

# Using UAV and geostatistics to upscale crop yield in heterogeneous agro-silvo-pastoral system

*Yélognissè Agbohessou\*, Alain Audebert, Adama Ndour, Mame Sokhna Sarr, Christophe Jourdan, Cathy Clermont-Dauphin, Sékouna Diatta, Louise Leroux, Simon Taugourdeau, Diaminatou Sanogo, Josiane Seghieri, Claire Delon, and Olivier Rupsard*

"Faidherbia-Flux" Web site :  
<https://lped.info/wikiObsSN/?Faidherbia-Flux>

Contact: [ayulrich@yahoo.fr](mailto:ayulrich@yahoo.fr)



## Research Questions

**1**

How much does *Faidherbia albida* tree benefit groundnut and millet crops?

**2**

How far does *Faidherbia albida* tree benefit groundnut and millet crops?

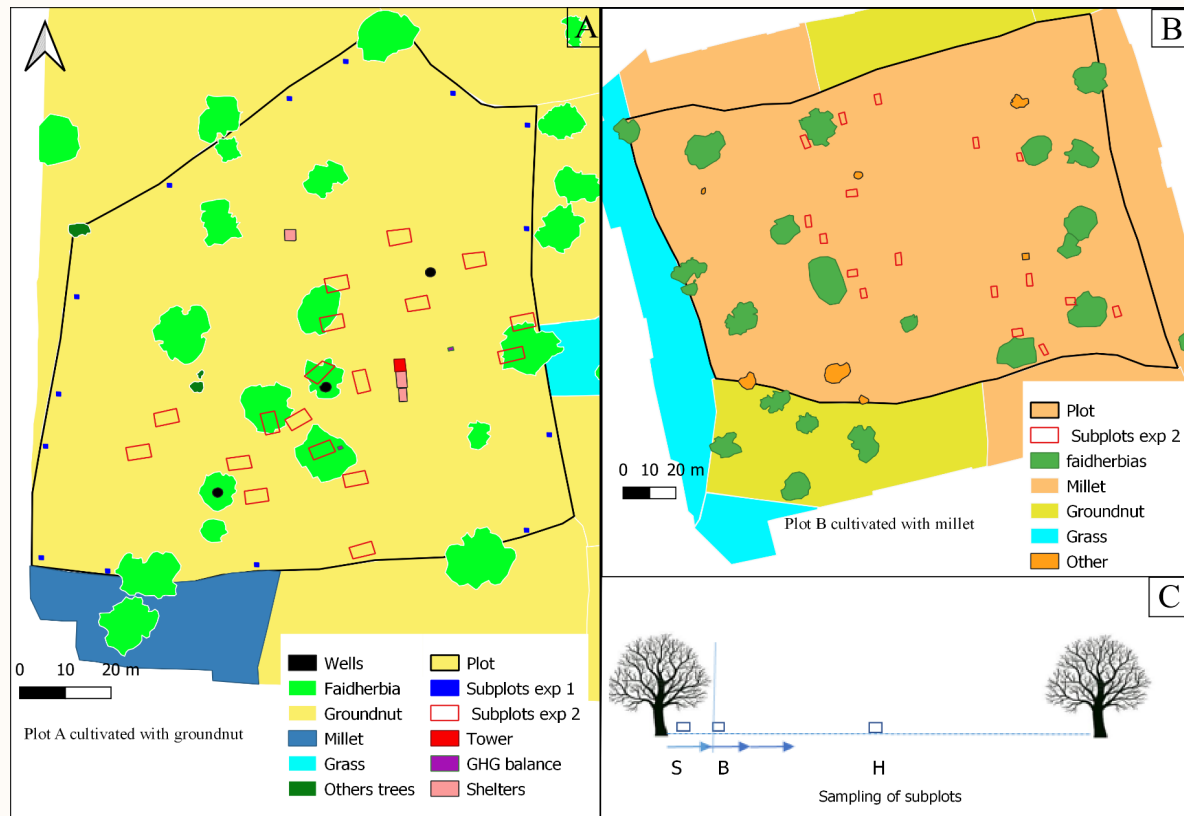
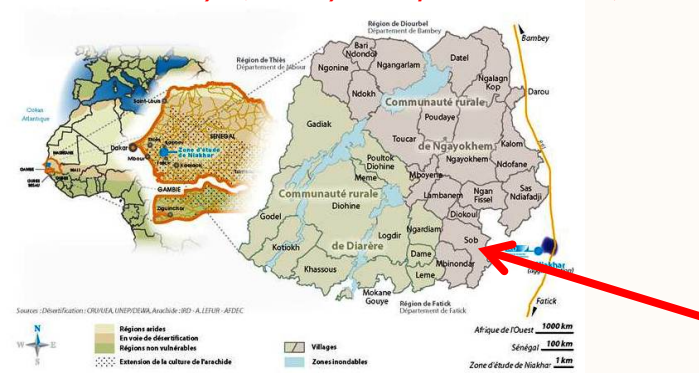
**3**

Can we upscale results from small sampling plots to the whole stand ?

