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.

General comments:

The study by Molla (and Gorems?) sought to determine how land-use (native forests, agroforests, croplands) affect soil nutrients, microbes, and physicochemical properties in southern Ethiopia. From these differences, they created spatial predictions for soil properties. This study is important as it is one of a handful of studies from this understudied region and is of importance for other tropical regions as well. The experimental design and laboratory analyses appear to be effective (although QA/QC is not effectively detailed) to answer the initial questions, they did find significant influences of agroforestry and row crops on soil physical, chemical, and biological properties. My recommendations for this study are to simply clarify wording, fix small errors detailed in the specific comments, and provide recommendations to better visualize and describe results for readers to have a clear set of take away points.

Specific comments:

Entire manuscript:

There should be a space between values and units. This was not consistent throughout the manuscript. Some units and equations that should use superscript and subscript were not correctly done. For example “CHCl3” or “N2”. Also use the symbol % instead of writing percent. Lastly, double check all units as there are small errors throughout the manuscript. For example, in Table 4, ‘H_2O’ is written ‘H_20’ with a zero and the cmol+/kg has a capital C for K.

Abstract:

A new first sentence is needed. What was the main objective of this study and why does this matter?

Please revise “Total nitrogen, soil organic carbon, and microbial biomass were determined by the micro-Kjeldahl method, and fumigation extraction method, respectively” as you have three analyses and two methods. Thus, the respective aspect of the list is not accurate.

Please revise conclusion sentence to say which type of land use had the highest C, N, and microbial biomass and why you hypothesize this occurred. This is more informative for readers.

Author information:

Why is the second authors list different from the top?

Introduction:

Second paragraph first sentence is a bit of an overstatement.

I recommend briefly state the directionality of the effect for “Specifically, it also strongly impacts soil functions [20][21][22][23], particularly microorganism activity, nitrogen, soil organic carbon, and other soil physical properties [24]”. What increases microbes, N, OC and bulk density vs decreases it, particularly with respect to agroforestry.

I recommend combining paragraph five with paragraph three.

From the sentence “The application of appropriate management approaches for sustained agricultural production necessitates timely and reliable soil information”, I think it is important to state what existing data can be/ is used for geospatial projections of soil properties in Ethiopia currently. There is no way this is the first study to make estimates and this is disingenuous to the literature of the topic not to do so.

Methods section

“7 002'-7 007'N latitude and 38 037' and 38 0 42' E” use the correct symbology of ‘°’ instead of zeros ‘0’.

“0.9 kg dm-3” make sure units that should be in the superscript are in fact in the superscript.

I recommend combining the “Natural Forest land”, “Plantation forest”, and “Agricultural land” into one paragraph. Also the genus ‘Eucalyptus’ is spelled incorrectly.

Figure 1 would be improved with having either satellite imagery, topography or land use data instead of colors/blank spaces. Even basematp orthosatellite imagery would help readers not from the region visualize the landscape and ecosystems.

There is no information on the quality control or quality assurance of the C, N, and microbial analyses. Were blanks, duplicates, or standard reference materials used?

Results and Discussion section

I recommend making Figure 2 smaller and showing pH, bulk density, C, N, and microbial biomass in a five panel figure. It will be a bit tough to make sure all of the font is legible but I think this is a very important visualization of the data that is lost in Table 2 and Table 3.

“Large microbial biomass may suggest increased quantity in the organic pool” this seems conceptually backwards. More organic matter can support a larger microbial biomass.

Please explain how “the opening of the canopy cover in agricultural land, particularly khat and sugarcane, increases the intervention of physical elements including intensity of light, wind velocity, and moisture content.” would affect microbial biomass, C, and N? I understand there is a linkage but this should be explained for readers.

The abbreviations “(NF, PF, and AL) should be in the methods and in the Tables. Please be consistent or you will confuse readers such as myself.

For Table 5 or Table 6, it would be helpful if the explanatory power of each variable used in the spatial model is detailed so readers know which variables are most important for the prediction and how it compares with other previous models.