

## ***Interactive comment on “Precision of farmer based fertility ratings and soil organic carbon for crop production on a Ferralsol” by P. Musinguzi et al.***

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**General comments** The paper is well structured, logical and follows contemporary trends in scientific research. There is increasing recognition in embracing local knowledge (grounded under specific circumstances) systems into Integrated Soil Fertility Management Framework. The authors' can further improve their efforts in improving relevance and precision of FFE in soil fertility assessment using SQR-SOC by indicating the relative importance of indicators by farmers. The most important ones or classical indicators can be used for each soil fertility category. Some sentences can be written short to enable the readers follow the authors' thoughts. The authors should

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stick to the same word throughout the document for consistency for example 'techniques' or 'approaches', 'patterns' or 'trends' and 'depths' or 'layers'. Words or terms once abbreviated at the beginning of the document need to be written in full unless at the start of the sentence.

**Comments per section of the manuscripts**

**Title page:** The title is informative but needs improvement to allude to the findings that farmer field experience (FFE) as an assessment tool for soil fertility was improved with a quantitative scientific technique. Some care should be taken to avoid generalization in the title as maize was the only test crop use. 'Using soil organic carbon to improve usefulness and precision of a farmer-based fertility rating for crop production on a Ferrasol' is my proposal. **Abstract:** Terms should be used with consistency for instance if it is techniques instead of approaches, the former should be used throughout the paper. The component of yield (grain or top biomass) referred to should be specified where necessarily. **Introduction:** Paragraphs are open and well closed. The topical ideas are well controlled. The last paragraph may need some examples or clear illustrations of studies that have demonstrated the relationships between SOC and crop yields. That is, are there any thresholds beyond which use of SOC content may be irrelevant? The statement of the objective requires rephrasing. My opinion is that SQR-SOC is a benchmark in Musinguzi et al. 2015 study. The authors' intent was to improve precision of FFE (as it pseudo-qualitative method) using a refined scientific technique of soil fertility assessment. Their results then showed that SOC singly (and not all other yet relevant properties) can be used to improve farmer-based rating. It is of relevance to resource-constrained farmers because use of carbon alone as an indicator of soil fertility will circumvent high costs of determining other properties. **Methodology:** The methods used in the study are good and reflect the content of the paper. Some comments that can be raised are: The characteristic (s) of a Ferrasol in Kiboga can be listed. It is the properties that pose a limitation to crop production. The FFE was a basis for scoring but was not really 'used' to score. Farmers perhaps used numbers

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or weights to score. A typology was developed using a collection of criteria. Were the criteria specific to maize plants during the rating? That is, stunted (maize) plants. It is necessary to emphasize the choice of maize as a test crop for the study. Maize is very responsive to soil fertility status. The terms approach and technique should be used rightly. Site and field can be used appropriately in the context of the scope of this study. Some literature cited can be placed in the introduction for example the sentence on the role of carbon in soil fertility. Experiments were laid out in a RCBD with two factors. Factorial is an experiment and not a design. Clarify the 'split-plot' experiment-what is the main and sub-plot in the study context of fertility categories in a field. I have suggested based on preceding descriptions on the design. Planting and harvest dates may be shown in Figure 1 or mentioned. Fertilizers are Triple Super Phosphate and Muriate of Potash and the rates are 25 kg ha<sup>-1</sup> and 60 kg ha<sup>-1</sup>. The number of plants harvested should be mentioned since the harvest area is not clear though number of rows is mentioned. Total biomass (includes roots) was not determined but top biomass was measured. Results:3.1. heading needs corrections-see suggestion on 'productivity' to include both soil fertility and crop growth/yield. The heading does not allude to the results presented and interpreted below it. I expect interpretation of maize yields using both techniques immediately after the first statement and later soil heterogeneity can be mentioned. Probability values should be rightly placed in the sentences for example, "...significantly different ( $p > 0.05$ )" and not at the end of anywhere. Some cited literature e.g. "... tropical soils (Okalebo et al., 2002)" in results should be correctly placed in the discussions section. Table 1. The title can be shortened by using foot notes to detail the definition of rating and number of observations as suggested. 'Uganda' can be omitted from the table 1 and 2 titles (there is only one location to which maize yields are indicated in the table) and Ferralsol kept to show specificity of location characteristics. It appears FFE indicates better grain yield than top biomass based on LSD values. Some statement on comparison of grain and biomass yields using FFE and SQR-SOC may be useful. Abbreviations may not necessarily be repeated with the tables. Units may not repeated within the table but can be indicated in

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the variable description i.e. (%SOC). 3.2 The contribution of PLS model (1st and 2nd) components- "SOC (72.2%),..." is correct for two but not all the three. Consistent use of terms depths and not layers can be observed. A regression is a dependent variable (s) on independent one (s)- variables that were regressed should be well stated as suggested. Percentages in the interpretation of results can all be kept to one decimal for uniformity and neatness. Fig.2 The functional relationship of maize yield and SOC for 15-30 cm depths is missing. It may be indicated even if the relationship was weak.

Discussion: The results are discussed in scientific style. Discussion should be focused to results among other comments below: 4.1 The title should not necessarily be as the result subheading (see suggestion on improving). Did sand fractions vary less as it was for silt and clay? The variation in sand fractions and its implications on heterogeneity within Ferralsol should not be overlooked. 'Depths' instead of layers can be kept for the sake of consistency of language used. The last line of the discussion (line number 25- "The integrated Soil Fertility Management approach. ....") is general rather specific to the results discussed. This could be part of the introduction at the start. 4.2 It may not be surprising to detect no influence of N on maize yields indicative of a small variance since total N levels are considerably low. The significant correlation is expected given the variation of N between fields. The findings don't suggest the need to explore other properties like micronutrients to improve fertility rating unless it is pointed out clearly in the result section. There are some loose ends in discussion for this section. It is clear the variations of SOC and contribution to yield were largest. Little is mentioned about the rating of SOC in terms of adequacy levels. The discussion in line 10 for instance is not focused to results but rather to general literature "Although the use of C fractions is not affordable to resource. ....". The last part of discussion in line 25 "For resource-constrained farmers, testing one parameter. ...." is rather appropriate to place in the last parts of the conclusion than specific discussion. Conclusion: The conclusion is not tightly linked to the title. The authors can further improve the conclusion by avoiding repetition of opinions that are not drawn from results. Highlighting key findings that blend together can yield a golden

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thread in the paper. This is my draft opinion of the conclusion: The FFE technique was inefficient where SOC were above 1.2% (medium fertility) but useful in poor fertility. The threshold value of SOC could be lower than 1.2% from maize yield predictions. A large variation in yield was accounted by SOC and it was consistent with depths. References: The bibliography is sufficient. Literature used is very recent. References missing but cited in the main document are highlighted in yellow. -Africa Fertilizer Summit, 2006 -Doran and Parkin, 1996 Additional (technical corrections): See the track changes for grammar errors. View: The paper in its current status requires minor revisions.

Please also note the supplement to this comment:

<http://www.solid-earth-discuss.net/7/C631/2015/sed-7-C631-2015-supplement.pdf>

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Interactive comment on Solid Earth Discuss., 7, 1237, 2015.