# Materials and methods

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## Niakhar Health-Population-Environment Observatory\* (> 50 yrs of past research)



<https://lped.info/wikiObsSN/?AcCueil>

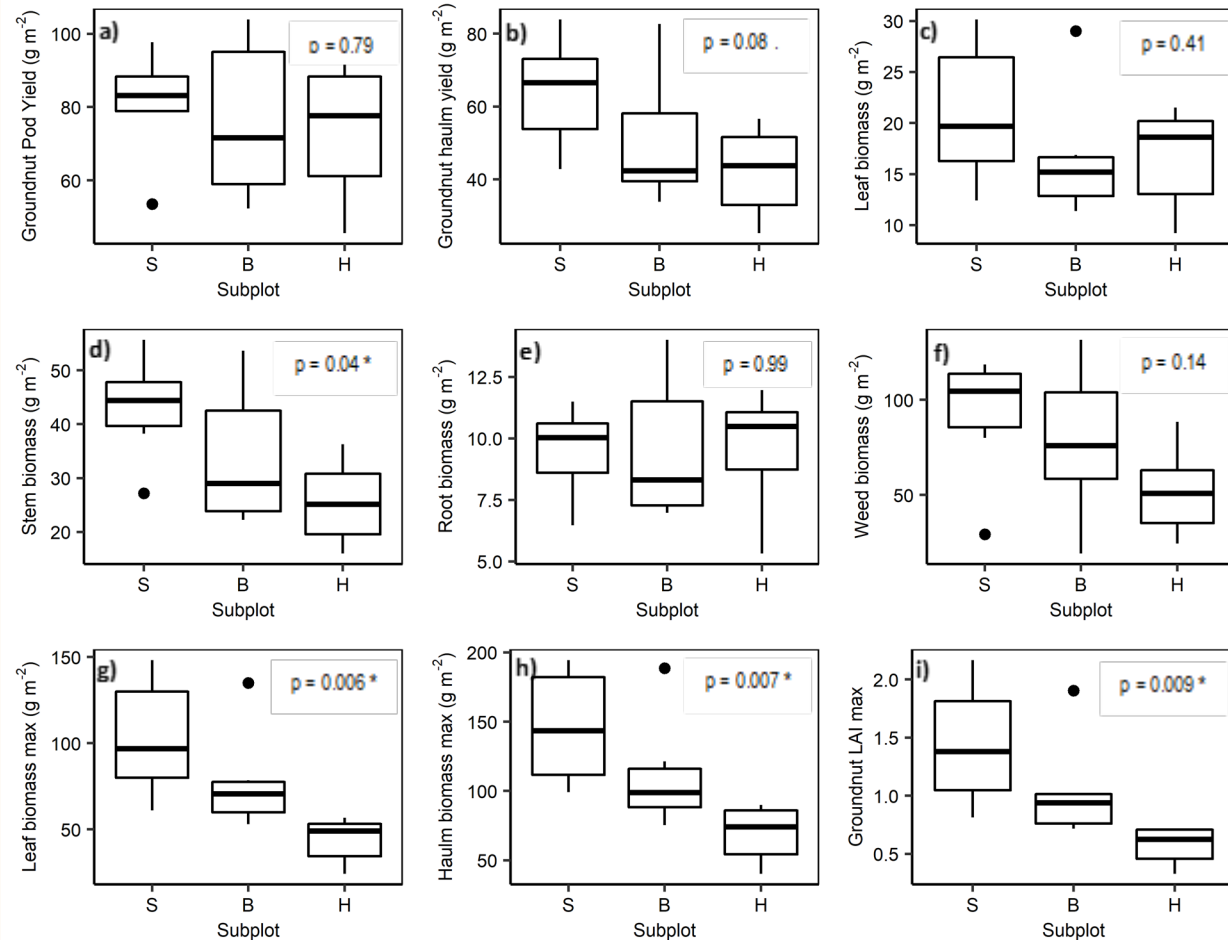


UAV flights

"Faidherbia-Flux" : Plots and sampling

# Results: How much does *F. albida* benefit to groundnut crop?

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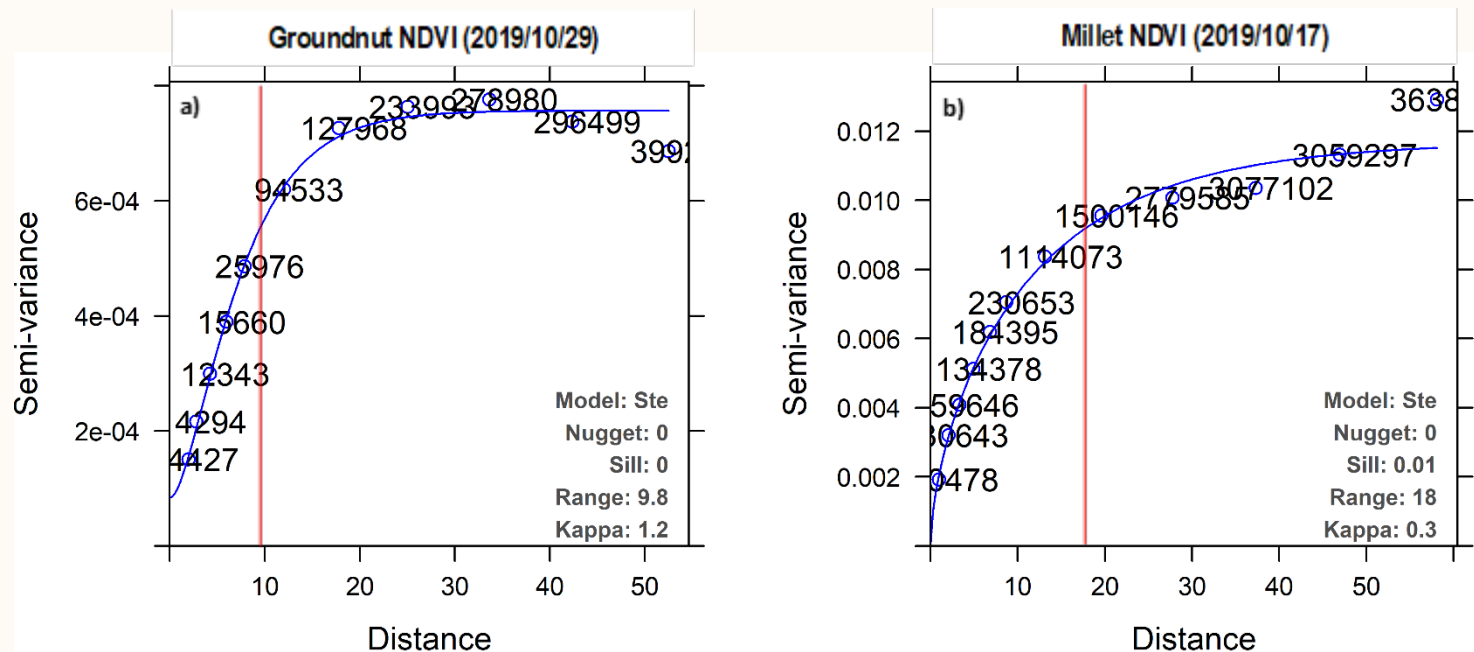


1. 50% increase in haulm yield under *F. albida* crown
2. Significant positive effect of *F. albida* on groundnut LAI, and haulm yield (leaf + stem biomass)
3. No significant effect of *F. albida* on groundnut pod yield and root biomass



# Results: How far does *F. albida* benefit to crops?

4



*F. albida* affects the groundnut NDVI signal up to 9.8-m and the NDVI of millet up to 18-m, confirming for millet the results of Roupsard and al. (2020)

