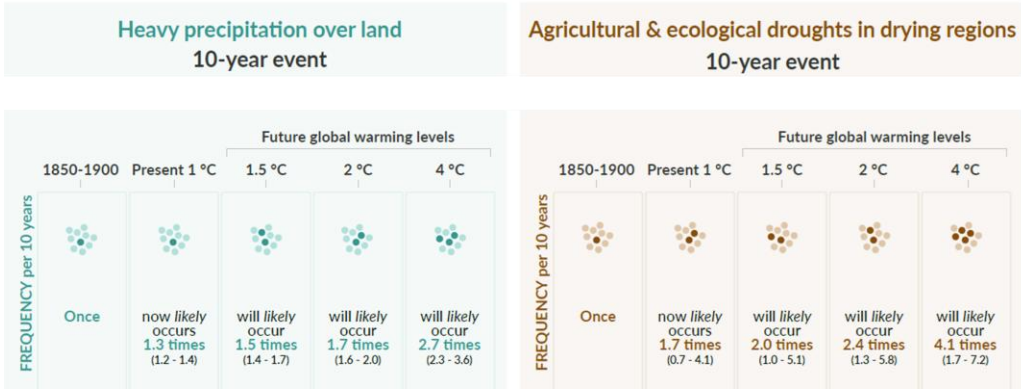
Challenges of low input cereal systems of West Africa

Global Yield Gap Atlas



Van Ittersum et al., 2016 - maize

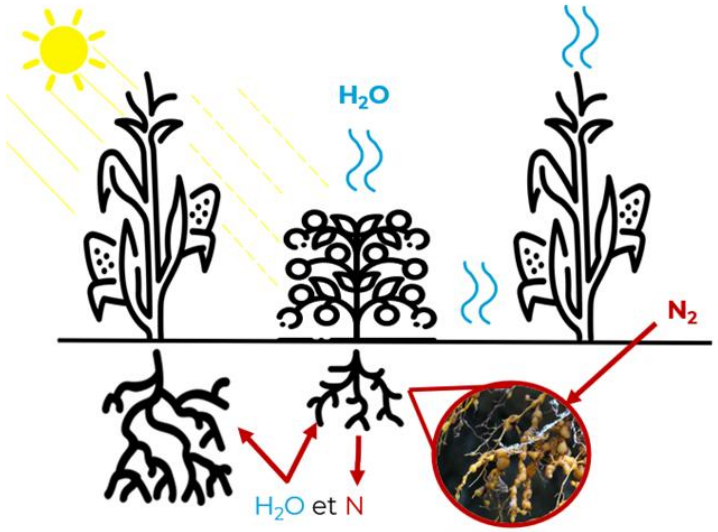
ipcc



Need for locally adapted intensification strategy

Cereal-legume intercropping

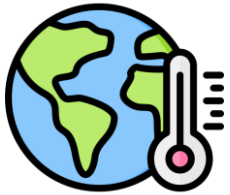
- Improved resource use efficiency (Namatsheve et al, 2020)



Sorghum-cowpea intercropping to close the yield gap while reducing N inputs in West Africa

What is the probability to save N in intercropping while closing the yield gap in contrasted sites of West Africa ?

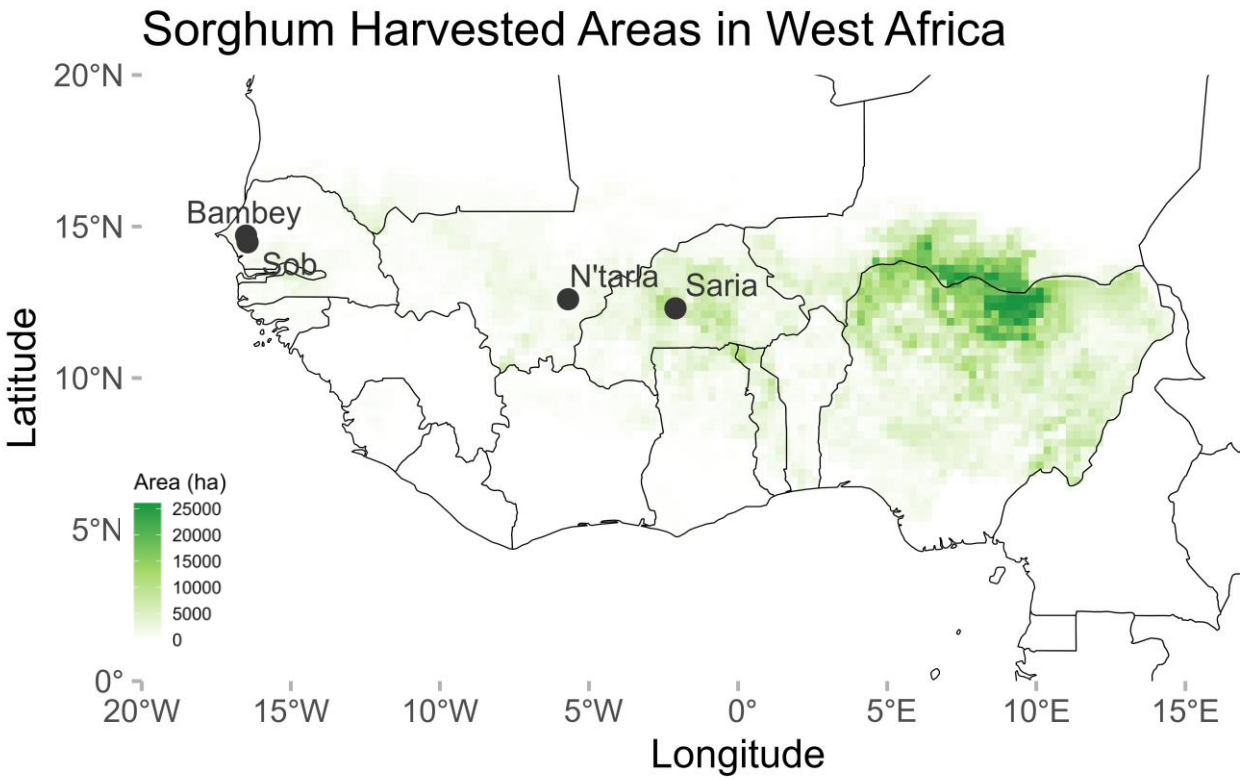
How does climate variability impact the N savings of intercropping ?



