Response to the reviewer comments

We thank the reviewer for his comments. Below, our responses to the reviewer comments are in red font.

Thank you to the authors for addressing points I raised in the earlier version of the paper. I still have a few issues with the paper.

Firstly, the data presented are only valid for this one soil, the results are not applicable to other soils.

Authors' response: This is incorrect. The manuscript describes a method developed for calculating OA application rates and lime-OA combinations based on measurements of standard soil parameters (pH, buffering capacity) and titratable alkalinity of OAs. As the above-mentioned soil parameters are measured using standard methods (e.g. see Aitken and Moody 1994, Kissell et al. 2019), this method is applicable to other soils. This was already mentioned in the previous revised manuscript and in our earlier response to the reviewer. Soil amendment calculations for any soil can be done using this method. The method was tested on five different types of OAs incubated in sandy loam soil.

References:

Aitken, R. L., and Moody, P. W.: The effect of valence and ionic-strength on the measurement of pH buffer capacity. Soil Research, 32(5), 975-984, https://doi.org/10.1071/SR9940975, 1994.

Kissel, D., Sonon, L., and Cabrera, M.: Rapid measurement of soil pH buffering capacity. Soil Science Society of America Journal, 76(2), 694-699, https://doi.org/10.2136/sssaj2011.0091, 2012.

Secondly, reporting buffer capacity as delta pH is misleading; for instance, raising pH 5 to 5.7 (delta pH 0.7) is not the same as raising pH 6 to 6.7: there is tenfold difference in actual protons, despite delta pH being the same. I wonder if it would not better to convert pH to actual protons concentrations and base the paper on changes in protons rather than changes in pH. This will also allow to do away with correction factors, and may help address issues raised by the authors (L 425-426; L 296-303; L344-356)?

Authors' response:

We did not report buffer capacity as delta pH, buffer capacity was calculated by dividing delta H^+ by delta pH. Specifically, as stated in the method section of the manuscript "The pH buffer capacity ($pHBC_{30}$), expressed in mmol H^+ (kg soil)$^{-1}$ pH^{-1}, was calculated from the titration curve as the inverse of the slope of the linear regression between pH and the added base". As such the delta pH following base additions is just used to normalise the pH change and is relative to different initial soil pH values. This is a standard method and

nomenclature for expressing pH buffer capacity (e.g. Aitken and Moody 1994, Kissell et al. 2019). We also used delta pH to represent a change in pH of amended soil due to proton neutralisation by the amendments.

Finally, the Discussion is too long and could be condensed quite a bit.

Authors' response: The discussion was shortened by about 20%.

Editor's comments

Please, revise the manuscript again according to the new comments of the reviewer, particularly those regarding the excessive length of the discussion section.

Authors' response: The discussion was shortened by about 20%.