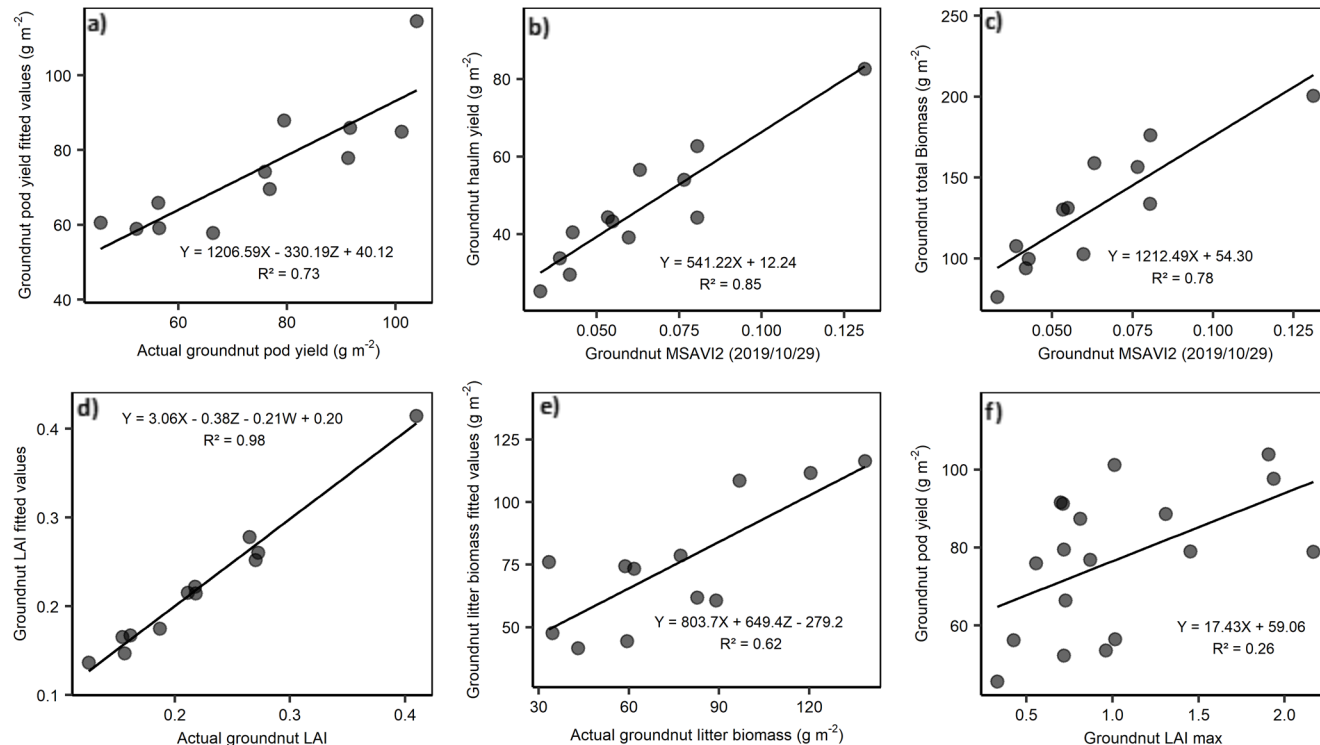
How far does the tree affect the crop in agroforestry? New spatial analysis methods in a *Faidherbia* parkland

Olivier Roupsard<sup>a,b,c,\*</sup>, Alain Audebert<sup>d,e,f</sup>, Adama P. Ndour<sup>f</sup>, Cathy Clermont-Dauphin<sup>g,c</sup>, Yelognissé Agbohessou<sup>c,h</sup>, Josias Sanou<sup>i</sup>, Jonas Koala<sup>j</sup>, Emile Faye<sup>k,l</sup>, Diaretou Sambakhe<sup>f</sup>, Christophe Jourdan<sup>a,b,c</sup>, Gueric le Maire<sup>m,b</sup>, Laure Tall<sup>n,c</sup>, Diaminatou Sanogo<sup>h</sup>, Josiane Seghier<sup>i</sup>, Laurent Cournac<sup>b</sup>, Louise Leroux<sup>o,p,q</sup>



