



Effect of N fertilizer amount and water management on CO₂ exchange and net ecosystem C balance of rice cultivation in Southern Benin, west Africa

Sossa C.L.G^{1*}, Naab J¹, Augustin J², Sanogo S¹, Sintondji L¹, Hoffmann M²

¹West African Science Service Centre on Climate Change and Adapted Land Use, BP423, Bamako, Mali

²Leibniz Centre for Agricultural Landscape Research 15374 Müncheberg, Germany

*Email: sogeof1992@gmail.com

Background

- Water management affects the organic matter mineralization → increasing CO₂ emissions
- N application increase crop biomass and the microbial decomposition of the crop residues soil → CO₂ flux

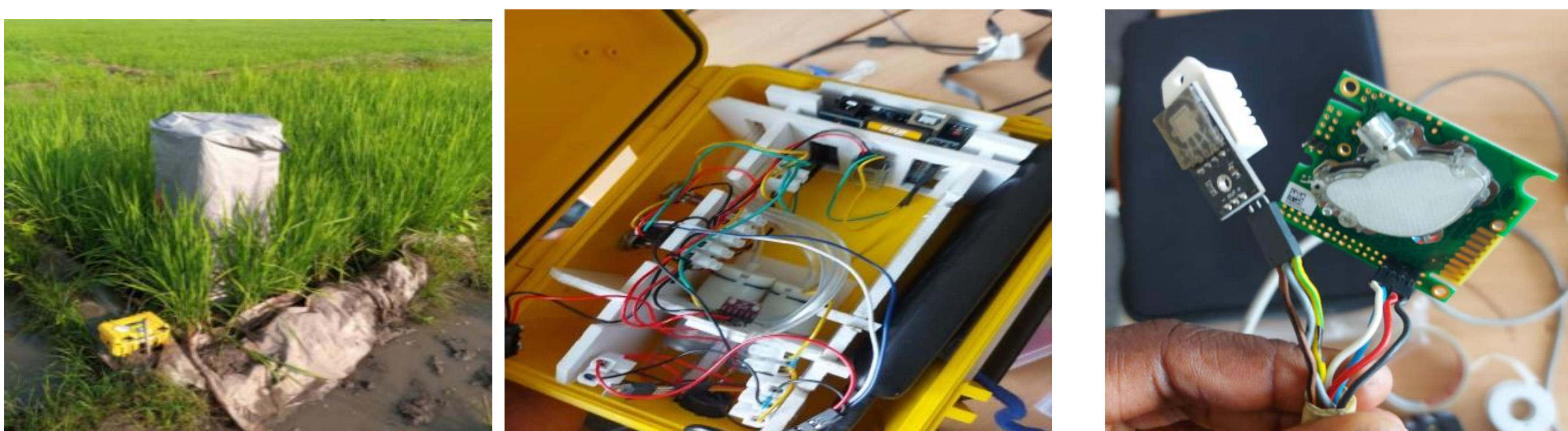
Objectives

- To investigate the effect of different water management and N fertilizer amount on CO₂ emission.
- Assess the NECB from rice cultivation under different water technologies and N Fertilizer amount

