

Review of: "The impact of land use practice on the spatial variability of soil physicochemical Properties at Wondo Genet, Southern Ethiopia"

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Potential competing interests: No potential competing interests to declare.

The author has collected a lot of interesting data regarding soil properties and their variation among different land-use types at Wondo Genet in Ethiopia. While the manuscript presenting and interpreting this data is generally well structured, it also has a lot of formatting and interpretation issues that (in my opinion) complicate its publication. Please see the comments below.

Introduction section is generally fine.

Methods:

- Section 2.1, provide some indication of the temperature variability in the region.
- Section 2.1, you mention 3 different land-uses of interest. If possible, it would be useful to distinguish between them on the maps that you provide. Furthermore, you calculate percentages of the total watershed area that they makeup. Since these don't add up to 100, it would be nice to have some indication of the other major landtypes makeup the remaining percentage of the area.
- You distinguish distinguish between "khat plantation, enset plantation, coffee plantation, and sugarcane plantation" which you then call "farmland", yet as your primary groups you have "Natural forest, Plantation forest, and Agricultural land". Classifying your plantation soils as 'farmland' is confusing when you also have a main group called 'agricultural land'. mixing terms like 'Agricultural land', 'farmland', 'planted forests', 'plantation forest', etc can be confusing. Try to stay consistent.
- section 2.3 HUSD should be written in full and referenced the first time its mentioned.
- no mention of the statical methods applied to the laboratory data. results mention analysis of variance, yet the details thereof are not presented in the methods.

Results:

- Expect to see the data that is talked about in the first paragraph, directly after the first paragraph.
- Table 2 is referenced before table 1.
- You mention "Cash crops, on the other hand, were found to have a greater bulk density than forest soil and plantation woods. This was most likely related to reducing carbon stocks and improving the soil as a result of repeated planting and harvesting activities". yet greater bulk density is not regarded a favourable effect thus 'improving the soil' is strange

wording.

- You don't know if the porosity of the forest soils allow "optimal oxygen diffusion and water penetration", you only know that it is likely better than for the other soils.
- Since you introduced three primary land-use categories, it would be useful to have the results (as for Figure 2) presented according to those land-use categories (i.e. by color, groups, or subcharts).
- You say that "Macro-aggregates were significantly higher in the Khate plantation (67.6%) ", and indeed this soil had the largest fraction of macro-aggregates, yet your statistical analysis shows that this difference is not statistically significant (Table 1).
- Your rationalization that differences in aggregate size fractions "might be attributable to the fact that in a planted forest, there is no tillage, there is less interference, and there is more organic matter intake (litters and root biomass) that binds soil aggregates together, leading to better soil structure development." and that "Natural forests, on the other hand, had lower aggregates owing to soil disturbance and a higher micro percentage, which were attributed to continuous SOM distribution and quick oxidation, respectively." Doesn't rhyme since natural forests are naturally the least disturbed (no tillage, and no interference) and should therefore have greater aggregation than plantation soils.
- All superscript numbers in Table 1 are '1', suggesting no significant differences in aggregate size fractions with soil depth. You might consider removing this number from the superscript all together and just stating that there were no significant differences with depth to improve the legibility of the table.
- The table 1 footer mentions "MBC- Microbial biomass carbon; SC-soil organic carbon; BD-Bulk density; Mc- moisture content; Por-porosity" but these do not appear in the table itself. Check for other tables as well.
- You mention "Natural forest conversion to EuC, Cupr, Gr, and Podo soils resulted in considerable reductions in SOC content, with lower values of 47%, 41%, 37.5%, and 34.8%, respectively. ", But this cannot really be said with such certainty unless you know the history of the plantation soils. After all, you've mentioned several times the high spatial and temporal heterogeneity of natural forest soils. It is an interesting interpretation however, but simply needs to be stated with more caution.
- "It was observed that soil MBN tends to decrease with soil depth in all land-use types." Why do you think this is? Why not for carbon?
- There is some repetition in the text. i.e. paragraph: "High levels of root debris and exudates supported high microbial activity . Because most microbes are heterotrophic, their dispersion and biological activity are typically dependent on organic matter, the findings of the research revealed a tight relationship between MBC and SOC or tN.n. In general, the quantity and quality of C inputs have a direct relationship with the amount of soil microbial biomass." has been said in different words before. Consider reading through the text again to cut out such repetition of points to make the text easier to read. i.e. also with "Microorganisms utilize the organic wastes left on the soil as a source of energy and nutrients."
- The presented raster data and comparison thereof for the different land-use classes really warrants an overlay or masking or some other map that shows the spatial distribution of the land-use classes.
- Table 4 header should mention that the data are derived from the HUSD.
- "As indicated in **Table 4** the spatial variability and distribution of soil organic carbon and CEC values are lower throughout the study area" lower than what?

- "the low flexible foundations of the soil" What does this mean??
- "must have greater than 10 cmol/kg of soil to be satisfactory." Satisfactory for what?
- You use both different and the same color gradients for different maps. I would recommend to do them all differently for each map, or all the same, or different per group, because now it suggests there is a relationship between the variables mapped in the same color gradient, whereas actually there is none.

Conclusion:

- "Investigating the effect of changes in land use and mapping the diversity of landforms is an important prerequisite for land management" - it is not for 'bad' land management. consider rewording.
- "The present study shows that the physicochemical properties of soil in the study area were significantly affected by land-use change" - should be reworded to a more cautious expression. You can say that they were different for different land-uses but since you don't know the history and soil properties of the plantation/agricultural soils, you cannot say with such certainty exactly what changed (also given the heterogeneity of natural forest soils, the presumed predecessor soil).
- "highest amount of biomass carbon and nitrogen emissions from plantation forests & farmlands", Emissions??? You dont mention emissions at all in the text, you dont measure CO2 or microbial respiration.
- "was described by low rhizobia and soil OC/tn, but not much potassium & phosphorus", 'but' suggests a contradiction, but really it seems you are only saying 'low rhizobia, soil OC/tn, potassium and phosphorus.
- "This means that soil characteristics are more susceptible to variations in land management and land utilization processes." is not a rational deduction from the finding presented in the previous sentence. firstly, 'more susceptible' than what? "land utilization processes"? Do you mean to say that soil characteristics are likely to vary between different land-uses?
- "Besides, there is a loss of essential nutrients that can lead to decreased productivity of agricultural land in this study area." 'Besides', seems like it should be a 'furthermore/additionally'. If the reasoning is that: forest to agriculture = decrease in essential soil nutrients = decrease in agricultural productivity, then this reasoning is also flawed since agricultural productivity of forests is 0.

Consider rewording:

- "significant nutrient labile pool", which should probably be "significantly labile nutrient pool"
- "transformation of the soil", which is vague and ambiguous.
- "has been recognized as a driver of soil organic matter." should be 'have' since plural, and 'driver of soil organic matter' what? [formation, decomposition, dynamics?].
- subscripts in chemical formula's (i.e. 3 in CHCl₃ and 2 in N₂).
- Sometimes references can be made more elegant like in "according to [34]," or ""According to [40]", or "Similarly, [63] found"
- Space in "All the soil chemical property data "
- "the gridded soil database" should be 'gridded'
- "Studies conducted by [51][75] and [76]"

location-dependent variants are classified as highly dependent on location if the ratio is less than 25, moderately dependent if the ratio is between 25 -75 percent, and highly dependent on location if the ratio is greater than 75 percent." is not a complete sentence.