

Soil carbon sequestration and food security in Sub-Saharan Africa: Synergies and Tradeoffs

Gatien Falconnier



The Guardian

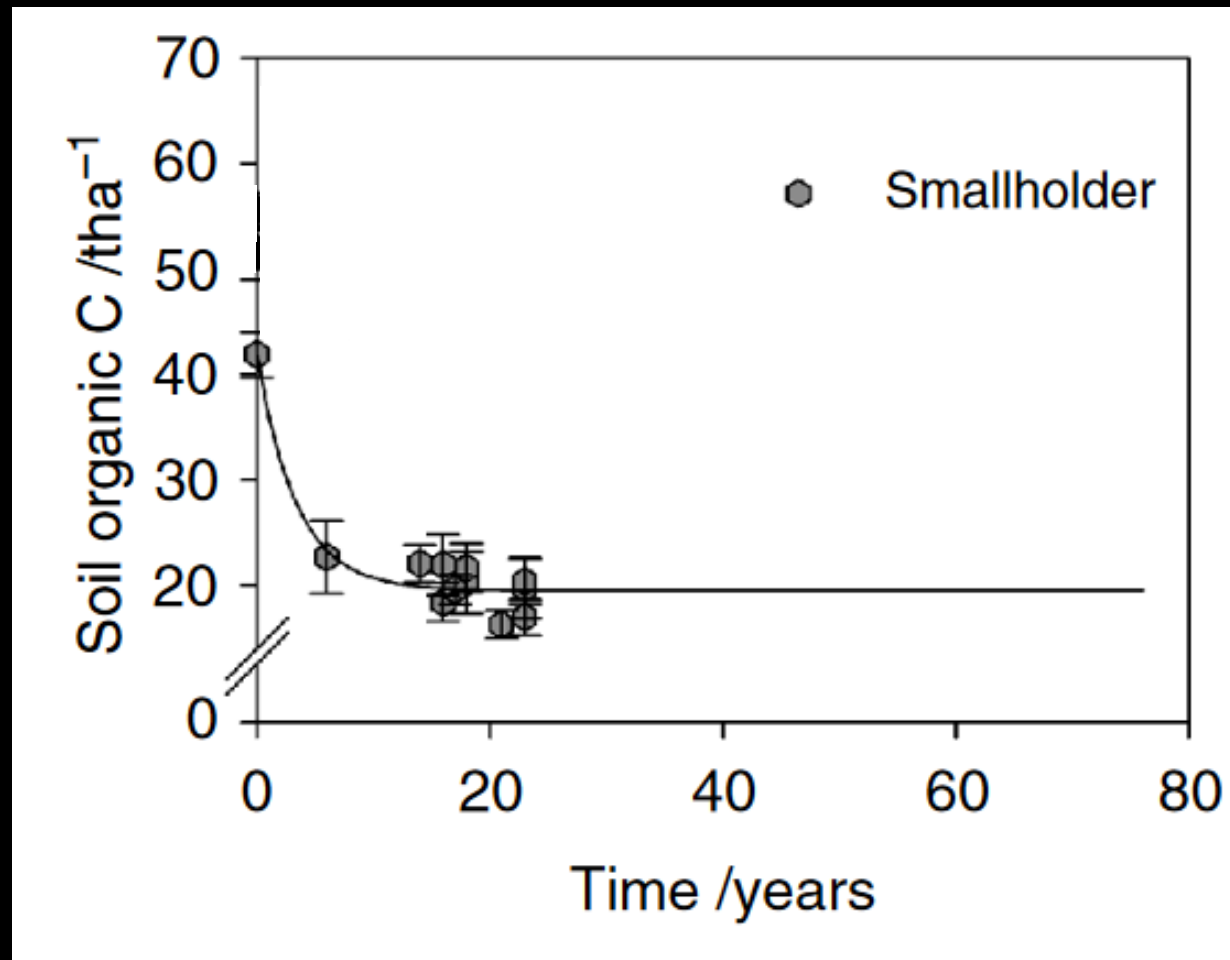
Zimbabwe on verge of 'manmade starvation', warns UN envoy