How will this potential benefit of intercropping evolve in future climate scenarios ?

Sorghum-cowpea intercropping to close the yield gap while reducing N inputs in West Africa

Approach : 30 year virtual experiment with STICS across 4 contrasted sites



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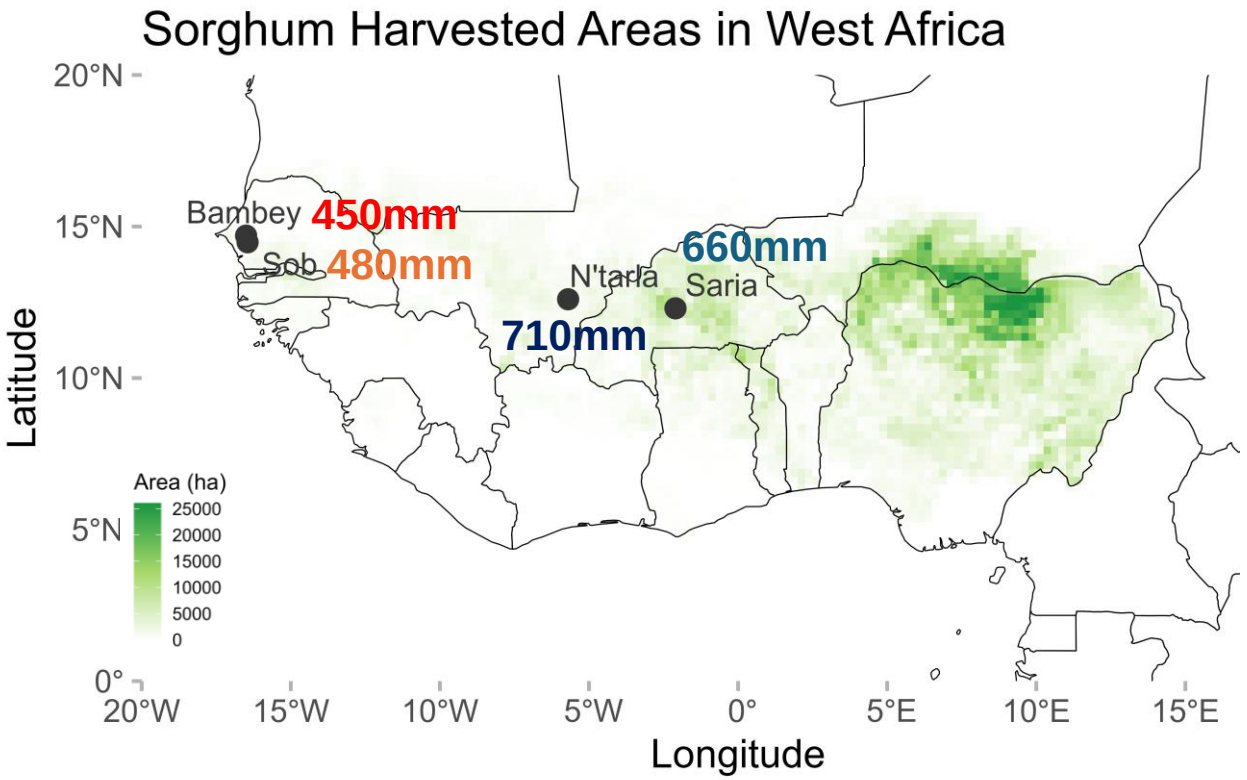
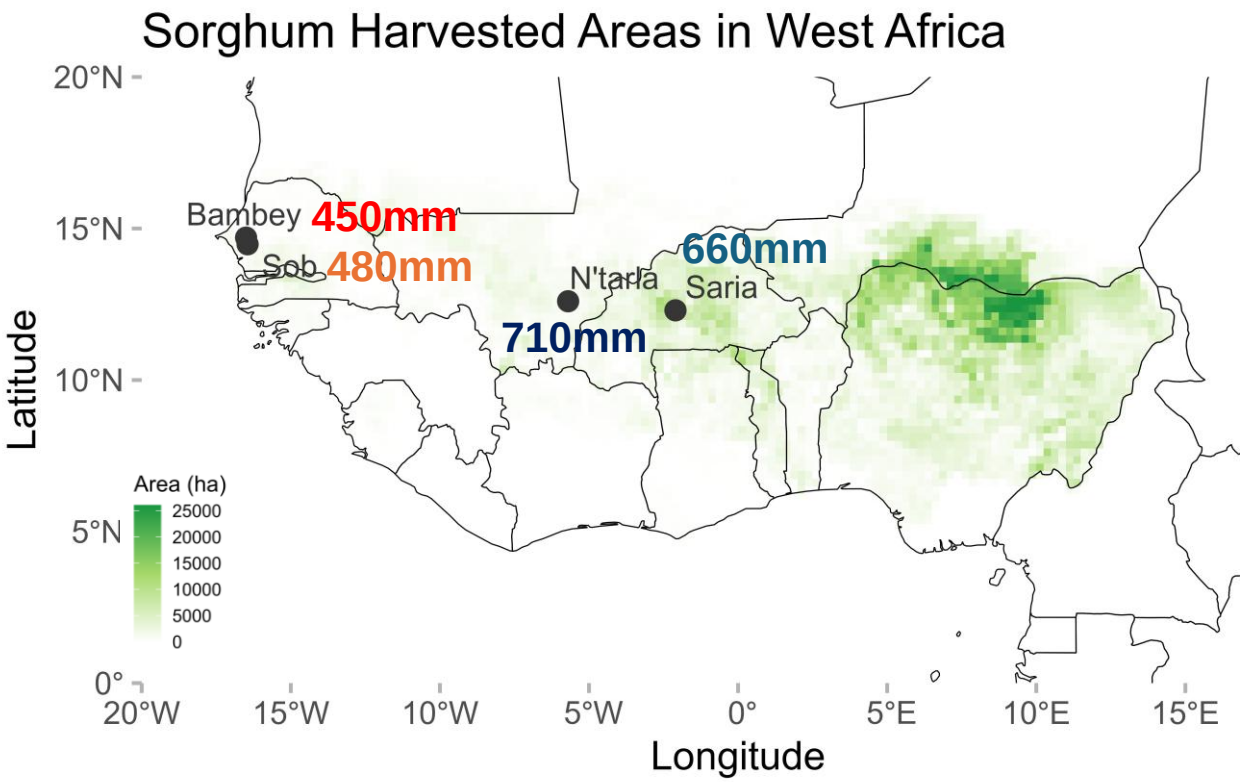
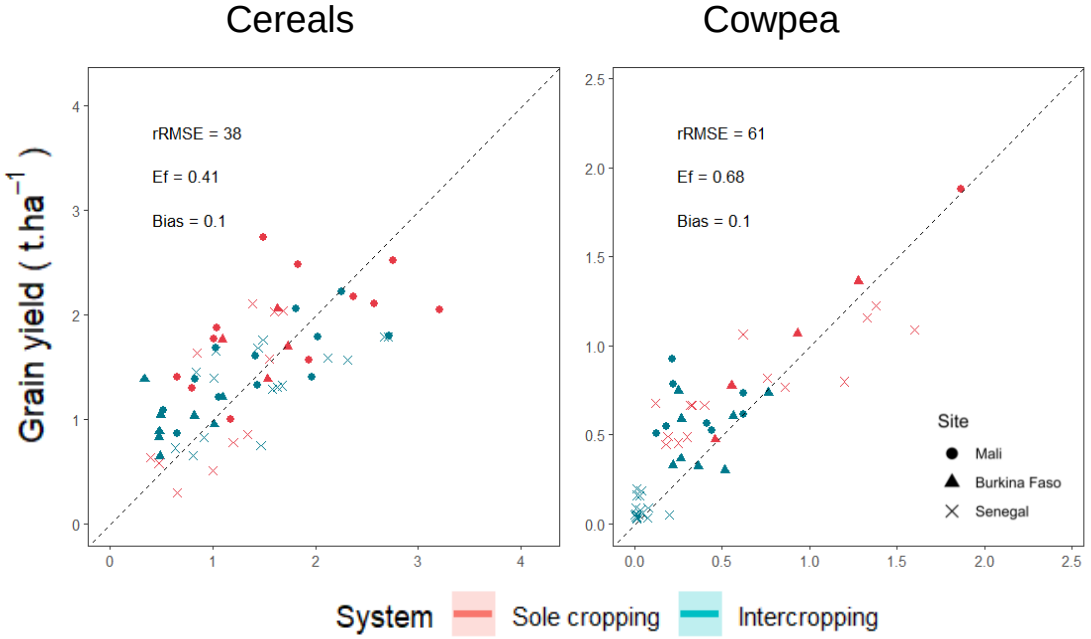


