Biogeosciences Discussions

Biogeosciences Discuss., author comment AC1
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Reply on RC1

Josue De Los Rios et al.

Author comment on "Assessing the effects of no-till on SOC dynamics throughout the soil profile after grassland renovation and conversion to silage maize" by Josue De Los Rios et al., Biogeosciences Discuss., https://doi.org/10.5194/bg-2022-6-AC1, 2022

Dear Referee,

Thank you very much for your suggestions for improvement.

Following, we would like to share a point-by-point report of the changes made to the manuscript based on your review.

Point 1

Line (L) 9: Should replace "global warming" with more general "climate change" (which also includes e.g. changes in preciptitation, sea level, and even cooling at some times/locations).

L9: "of" missing at end of line

Response:

The words “global warming” has been replaced by “climate change”

Point 2:

Repeated use of the term "whole profile" implies that samples were taken all the way to bedrock, which does not seem to be the case. This term should be clarified as referring specifically to "a depth of 0.9 m", and replaced with this more precise phrase wherever convenient.

Response

We have eliminated the word “whole”, and referred to the specific soil depth throughout the text to avoid this confusion.

Point 3

L23 SOC increases under GC indicate that the plot is still responding to historic disturbance or LUC. Implications of this need to be considered in the discussion.

Response

Added this in the manuscript (lines 297-303).

“Before establishing the grassland in 2004, the study site was dominated by an arable cropping system. Since then, the field ceased to be ploughed and a multispecies perennial forage mixture with different rooting depth was established, which favours both the increase and distribution of SOC to deeper layers over time observed in GC”

Point 4

L76 "most likely as a result of historical erosion and sedimentation processes" - and/or downslope transport of DOC

Response:

We have added “and/or downslope transport after “as a result of historical erosion”

Point 5

L77 "To exclude these site-specific effects, this study only reports results from the upper half of the experimental site". This was an unfortunate choice (that can't be remedied now). Better would have been to include slope location as an explanatory variable in the analysis. The exclusion of lower sites introduces a new confounding effect (similar to measuring only topsoil, but excluding subsoils in the earlier studies cited). I.e. an increase in SOC on the upper slopes could be accompanied by a corresponding decrease in downslope soc, if the greater accumulation on higher ground is partly accounted for by reduced tranport processes. This possibility and how it affects potential interpretation of the results (i.e. quanitifcation of this effect was not possible within the current study and would require further research to account for differential transport processes between treatments) needs to figure in the Discussion.

The paragraphs on L260-75 would be a relevent place to raise this issue.

Response: Added to the manuscript (303-312[J1]).

“These results, however, ignore the potential soil erosion effects caused by the slope gradient present on the site, excluded from our analysis by using exclusively the upper half of the site. Due to significant colluvial processes occurring at the site over time, large amounts of SOC were observed in the 30-60cm and 60-90 cm layer in several plots, with similar values to those observed in the 0-30 cm, confounding some treatment effects (not shown). These resulted in the lower half differing in SOC stocks and SOC distribution between the soil layers and treatments compared to the upper half (not shown). Slope gradients have previously shown to have an important effect on the distribution of SOC, favouring the downward movement and accumulation of SOC in the depositional area including the subsoil (Holz and Augustin, 2021; Li et al., 2019; Vos et al., 2019). The presence of a considerable slope gradient could, thus, override the treatment effects induced by the study factors tillage and N rates. Further research is required to account for the slope gradient effects and the different transport processes between the treatments.”

Point 6

Section 2.2.2: I appreciate how thoroughly the biomass inputs were assessed, and

commend the authors on this. Too few studies show this level of thoroughness, which is important.

Response:

We are thankful for the positive feedback.

Point 7

L303 "maintain SOC stocks" should be replaced with "to mitigate losses of SOC stocks"

Response:

We have replaced "maintain SOC stocks" with "to mitigate losses of SOC stocks"

Point 8

Fig 1: needs error bars on the data points and a confidence interval or s.e. ribbon on the regression lines

Response:

We have changed Figure 1, by adding the mean ± the S.D.s as error bars for the measured SOC values. We have done the same to Figure 3 to be consistent in the whole manuscript.

The confidence bands could not be added into the regression models of Figure 1, because of the different variances given by mixed models. However, Figure 2 and 4 reflect the uncertainties surrounding the slopes (± 95 % confidence intervals).

Additional changes made by the authors:

We have modified the X-axe name of Figure 1 and 3, to make them consistent with the statistical analysis.

We are happy to answer further questions and include your recommendations to our manuscript.

Sincerely,

Josue De Los Rios

Please also note the supplement to this comment:
https://bg.copernicus.org/preprints/bg-2022-6/bg-2022-6-AC1-supplement.pdf