Food shortages affecting 60% of country's population threaten to make political instability worse, says UN expert



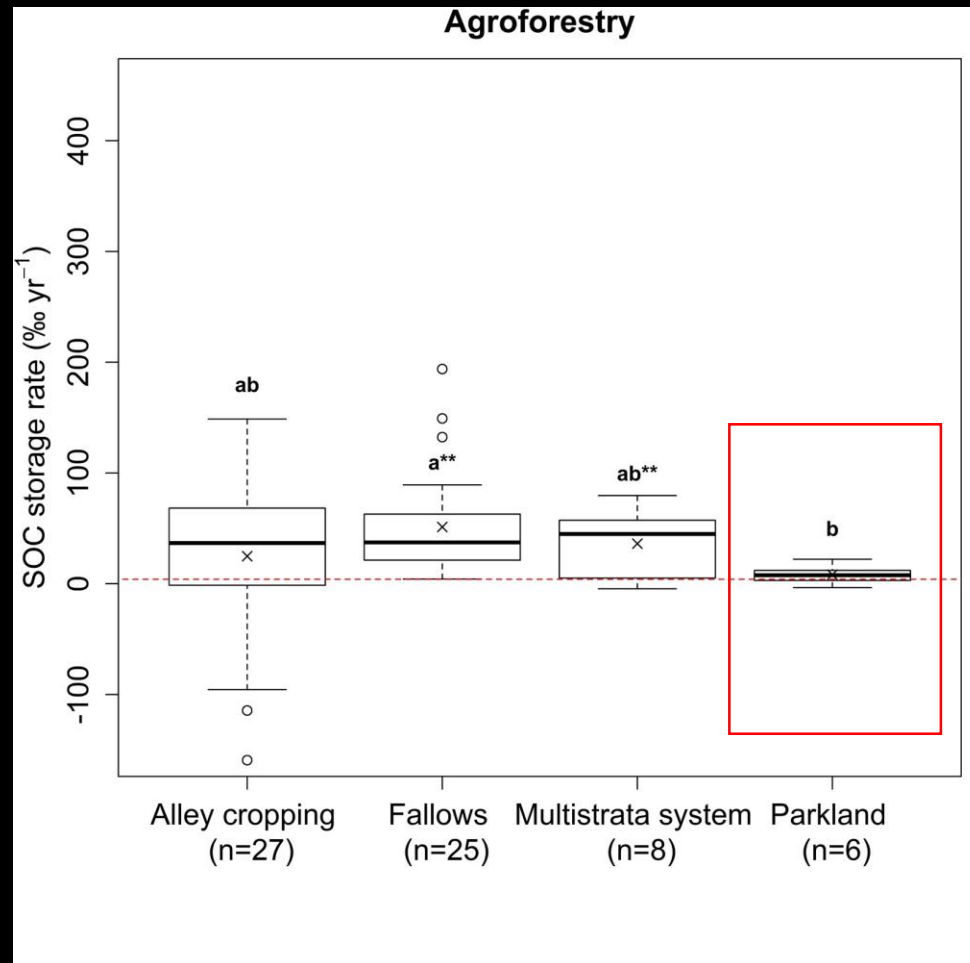


Soil organic carbon in smallholder fields



Zingore, S., Manyame, C., Nyamugafata, P., Giller, K.E., 2005. Long-term changes in organic matter of woodland soils cleared for arable cropping in Zimbabwe. *European Journal of Soil Science* 56, 727–736.