Sorghum-cowpea intercropping to close the yield gap while reducing N inputs in West Africa

Approach : 30 year virtual experiment with STICS across 4 contrasted sites



Calibrated on sole cropping



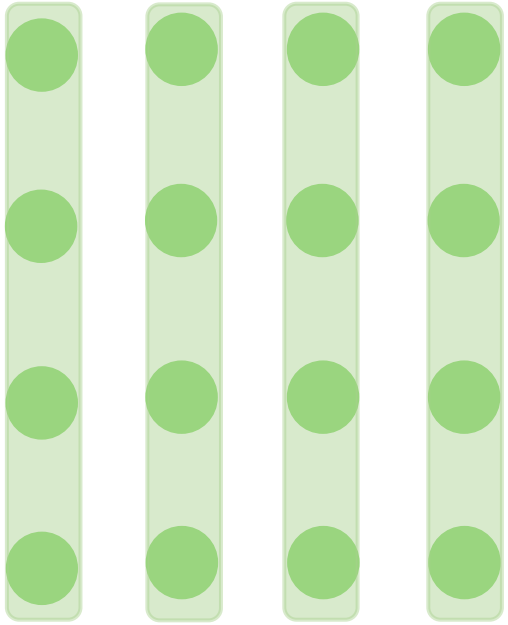
De Freitas et al. (under review - FCR)

Data from field experiments:
Traore et al., 2022, Senghor et al., 2023,
Sow et al., 2024, Ganeme et al., 2025

