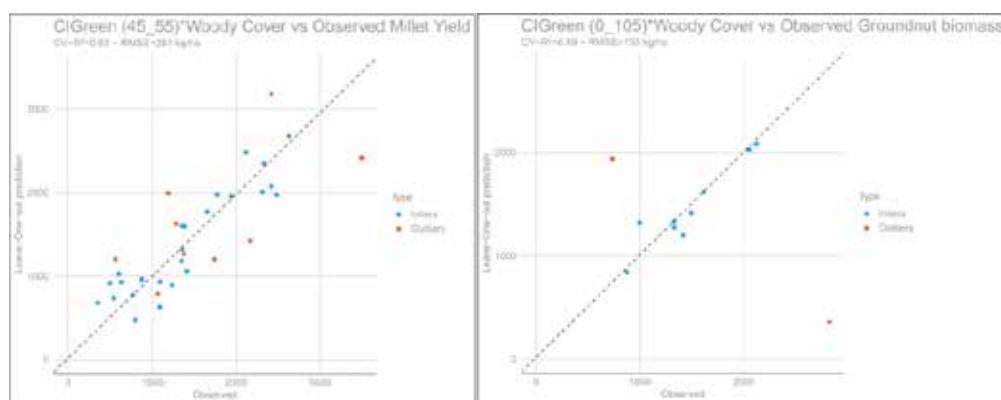


## Impacts of FMNR on the agricultural performance of smallholder farming systems at landscape scale in Senegal

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Management of isolated trees as an integrated part of smallholder farming systems has long been a key food security strategy in Africa. Current knowledge on the impact of parklands structuring on agrosystems productivity is limited. Combining multisources remote sensing, landscape ecology and statistical modelling, this study aims at evidencing the contribution of FMNR to the agricultural performance of smallholder farming systems at landscape scale in Senegal. Agronomical surveys were conducted in 2017 and 2018 on 70 farmers' fields with heterogeneous trees composition. We assessed groundnut aboveground biomass (AGB) and millet grain yield (GY). Proxies for parklands composition and vegetation productivity were derived from remote sensing. Regression models were calibrated and model parameters were optimized using a random sample consensus method accounting for measurement uncertainties. For 2017, Green chlorophyll index over millet flowering phase and whole groundnut cropping cycle allowed estimating GY and AGB with  $R^2$  of 0.76 and 0.67 respectively. Integrating information on tree cover structure (fraction of soil covered by trees) increased assessment accuracy by 7% for millet GY ( $R^2=0.83$ ) and 22% for groundnut AGB ( $R^2=0.89$ ). These promising results have to be strengthened with data from ongoing cropping season but they already indicate the need to integrate information on trees at landscape scale to better assess agricultural performance of smallholder farming systems.



Millet grain yield estimation (left) and groundnut aboveground biomass estimation (right) with a linear model and a random sample consensus algorithm applied to linear regression. Input variables are chlorophyll index, woody cover and phenological information derived from multisources high spatial resolution remote sensing data.

**Keywords:** Parklands, Senegalese Peanut Basin, crop productivity, remote sensing, landscape.