Potential of agroforestry

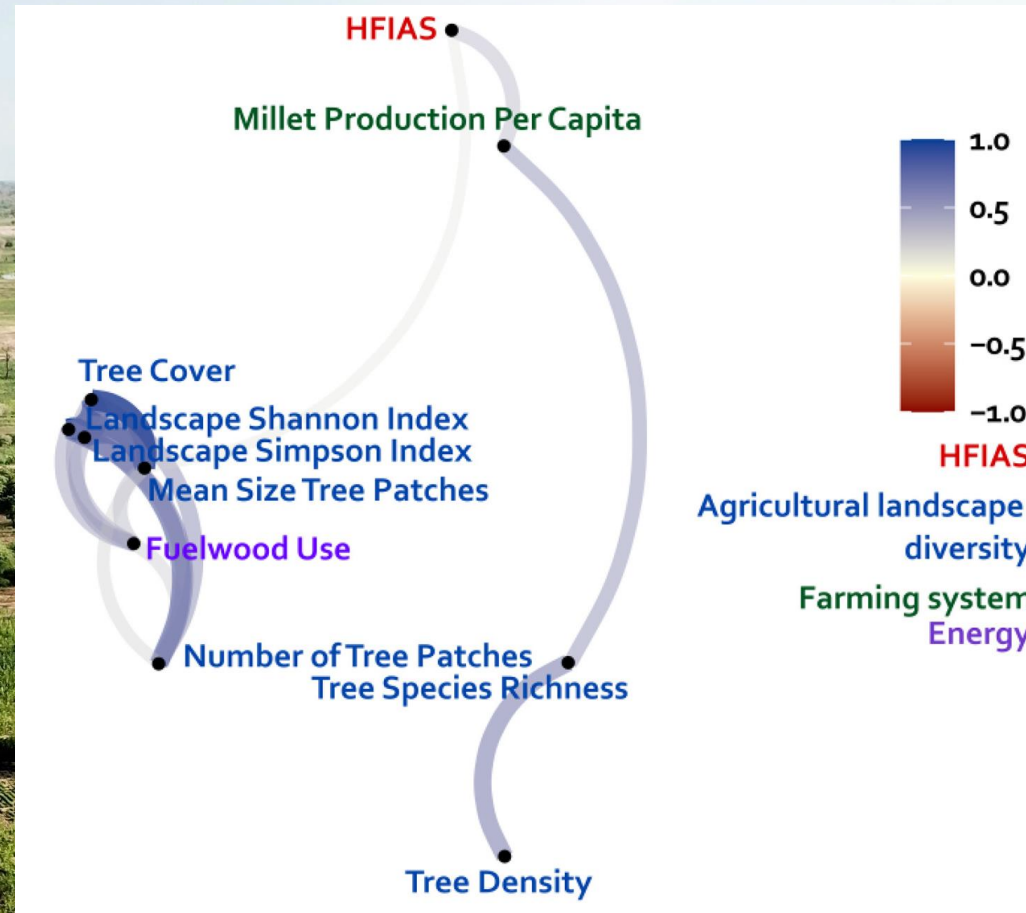


Corbeels et al., 2018. *The 4 per 1000 goal and soil carbon storage under agroforestry and conservation agriculture systems in sub-Saharan Africa*. Soil and Tillage Research.