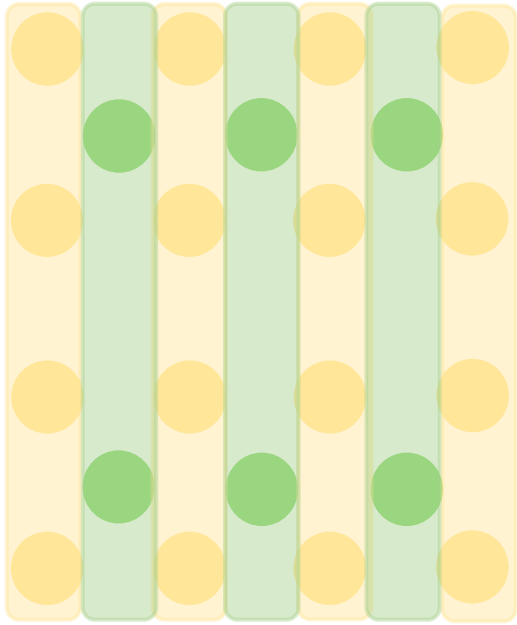
Alternate row additive intercropping

Sorghum sole cropping

Cowpea sole cropping



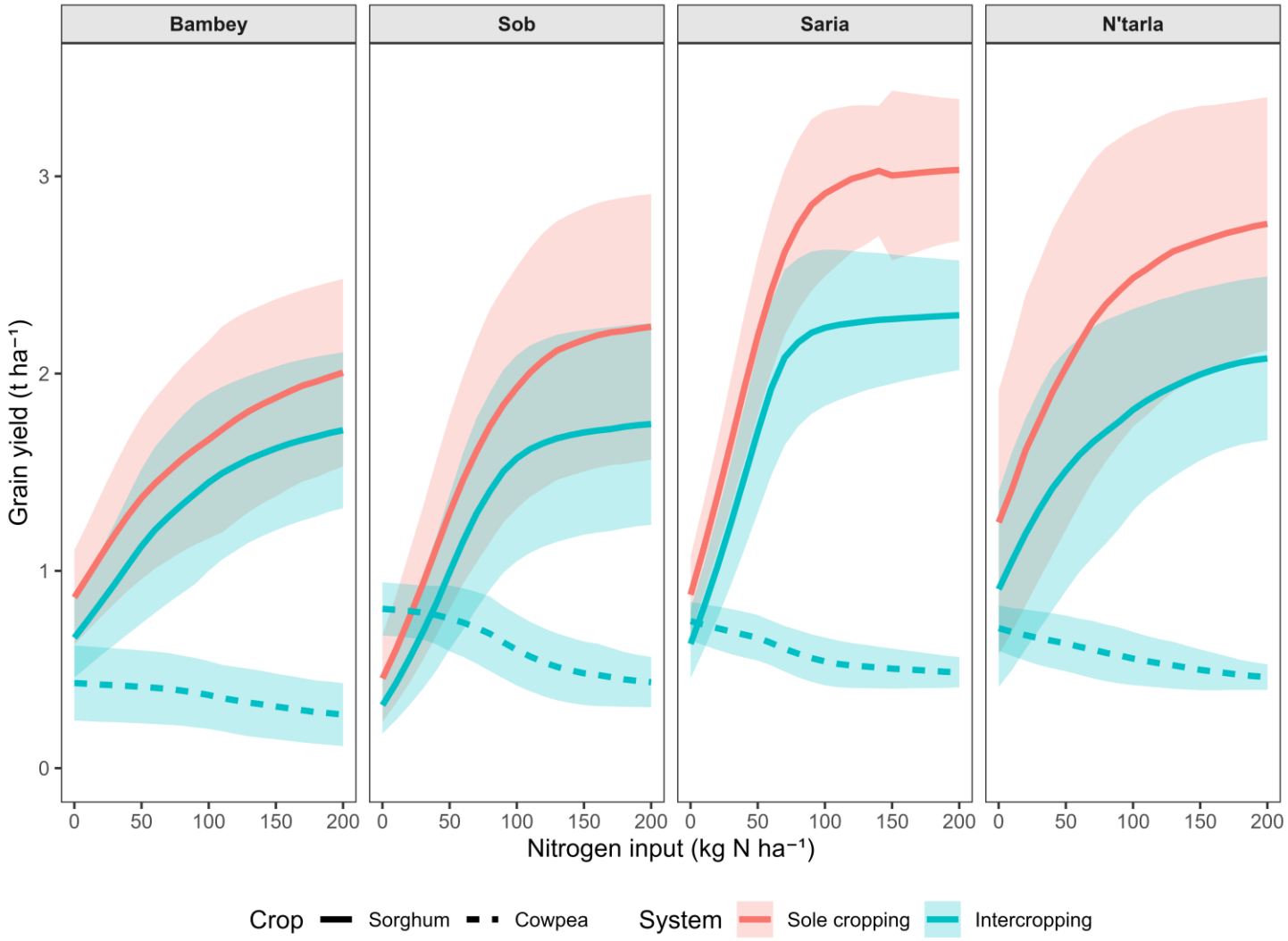
100% Sorghum + 50% cowpea



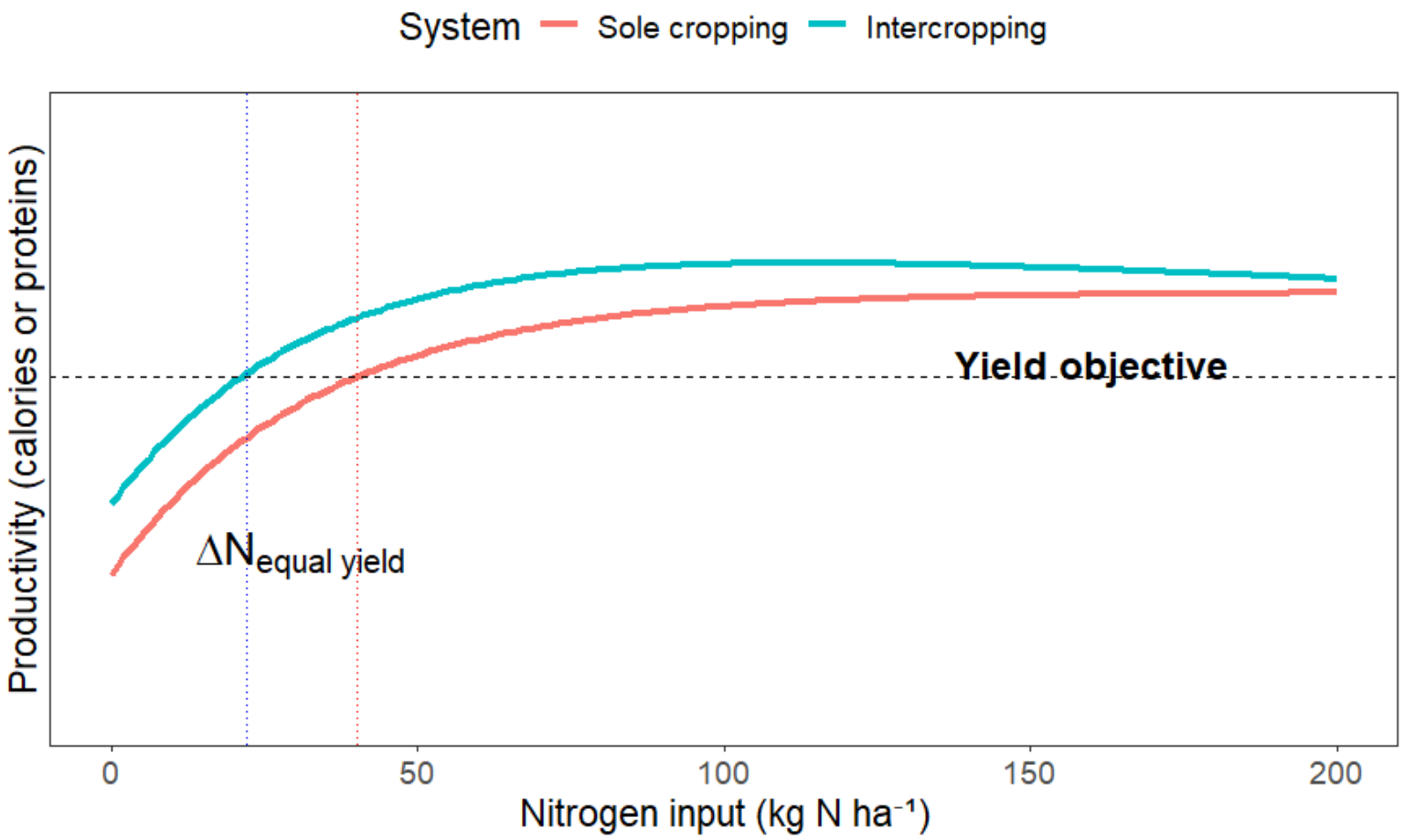
Simulations of sorghum sole cropping vs sorghum-cowpea intercropping under 0 to 200 kg N ha^{-1}

