Biogeosciences Discuss.,
https://doi.org/10.5194/bg-2019-416-AC1, 2019


Biogeosciences Discussions

# *Interactive comment on* "Changes in Particulate and Mineral Associated Organic Carbon with Land Use in Contrasting Soils" *by* Sabina Yeasmin et al.

**Sabina Yeasmin et al.**

sabinayeasmin@bau.edu.bd

Received and published: 12 December 2019

We thank the Referee #1 for taking time to review our manuscript and appreciate the valuable comments and suggestions. We have addressed the comments in the following sections and in a revised manuscript: Referee #1: This manuscript reports changes in the organic matter in different soil types due to land use change, a relevant topic considering the potential of soil C storage in the face of mitigating greenhouse gas emissions. Therefore, undisturbed soil samples were collected at different sites in New South Wales (superficial and subsurface layers), which were determined organic-C and N through the densimetric fractionation (particles size), x-ray diffraction (mineralogy) and isotopic analysis (stable – 13C and 15N; and radioisotope – 14C) sought to point out the associations between organic matter and minerals of different soils.



However, there are serious flaws that should be considered. My main concerns are: -In a general analysis of the manuscript, the reading is tiring, sometimes excessive in speculations not based on results; and more: what's the question to be answered?

Authors: We have made revision in the manuscript to avoid repetition and lengthy monotonous sentences. Objectives have been re-written to clarify the questions possessed and discussion has been improved based on the result sections. They all will be addressed in the revised version.

- Introduction and objective need to be rewritten more clearly and cohesively; less descriptive of the methods and paragraphs that best demonstrate the problem studied at work (e.g., LUC impacts on SOM; LUC impacts on different soil types; importance of soil mineralogy on SOM stabilization).

Authors: Introduction and objective have been revised based on the above comments.

- Methods: Site description is poor, but I believe that the most worrying point of this study was the soil sampling strategy. I searched several times for the number of points to form the composite samples, the area coverage or pseudo-repetitions. Thus, results have no statistical validity, especially the absence of error; which culminates in the difficulty of the discussion and conclusions; making the whole work only qualitative and speculative.

Authors: Site description has been revised. Additionally, detailed geological, climatic and land use information for the sites are now provided in supplementary information (S) Table S1.

#We have incorporated the exact number of sampling point to form the composite samples as 'Random bulk soil samples were collected from eight to eleven spots for the two depths: surface (0–10 cm) and sub-surface (60–70 cm) of each of the paired sites.'

#We already have information about analytical replicates (pseudo-repetition) in differ-

ent sections, such as- in section: 2.1 general characterisation of bulk soils: 'All soil analyses were performed in triplicate except the particle size analysis where only one replicate was analysed'. in section: 2.2 Sequential density fractionation: 'The whole fractionation process replicated twice'; in section: 2.4 Soil organic carbon, nitrogen and stable isotopic ratio analyses: 'Duplicate samples were analysed and the precisions for total C, total N, $\delta$13C and $\delta$15N'

#We have already presented the standard error value for bulk (except texture) + fraction properties in the tables as footnote and in the figures as error bar.

#About the statistical validity and qualitative findings: We understand reviewer's concern about the lack of replication and statistics. We have acknowledged the issue of field replicates in the manuscript with proper reasoning and references (manuscripts based on similar fractionation scheme that are already published in reputed international journals): "The random samples from the corresponding depth were mixed thoroughly to make the composite sample for each of the individual sites, similar protocol has been used in many published studies (e.g., Kaiser et al., 2010, 2012; Lehmann et al., 2007; Sleutel et al., 2011; Sollins et al., 2006, 2009). Admittedly, that a sampling strategy with separate two or three field replications instead of compositing replications at each site would have been advantageous to find out the spatial variability, but we still believe this sampling protocol would not limit the capacity of this study to assess land use effects in contrasting soils (Kaiser et al., 2012; Sollins et al., 2006)." The above cites articles also worked on size/density fractions of soil organic matter and have not used field replicates, and this issue did not limit them to draw a major conclusion. It is important to point out that these are leading articles in this arena. Additionally, the sampled sites are typical and representative soil types of the desired mineral composition; and mineral composition is not expected to vary within field replicates. The composite samples made up of several random samples are expected to truly represent the organic carbon concentration in the soil. The fractionation scheme used in our experiments (and other studies) is very laborious and time consuming. Thus, use