Methods

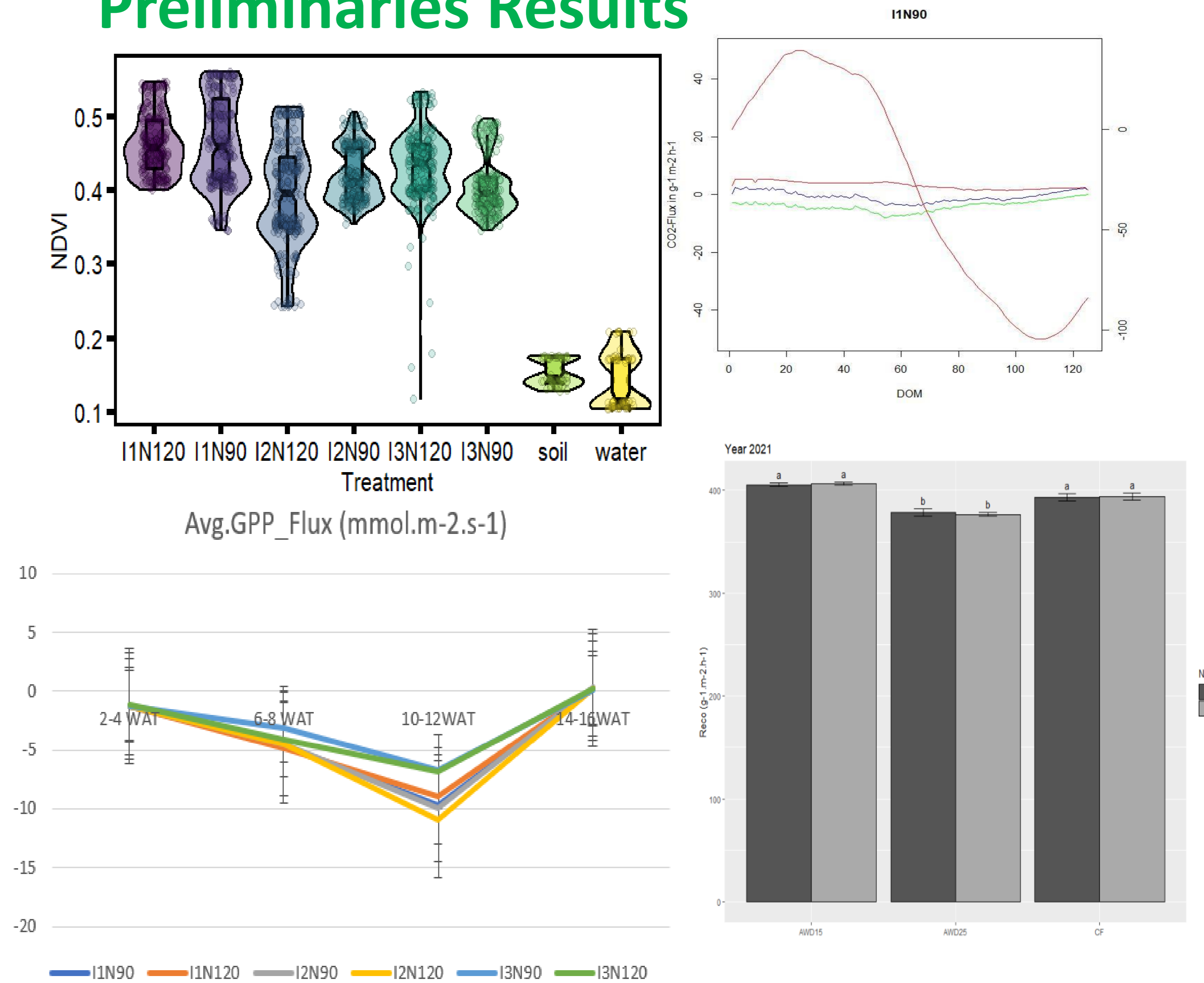


- koussin Lele (7°15'N, 2°16'E), Southern Benin
- Main factor (Water management): Continuous flooding (CF), Alternate Wetting and Drying (AWD 15 and AWD25)
- split-plot experimental design (Oct.21- Feb.22)
- CO₂ sensor K30FR, DHT22 for Temp. and RH, all connected to the Minions (New low cost system)
- Weekly NDVI measurement



- GPP(Transparent chamber) and Reco (dark chamber)
- Ideal gas law using a linear regression approach
- GPP=f(PAR) and Reco=f(T)

Preliminaries Results



- Higher avg. cumul. GPP was recorded with the CF treatments ($-497.357 \pm 2.11 \text{ g}^{-1} \text{ m}^{-2} \text{ h}^{-1}$ and $-492.936 \pm 1.423 \text{ g}^{-1} \text{ m}^{-2} \text{ h}^{-1}$)
- Lower avg. cumul. Reco was recorded in AWD25 treatments comparatively to other treatments ($377.356 \pm 3.523 \text{ g}^{-1} \text{ m}^{-2} \text{ h}^{-1}$)
- CFN90 : gain of $89 \text{ g} \pm 1.32 \text{ C m}^{-2} \text{ h}^{-1}$ during the first growing season

Conclusion

- AWD 15 N90 is more promising in term of yield and low emission of CO₂
- Autotropic respiration and Heterotrophic respiration will be measured separately
- Estimation of the full Annual NECB will be performed for each treatment

Reference

Hoffmann M, Jurisch N, M, Sommer M, Augustin J (2015): Automated modeling of ecosystem CO₂ fluxes based on periodic closed chamber measurements: a standardized conceptual and practical approach. *Agric. For. Meteorol.* 200, 30–45

Acknowledgment