Cumulative rainfall over the growing period

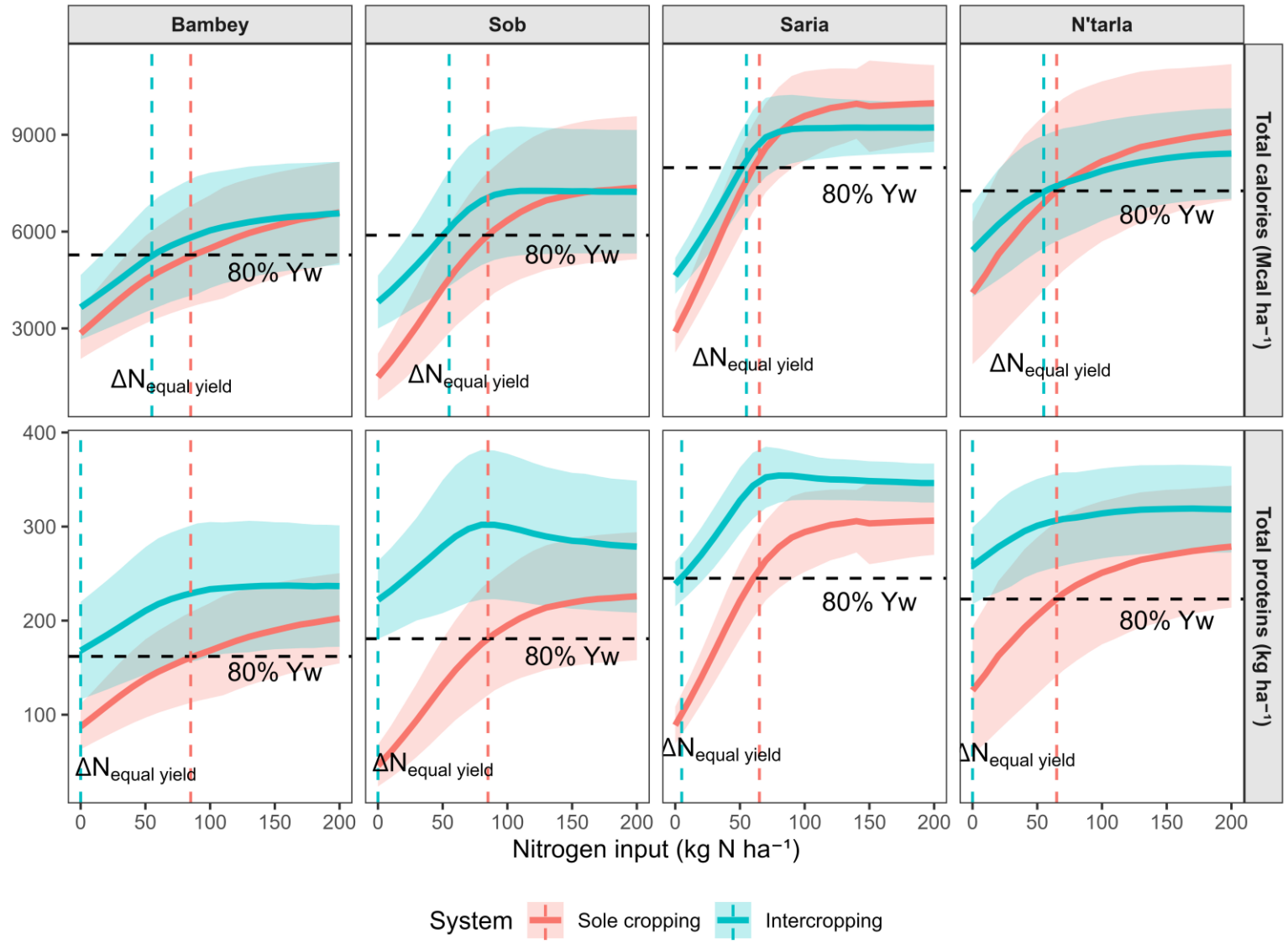
450mm **480mm** **660mm** **710mm**



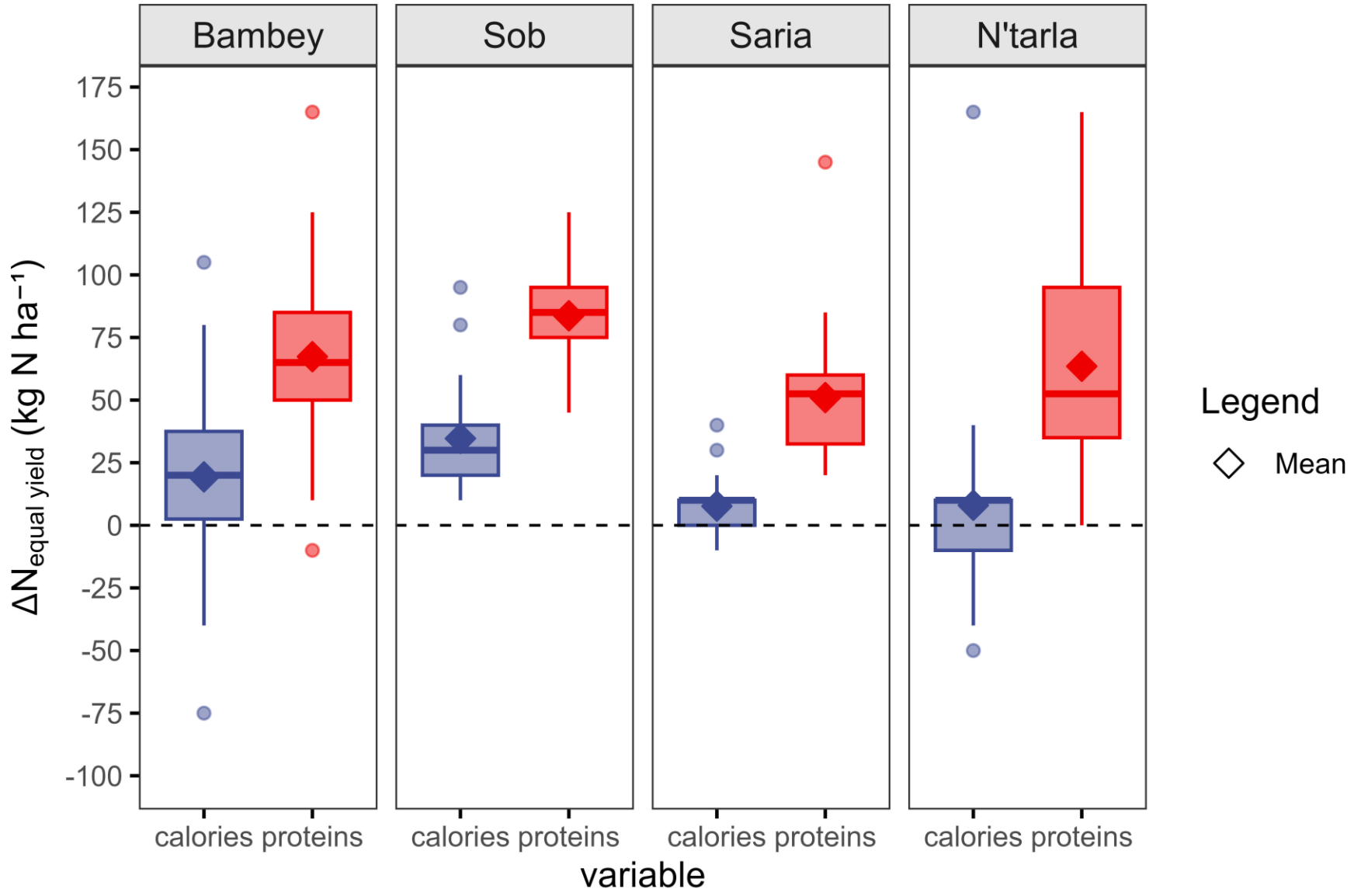
Concept - The N input rate to produce a yield objective



