

Dear Editors and Reviewers,

Thank you very much for your comments and suggestions.

My manuscript, **Effects of application of biochar and straw on sustainable phosphorus management**, was revised according to the editor and reviewers' comments, and the itemized response to editor and each reviewer's comments is attached. We want to thank you sincerely for editors and reviewers' comments and suggestions and we feel so sorry that so much of your precious time was wasted on our paper revision. Those comments are all valuable and very helpful for revising and improving our paper, and we really learned a lot. We appreciate for editors and reviewers' warm work earnestly and we have studied comments carefully and have made corrections which we hope meet with approval. We use the MS Word Track Changes function to correct the manuscript as suggestions. The main corrections in the manuscript and the responds to the reviewer' comments and suggestions are as flowing:

Once again, we thank both editor and reviewers for their positive and constructive comments and suggestions.

Replies to R1:

L. 1. "on sustainable phosphorus management" is too vague for the title.

Answer: We are very sorry that I did not make it clear. We have corrected it. Thank you for your attention.

L. 15. State the objective of the study before describing experimental and methodological details.

Answer: Thank you very much for your professional comments and suggestions, we have added objective. Thank you for your attention.

L. 17. What do you mean by long-term here?

Answer: The long-term here refers to the period from 2013 to 2018. Thank you for your attention.

L. 21. The Hedley fractionation separates P into several plant-available and refractory forms. What do you mean by the Hedley-P fraction?

Answer: In L 21. The concentration of Hedley-P we refer to the total concentration of P separated by Hedley fractionation (several forms that are available and difficult to degrade by plants). Thank you for your professional comments.

L. 27-28. "...and reduces environmental pollution." This conclusion is not supported by the data, it is out of the reach of the study.

Answer: We have deleted this part. Thank you very much for your patience and responsibility.

L. 40-41. Provide references for these statements.

Answer: We have added references for these statements.

L. 53. Provide references to the studies mentioned here. There are previous studies on the effects of straw on soil P (e.g., Zheng et al., 2019, Li, et al., 2019), so what is the original contribution of the present study to the current knowledge?

Answer: We have added the references. The original contribution of this study to the current knowledge is that the previous study was based on the conclusion of direct application of straw. In present study, straw was made into biochar to see how the results would change compared with direct application of straw. Thank you for your professional comments.

L. 53-54. What do you mean by P activation coefficient or unutilized straw in this context? Please clarify.

Answer: Previous studies have shown that straw application can increase the content of available P and total P in soil. But some studies have shown that the activation coefficient of P

in soil without straw application is higher than that with straw application, that is, the ratio of available P to total P is higher. Thank you for your attention.

L. 56. This sentence is unclear and needs a reference.

Answer: We have corrected it and added a reference. Thank you for your attention.

L. 63. There are previous studies on the effects of biochar on soil P (e.g., Lehmann et al., 2003, Gundale and DeLuca, 2006, Wang et al. 2017). The authors need to stress the novelty of their contribution.

Answer: We have corrected it. Thank you very much for your professional comments and suggestions.

L. 84-90. These statements need to be supported by references.

Answer: We have added the references. Thank you for your attention.

L. 91. So the novelty is in the use of the Hedley fractionation method and NMR spectroscopy on soils amended with straw and biochar. Yet it is not clear how this may provide new mechanistic insights into the dynamics of P in soils amended with straw and biochar.

Answer: You are right, we have corrected it. Thank you very much for your professional comments and suggestions.

L. 97, “were to...” It seems that a verb is missing here (investigate?).

Answer: We have corrected it. Thank you very much for your attention.

L. 100-101. There is no data in this study on “the reduction of environmental pollution.”

Answer: We have deleted this part. Thank you very much for your attention.

L. 112-115. These treatments do not allow to isolate the effects of biochar and straw from those of the mineral fertilizers and the crop.

Answer: You are right. Biochar is made of plant straw, there is no way to separate, so we set up a blank treatment, no fertilizer and straw, and single fertilizer treatment, no straw.

L. 115-116. Were biochar and straw applied annually or just once? Please clarify here.

What was the rationale behind these rates.

Answer: This is the amount of biochar and straw applied each year.

L. 121. The biochar used in the study was obtained at temperatures from 450 to 600 °C.

This seems like a very wide range, and pyrolysis temperature is known to be determinant on biochar properties. Further details on the pyrolysis process, such as heating and retention time, would be needed.

Answer: Sorry, we do not have the right to write down more details about intellectual property rights.

L. 131. Report size in mm

Answer: We have corrected it. Thank you very much for your attention.

L. 176. What is the effect of this pretreatment on soil P content and speciation?

Answer: The purpose of this treatment is to detect the forms of P in soil by <sup>31</sup>P-NMR method, which has no obvious effect on forms. Because the P is extracted by extractant, the content of P will not be the total phosphorus content in soil.

L. 195-199. Did you check for normality and homoscedasticity? Please clarify.

Answer: We have checked it. We did not write this part because the journal did not require it and there was a space requirement, and we looked at other paper and did not mark this part.

L. 276, “after correction.” Please clarify the correction used here.

Answer: We have corrected it. Thank you very much for your attention.

L. 295. Add references for this statement.

Answer: We have added the references. Thank you for your attention.

L. 303. Provide the effects of the treatments on crop yields, as they affect nutrient content and speciation in soils.

Answer: We are very sorry, because we have published the output data, so we ca not provide it.

L. 360, 382. Add references to support these statements.

Answer: We have added the references. Thank you for your attention.

L. 422-427. The combination of treatments used does not allow to separate the effects of biochar and straw from those of the mineral fertilizers and the crops.

Figure 1. The grey shades used here to indicate P forms are very hard to differentiate.

Answer: In order to distinguish better, we have changed the colour of Figure 1. Thank you for your attention.

We tried our best to improve the manuscript and made some changes to the manuscript. Thank you for your time and patience. Thank you very much for your good comments and suggestion.

With best wishes!