Agroforestry

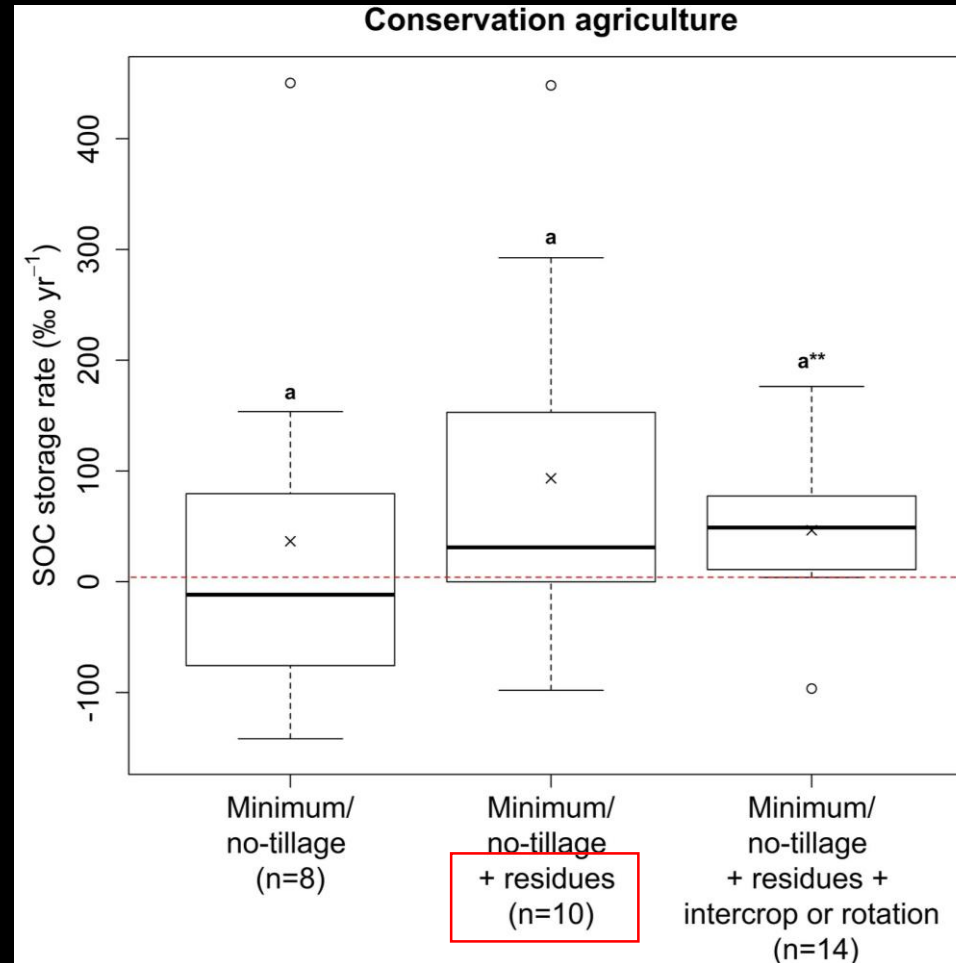


Trees related to greater food security



Leroux, L., Faye, N.F., Jahel, C., Falconnier, G.N., Diouf, A.A., Ndao, B., Tiaw, I., Senghor, Y., Kanfany, G., Balde, A., Dieye, M., Sirdey, N., Aloba Loison, S., Corbeels, M., Baudron, F., Bouquet, E., 2022. *Exploring the agricultural landscape diversity-food security nexus: an analysis in two contrasted parklands of Central Senegal*. *Agricultural Systems* 196, 103312.