# Results: Can we upscale groundnut yield from small plots to the whole stand ?

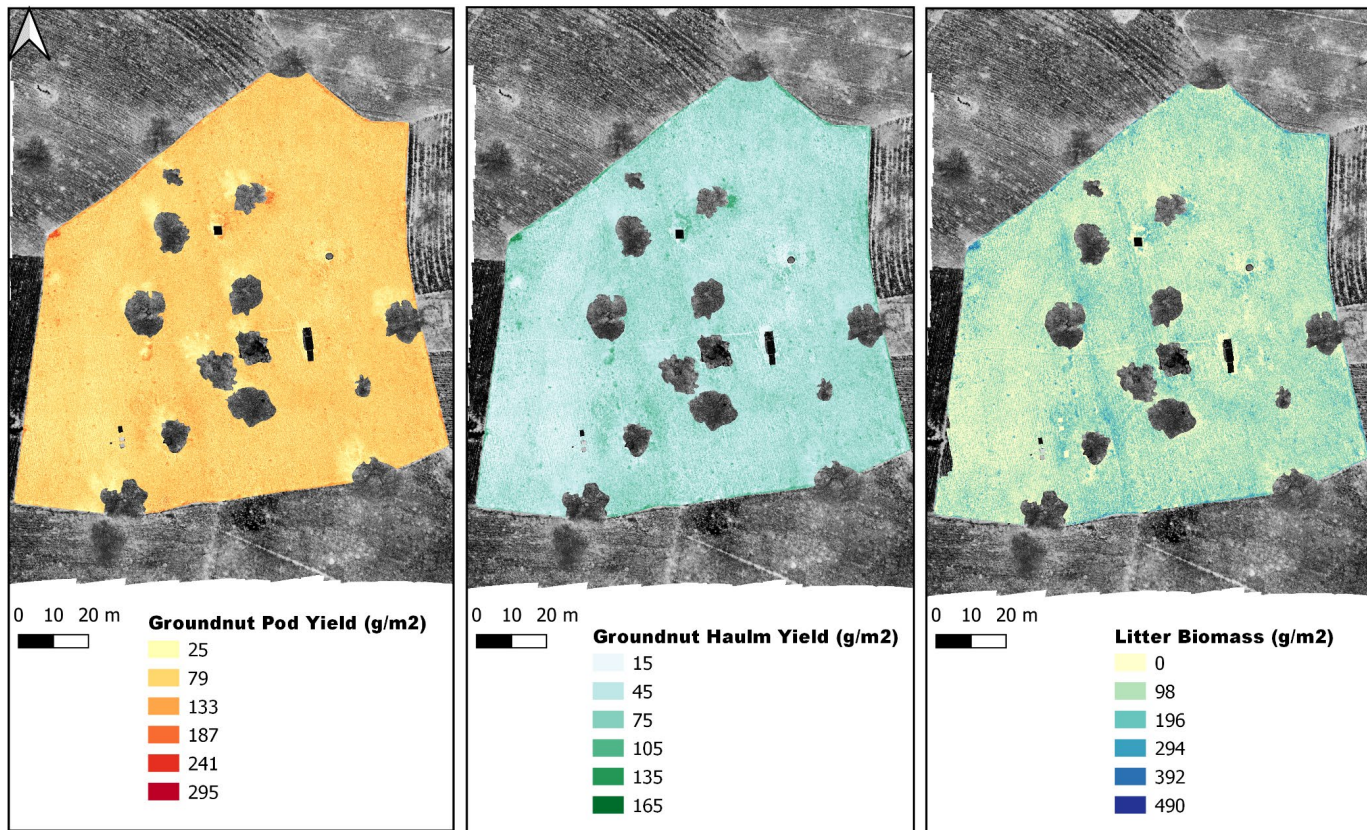
4



- Pod yield was strongly correlated with MSAVI2 + NDVI.
- Both groundnut haulm yield and total groundnut biomass were strongly correlated with MSAVI2.
- The litters biomass was strongly correlated with NDVI

# Results: Can we upscale groundnut yield from small plots to the whole stand ?

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The estimated pod yield for the whole plot was  $0.81 \text{ t h}^{-1}$ , the estimated haulm yield was  $0.52 \text{ t h}^{-1}$



# Conclusion

- ❖ *F. albida* improves the haulm yield of the groundnut crops under its crown by about 50%. However, unlike its strong effect on millet ( $\times 3$  under tree crown), it does not significantly affect the groundnut pod yield..
- ❖ *F. albida* affects the groundnut NDVI signal up to 9.8-m and the NDVI of millet up to 18-m.
- ❖ Groundnut pod and haulm yield were mapped at the whole-plot scale. Groundnut pod and haulm yield were estimated with only 8% and 13% error as compared to actual whole plot harvest, respectively.





Scan Me

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Thank you for your  
kind attention

*Djèredjèf*

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Roupsard O., Audebert A., Ndour A.P., Clermont-Dauphin C., Agbohessou Y., Sanou J., Koala J., Faye E., Sambakhe D., Jourdan C., le Maire G., Tall L., Sanogo D., Seghieri J., Cournac L., Leroux L. (2020). How far does the tree affect the crop in agroforestry? New spatial analysis methods in a Faidherbia parkland. Agriculture, Ecosystems & Environment, vol. 296, p. 106-928