Concept - The N input rate to produce 80% of the sorghum Yw

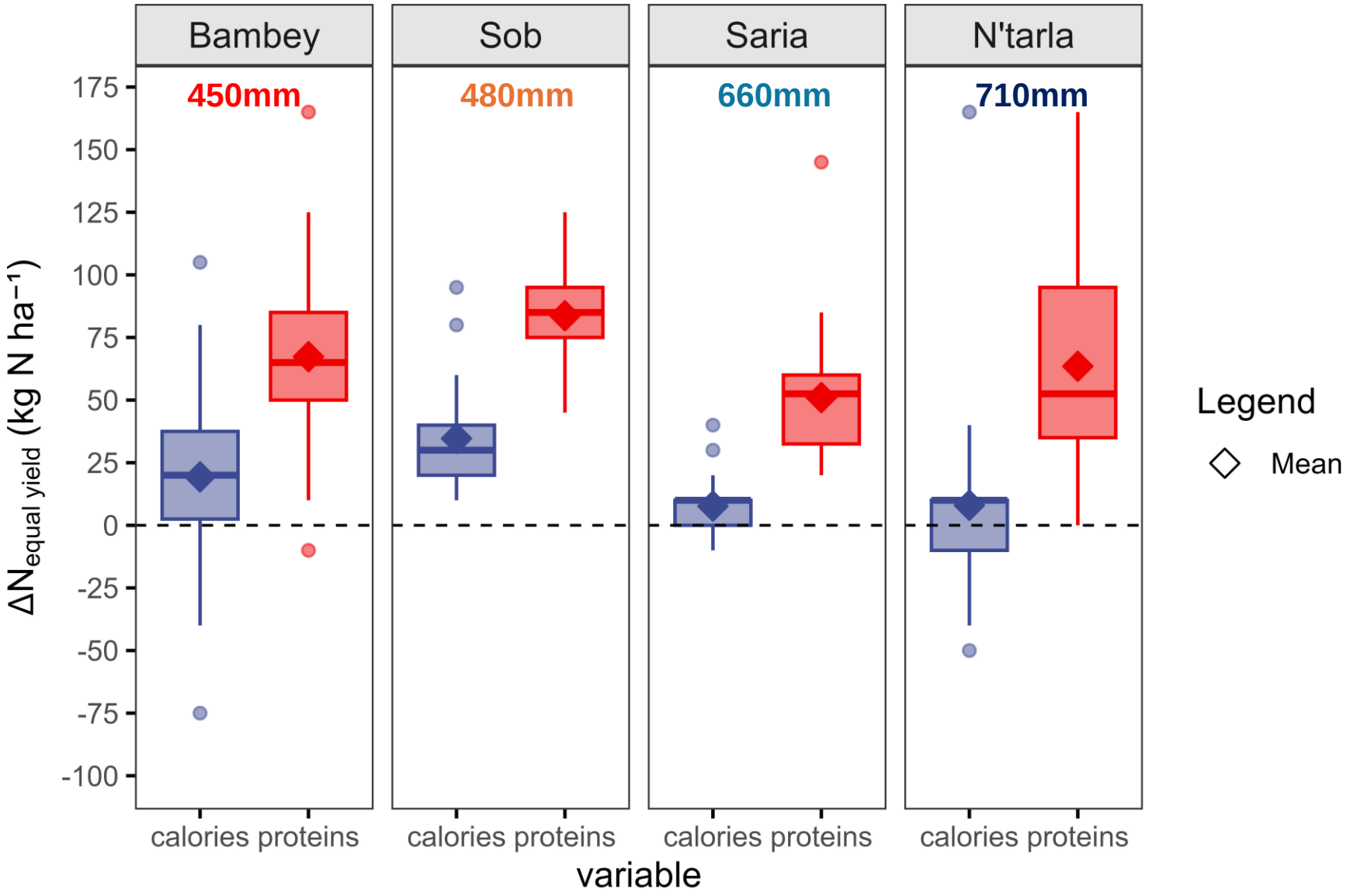


N savings in intercropping while producing 80% of the water limited sorghum yield potential