Conservation agriculture

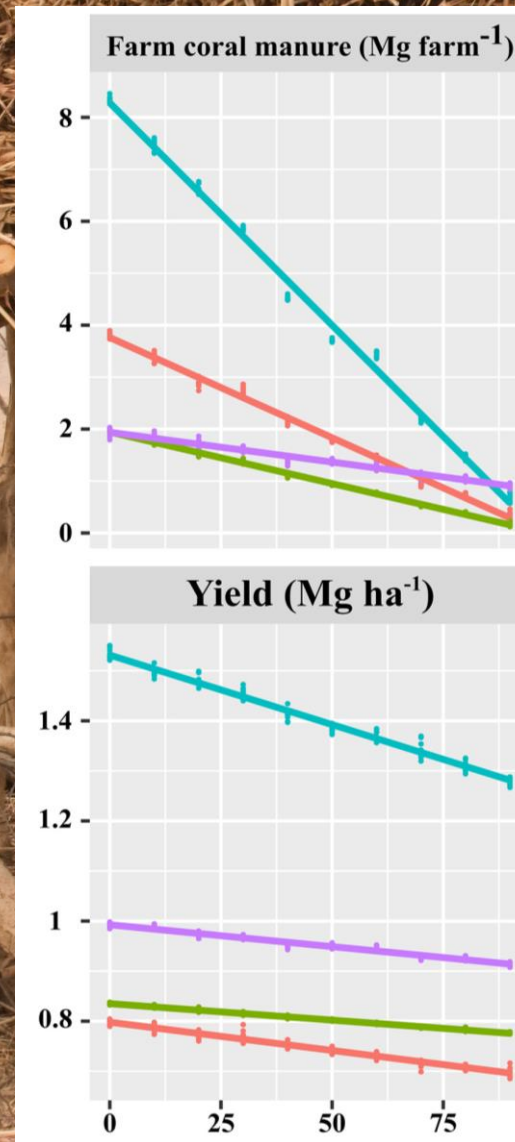
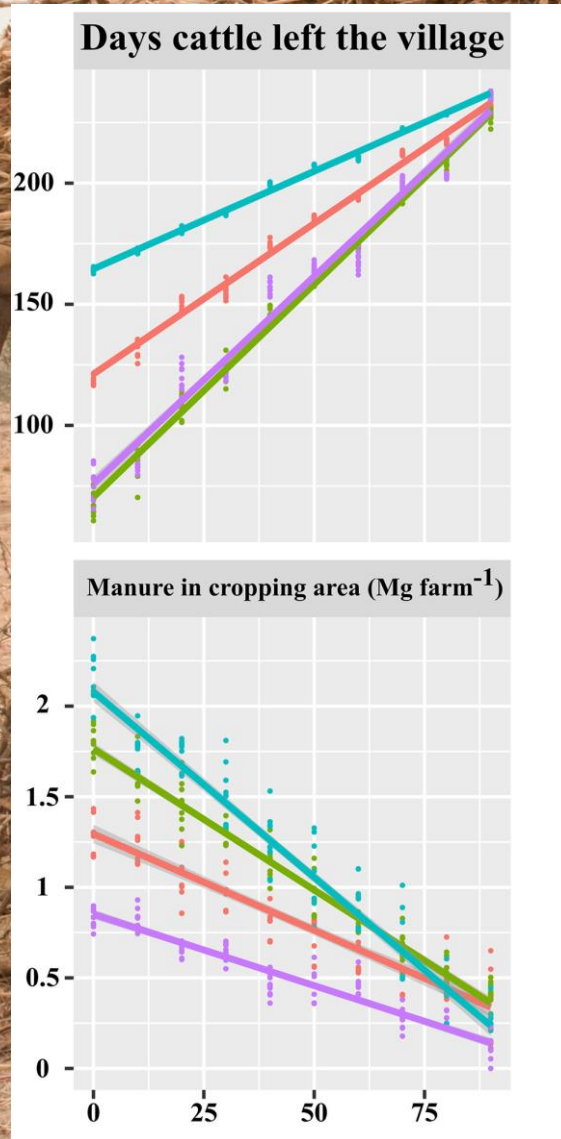


Corbeels et al., 2018. *The 4 per 1000 goal and soil carbon storage under agroforestry and conservation agriculture systems in sub-Saharan Africa*. Soil and Tillage Research.

Trade-off for the use of residues



Trade-off for the use of residues



Proportion of total cropping land under crop residue mulching (%)

