Soil fertility gradients in the Smallholder Cropping Systems in Limpopo Province, South Africa

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Introduction

- Maintaining soil fertility is key for the low input smallholder cropping systems in southern Africa. However, due to resource limitations, these farmers are often constrained to provide the necessary input to avoid nutrient mining.
- Farmers therefore, tend to apply the limited available input only to nearby homestead fields while remote fields are typically neglected.

<u>Objective</u>:

Assessing soil fertility gradients in smallholder cropping systems of Limpopo – South Africa

Materials and Methods

- Study area**: Limpopo, South – Africa** (Fig. 1a)
- **4 Sites** (Gabaza, Mafarana, Selwana and Tshipuseni – selected across a climate gradient)
- For each site homestead fields (**Home**) and remote fields (**Field**) were assessed (Fig.1b)
- In total 58 farmers (with both field types) were surveyed → **116 soil samples**
- <u>The following soil fertility indicators were analysed</u>:

pH (KCl), available P (Bray II), soil texture, OC (Walkley – Black), N (dry combustion)
Extractable (1M KCl) Ca, Extractable (Ambic) K, and Zn.

- **Differences between the field types and sites were evaluated with the t-test**

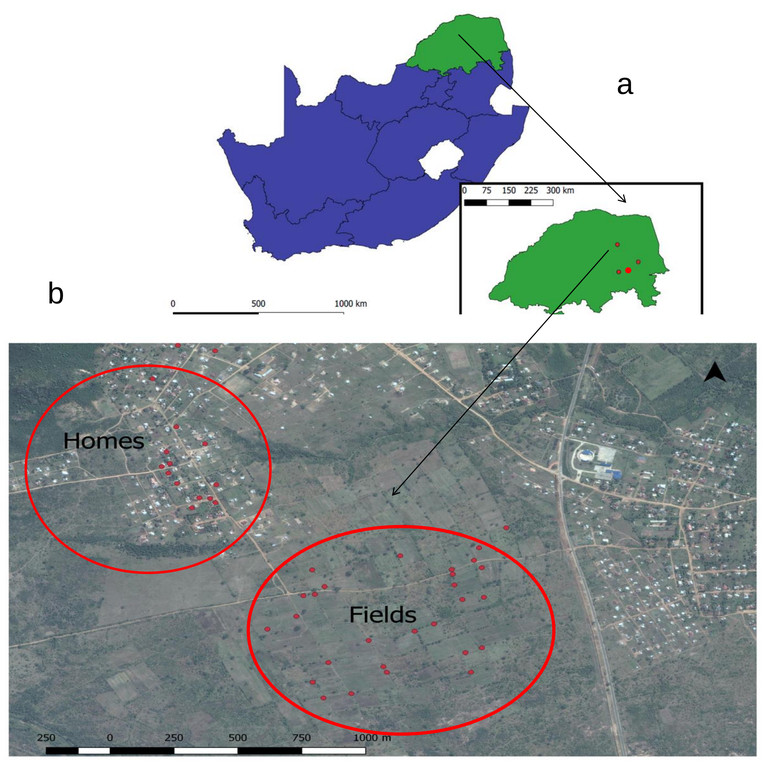

Fig. 1 Map of Limpopo (a) and soil sample gradients in Tshipuseni (b)

Results

Tab. 1 Soil physical and chemical properties across field types and sites

	Mean ± Standard deviation		P-values	
<u>Variables</u>	**<u>Home</u>**	**<u>Field</u>**	**<u>Types</u>**	**<u>Sites</u>**
Clay (%)	26.15 ± 8.17	31.02 ± 13.23	< 0.05	< 0.05
Sand (%)	63.83 ± 10.21	59.04 ± 15.25	< 0.05	< 0.05
pH	6.52 ± 0.79	4.78 ± 0.47	< 0.05	0.26
N (%)	0.07 ± 0.04	0.07 ± 0.04	0.44	< 0.05
P (mg kg^{-1})	63.95 ± 48.83	25.62 ± 25.32	< 0.05	< 0.05
K (mg kg^{-1})	392.85 ± 220.36	215.59 ± 162.85	< 0.05	< 0.05
Ca (mg kg^{-1})	1513.33 ± 425.15	1179.74 ± 391.19	< 0.05	0.59
Zn (mg kg^{-1})	13.61 ± 8.90	1.36 ± 1.23	< 0.05	< 0.05
SOC (%)	0.97 ± 0.53	0.98 ± 0.66	0.63	< 0.05

Fig. 2 Relationships between the measured soil fertility variables across all sites

Soil fertility in the smallholder cropping sytems of Limpopo is explained by inherent properties (clay, SOC) and soil nutrient management practices (P, pH, Zn, K) (Tab. 1 and Fig. 2)

Conclusion

Resource allocation strategies in Limpopo have resulted in soil fertilirty gradients with remote fields often neglected while homestead fields receive available inputs.

This gradient should be considered when intensification pathways are discussed for the region.

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