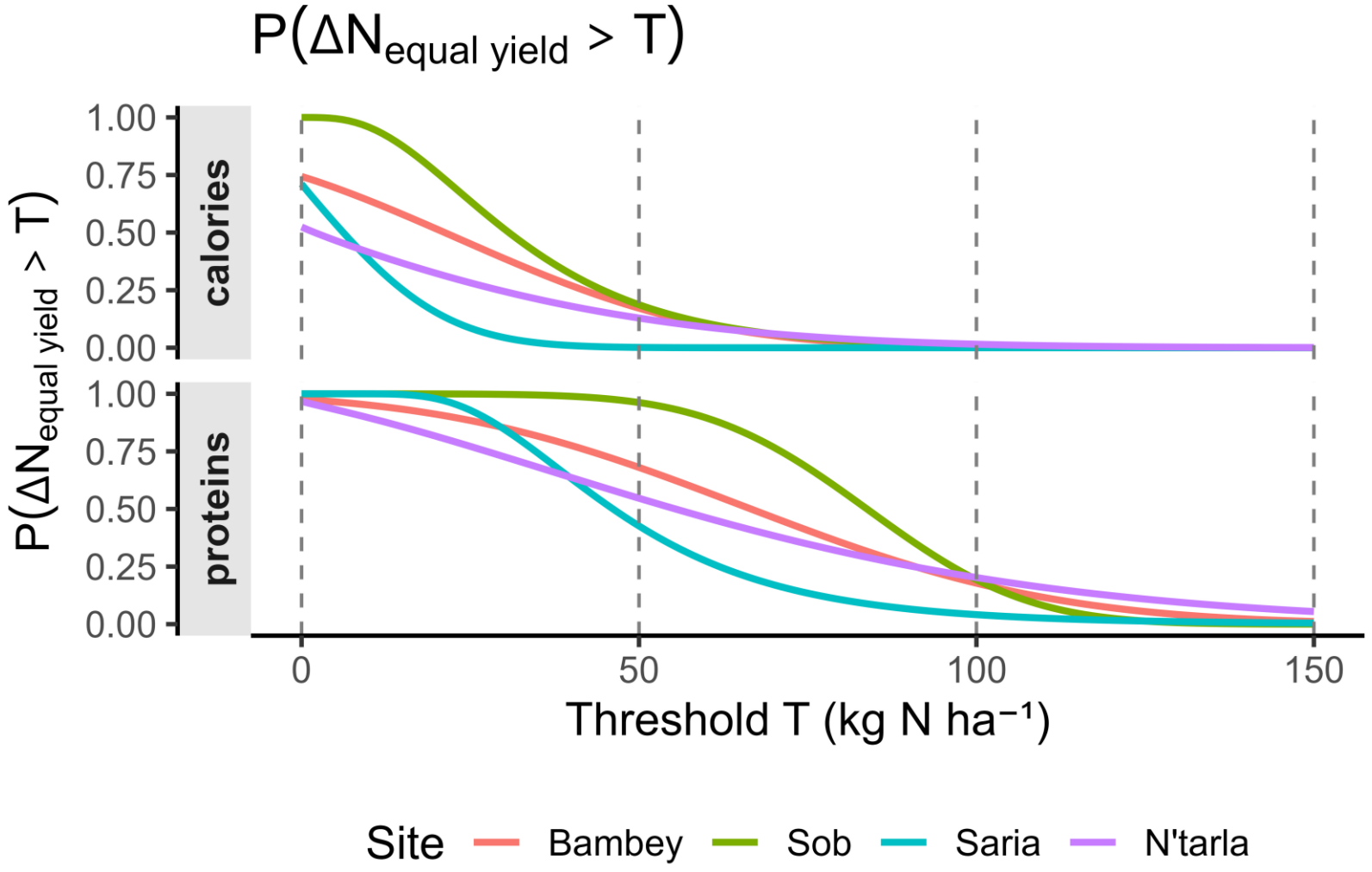


N savings in intercropping while producing 80% of the water limited sorghum yield potential

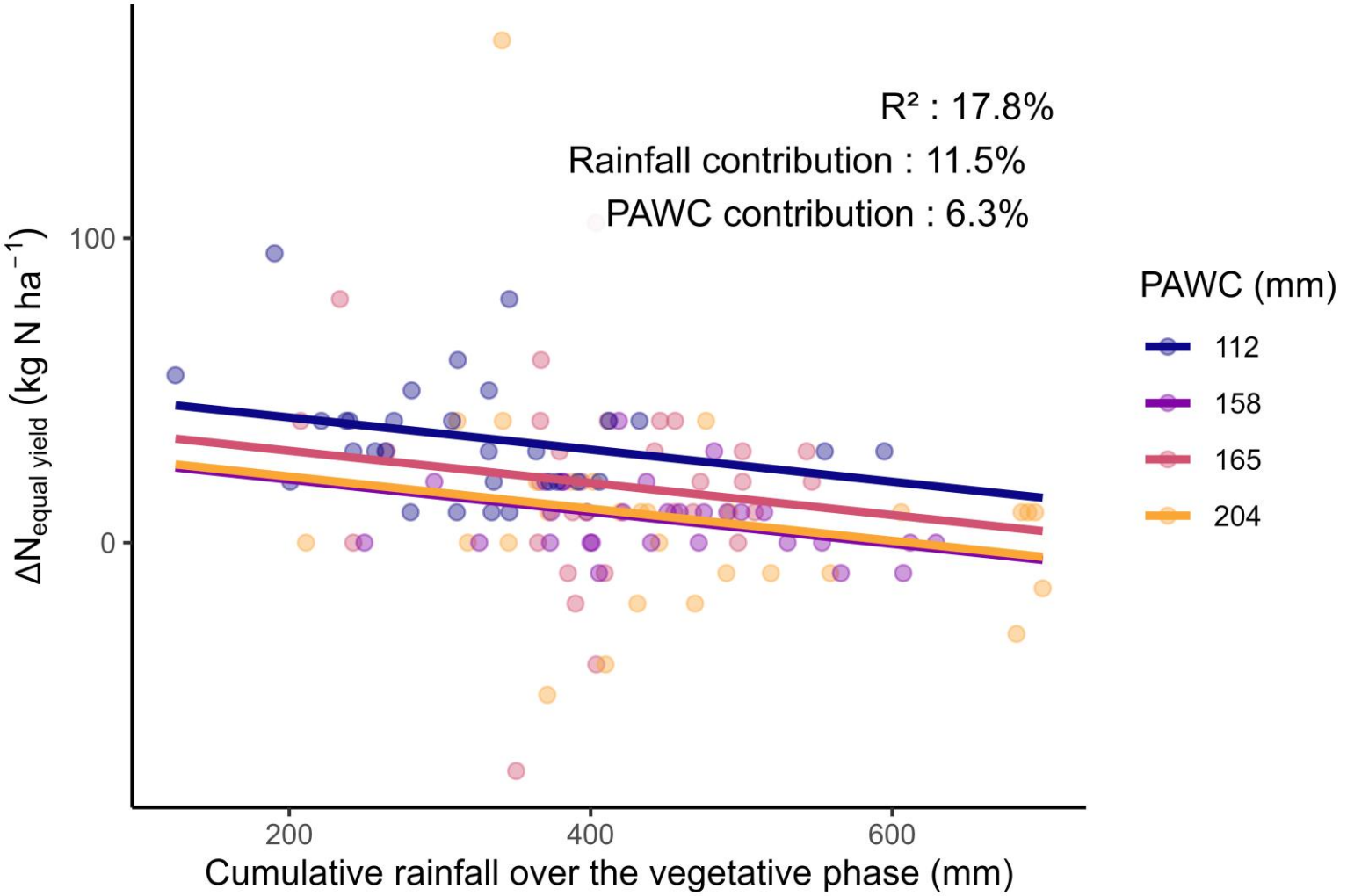
Cumulative rainfall over the growing period