Agro-pastoralist

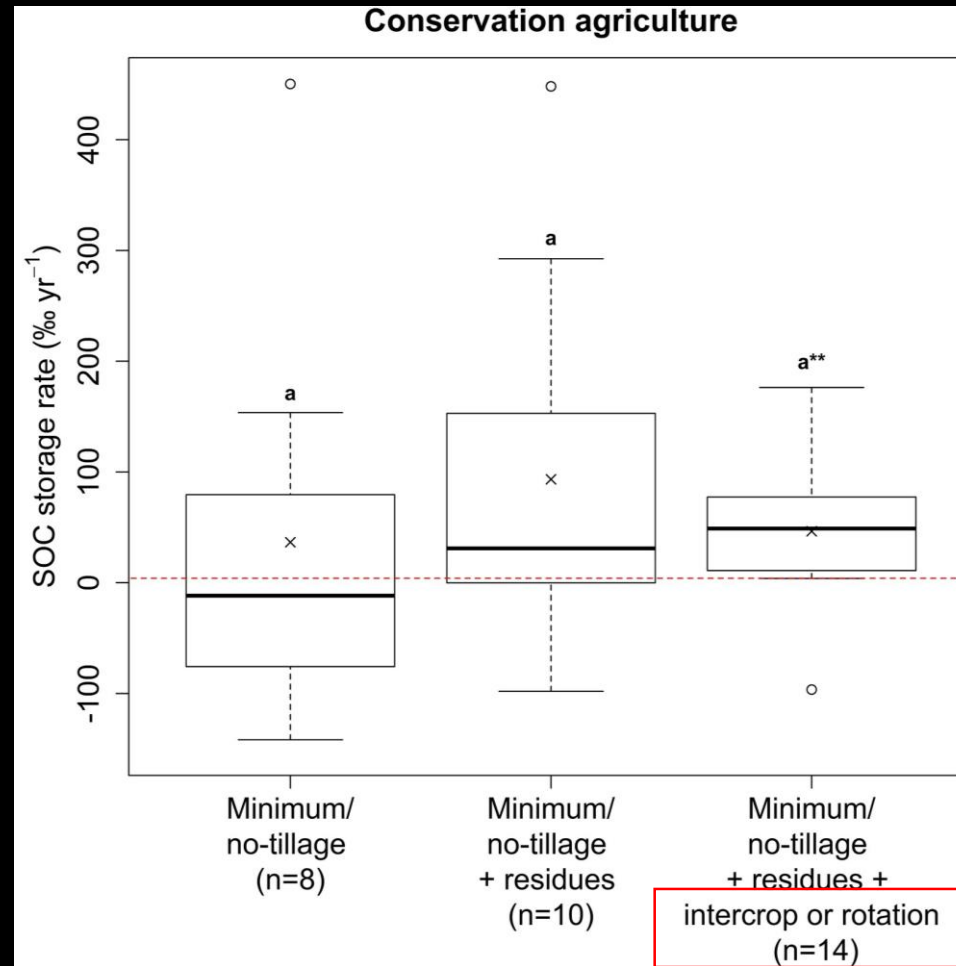
Susistence-oriented

Market-oriented

Pastoralist

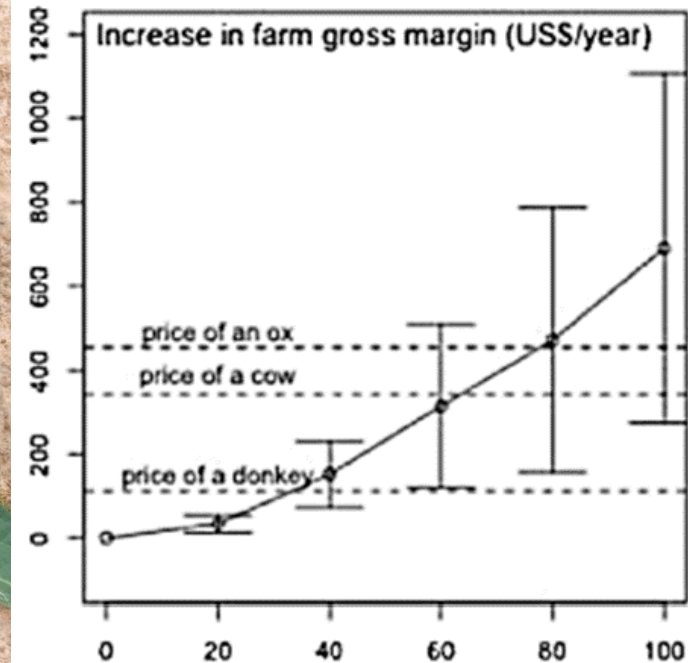
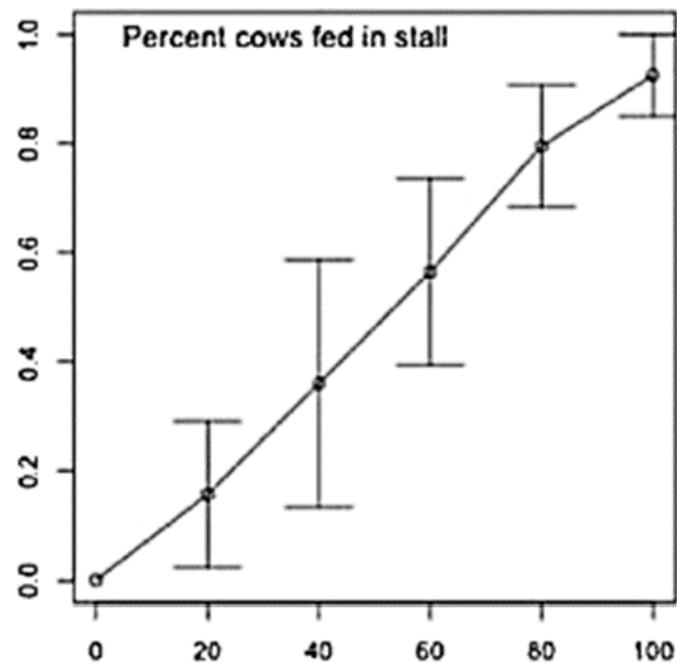
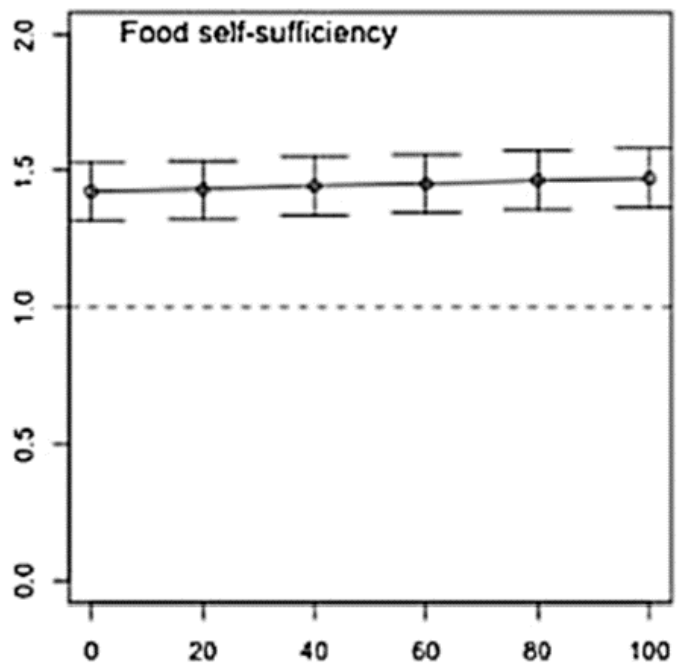
Berre et al., 2021. Biomass flows in an agro-pastoral village in West-Africa: Who benefits from crop residue mulching? *Agricultural Systems* 187, 102981.

Conservation agriculture



Corbeels et al., 2018. *The 4 per 1000 goal and soil carbon storage under agroforestry and conservation agriculture systems in sub-Saharan Africa*. Soil and Tillage Research.

HRE-LH



% area of maize intercropped with cowpea

Falconnier et al., 2017. Co-learning cycles to support the design of innovative farm systems in southern Mali. European Journal of Agronomy 89, 61–74.

Conclusion

- Food security is the main issue at stake, need to increase yield to feed a growing population
- Opportunities for synergies between parklands, carbon sequestration and food security
- Strong trade-off in crop-livestock systems if residues are to be retained on the soil



Thank you!



Photo: Rik Schulling / TropCrop - TCS