

REVIEW REPORT

SOILD-1-1239-2014

Integrated soil fertility management in sub-Saharan Africa: unravelling local adaptation

Dear editors,

I have reviewed this discussion paper for publication in SOILD. The authors are arguing for inclusion of 'local adaptation' as an essential component of successful ISFM interventions in smallholder farming systems in SSA. First 'local adaptation' is conceptualized and the need for it illustrated with examples of soil fertility patterns within farms, different farm typologies and some limitations to ISFM interventions. The next two chapters describe the impacts of local adaptation on agronomic efficiency (of fertilizer nutrients) at the plot and farm scale. 4 examples are given for the plot scale (liming, secondary and micro-nutrients, tillage, water harvesting) and 2 examples are given for the farm scale (Zimbabwe, western Kenya). The next chapter discusses how (mostly) research on ISFM and local adaptation can be brought to the smallholder farmer and suggests the use of Decision Support Tools and integrated modeling approaches with examples from the NUTMON and NUANCES frameworks and the Nutrient Expert extension support tool. The final chapter draws some conclusions and suggests some research challenges we still face. I liked reading the discussion paper a lot and only have a few suggestions for possible improvement:

- Section 2.1, Lines 9-15: I think it would be worth mentioning all soil forming factors that contribute to the formation of the soil-scape (climate, organisms, topography, parent material, time; Jenny, 1941). As it is written now, only long term weathering and soil redistribution seem to be responsible for a typical soil catena (toposequence). Parent material e.g. is very important in determining inherent soil fertility patterns (e.g. poor sandy soils develop on old African basement rocks whereas richer and more clayey soils develop on younger volcanic materials).
- Section 3.3, Lines 8-11: I am surprised about the association of plough-pan formation with 1:1 clays like kaolinite. Are there other references/data than the Africa Soil Atlas?
- Section 5.2. Another good example of a DST/integrated modeling framework is the Tradeoff Analysis model for Multi-Dimensional impact assessment (TOA-MD). This model has been used to support decision making with ex ante impact assessments of alternative practices and/or policies in smallholder agricultural systems in SSA. Examples are the introduction of dual-purpose sweetpotato in western Kenya (Claessens et al., 2009) and tradeoffs in crop residue use (ISFM) in semi-arid Zimbabwe (Homann-Kee Tui et al., 2014).

Congratulations with the paper, a very interesting read!

Minor edits/typos, referring to page and line numbers:

1249, 6-8: I don't understand this sentence

1249, 15: 'if done correctly', what does this mean? Maybe add a reference on correct liming?

1250, 10: ~~have~~ has 14: ~~reverse~~ opposite 21: period missing

1251, 8: common **in** SSA

1252, 8: ~~under~~ in

1254, 15: was used

1257, 13: period missing 19: ~~on~~ for 20: recommendations

1259, 4: crop-**livestock**-soil? 6: constraints 10: function **of**

1260, 11: models 13: ~~seasonal~~ seasonal 17: seasons

1261, 19: explain 22: ~~that~~ with

1262, 15: remove period

1263, 7: **a** balanced 11: what does 'tertiary level' mean?

1263, 20: and improved germplasm?

1264, 7: changes

1265, 13: others

References

Claessens, L., J.J. Stoorvogel, and J.M. Antle. 2009. Economic viability of adopting dual-purpose sweetpotato in Vihiga district, Western Kenya: a minimum data approach. *Agricultural Systems* 99:13-22.

Homann-Kee Tui, S., Valbuena, D., Masikati, P., Descheemaeker, K., Nyamangara, J., Claessens, L., Erenstein, O., Van Rooyen, A.F., Nkomboni, D., 2014. Economic trade-offs of biomass use in crop-livestock systems: exploring more sustainable options in semi-arid Zimbabwe. *Agricultural Systems*, in press.