Probability to save N in intercropping while producing 80% of the sorghum water limited yield



Impact of rainfall on N savings in intercropping to produce calories

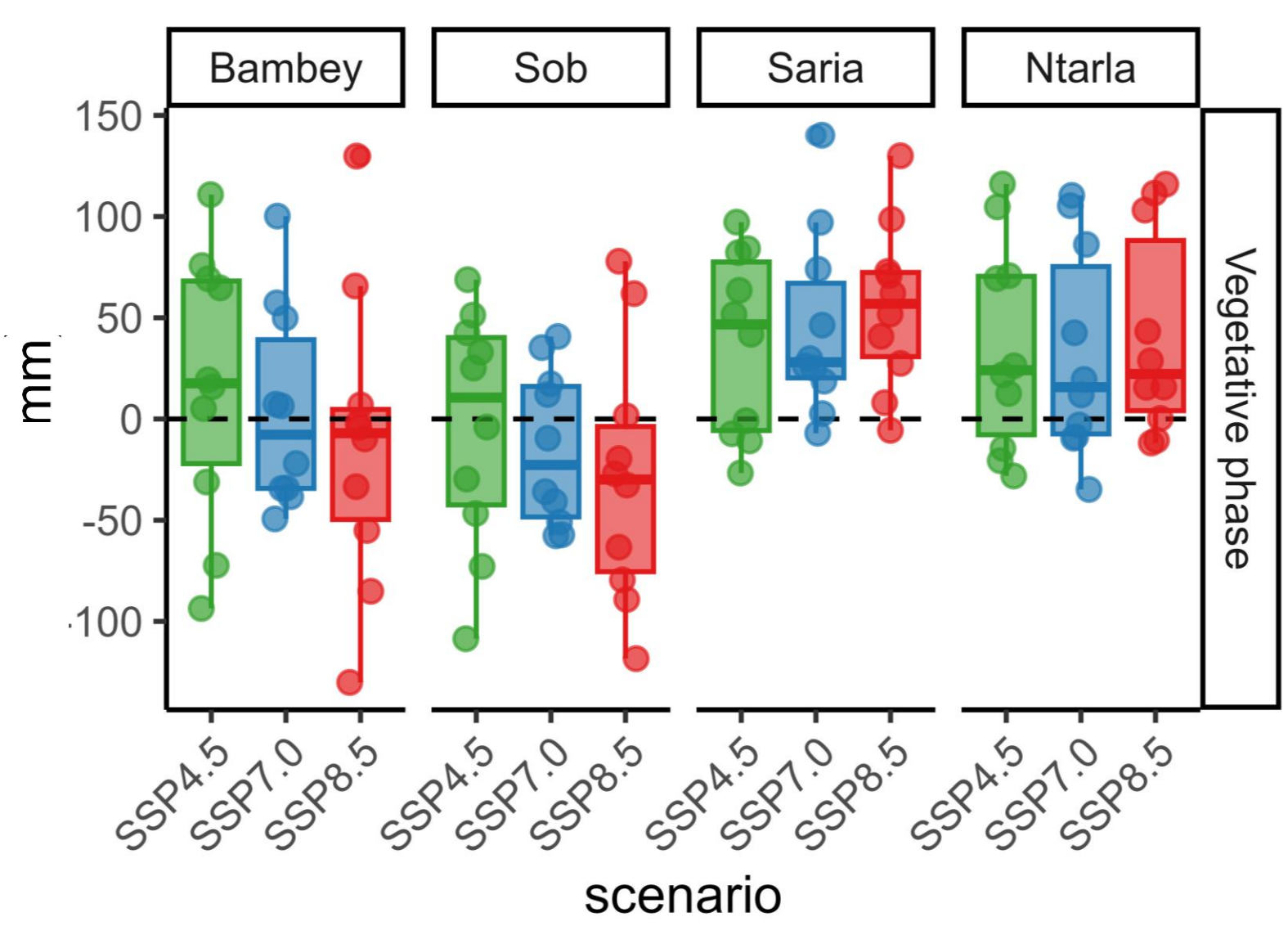


No effect of the cumulative rainfall over the reproductive phase.

Impact of rainfall on N savings in intercropping to produce proteins

No effect of climate variability on the N savings to produce proteins

Change in average seasonal rainfall - West Africa
Historical (1980-2010) vs Future (2030-2060)



Take home message

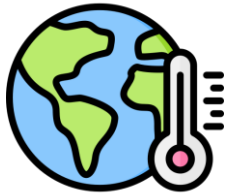
Intercropping saves a share of the N needed for sustainable intensification

Intercropping was more beneficial in drier conditions (Adam et al., 2025)

Rainfall variability affected N savings by intercropping

↘ cumulative rainfall during the reproductive phase ↗ N savings to produce calories

No effect on N savings for protein production



Climate scenarios

- **Senegalese sites:** ↘ cumulative rainfall ↗ N savings
- **Burkinian / Malian sites :** ↗ cumulative rainfall ↘ N savings