of a single composite sample that is representative of the soil type and land use is the pragmatic approach. The laboratory replicates were used to take care on variability in the analytical techniques used to characterize the soil fractions which is an acceptable methodology.

- I have difficulty understanding the presentation of results. Both soils and land-uses are different between sites; just as the depths have different mineralogical compositions and C-input sources. Sometimes these variables are presented as complementary; others are used comparatively.

Authors: We would disagree with the reviewer with this comment. We have clearly mentioned in the materials and method that the four selected locations differ from each other only in soil type. Each location has paired sites- native + cropped lands. The paired sites at each location represented similar landscape, position, climatic conditions and major soil characteristics. We also sampled soils from two depths of each site. Thus, the soils (mineralogy) are different between locations; land uses are different between paired sites of each location. We also clearly mentioned in the result section that mineralogy showed some minor differences between the surface and subsurface soil depths of each location. However, we understand that our writings might have created little confusion. Hence, we have revised the result and discussion section to avoid any confusions or difficulties in understanding of our reader.

- Finally, the discussion and conclusion is quite obvious. In this section you could further explore the results, with management suggestions to increase soil carbon stocks and infer about to reaching C-storage limits in each soil type, contributing to greenhouse gas mitigation.

Authors: We agree with this thoughtful suggestion. We have modified these sections accordingly in the revised version.

References: Kaiser, M., Wirth, S., Ellerbrock, R.H.,and Sommer, M.: Microbial respiration activities related to sequentially separated, particulate and water-soluble or-

ganic matter fractions from arable and forest topsoils. Soil Biol. Biochem., 42(3): 418-428, https://doi.org/10.1016/j.soilbio.2009.11.018, 2010. Kaiser, M., Ellerbrock, R.H., Wulf, M., Dultz, S., Hierath, C.,and Sommer, M.: The influence of mineral characteristics on organic matter content, composition, and stability of topsoils under longâĂŘterm arable and forest land use. J. Geophys. Res.-Biogeo., 117(G2), https://doi.org/10.1029/2011JG001712, 2012. Lehmann, J., Kinyangi, J.,and Solomon, D.: Organic matter stabilization in soil microaggregates: implications from spatial heterogeneity of organic carbon contents and carbon forms. Biogeochemistry, 85(1): 45-57, https://doi.org/10.1007/s10533-007-9105-3, 2007. Sleutel, S., Leinweber, P., Van Ranst, E., Kader, M.A.,and Jegajeevagan, K.: Organic matter in clay density fractions from sandy cropland soils with differing land-use history. Soil Sci. Soc. Am. J, 75(2), 521-532, https://doi:10.2136/sssaj2010.0094, 2011. Sollins, P., Kramer, M.G., Swanston, C., Lajtha, K., Filley, T., Aufdenkampe, A.K., Wagai, R., and Bowden, R.D.: Sequential density fractionation across soils of contrasting mineralogy: evidence for both microbial- and mineral-controlled soil organic matter stabilization. Biogeochemistry, 96, 209-231,https://doi.org/10.1007/s10533-009-9359-z, 2009. Sollins, P., Swanston, C., Kleber, M., Filley, T., Kramer, M., Crow, S., Caldwell, B., Lajtha, K., and Bowden, R.: Organic C and N stabilization in a forest soil: evidence from sequential density fractionation. Soil Biol. Biochem., 38, 3313-3324,https://doi.org/10.1016/j.soilbio.2006.04.014, 2006.

---

Interactive comment on Biogeosciences Discuss., https://doi.org/10.5194/bg-2019-416, 2019.