

***Interactive comment on* “Response of soil respiration and soil microbial biomass carbon and nitrogen to grazing management in the Loess Plateau, China” by Zhen Wang et al.**

Zhen Wang et al.

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Response to Anonymous Referee #1

General comments:

Dear editor, I reviewed this manuscript entitled “Response of soil respiration and soil microbial biomass carbon and nitrogen to grazing management in the Loess Plateau, China ”which analyzed soil respiration, SMBC, and SMBN under different grazing intensities and seasonal grazing patterns (in summer or winter), also abiotic and biotic factors were measured. The experimental design is reasonable, the indicators and

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data collection are sufficient, the analysis and demonstration are rigorous, the quantity and quality of charts are reasonable, and this research has important theoretical and practical significance. Basing on the above comments, the manuscript is fitted to the standard of SCI journal, but there are some problems has existed , so I suggest the author revise the manuscript before publishing it.

Response from authors: We are highly grateful for the reviewer's positive comments on our work. We carefully considered your comments and will take them into account for further revisions.

Page1 L18-19 What are the specific rotational grazing methods in the 9-year grazing areas mentioned here? Are there any combinations in the design of the experiment?

Response from authors: Thanks for these constructive comments. The specific methods used for rotational grazing were: In each grazing season, the wethers were allocated to three replicates for each of the four stocking rates, and rotationally grazed between each replicate plot allocated to that stocking rate. The WG plots were rotationally grazed from June to September (90 days), with a rotation cycle length of 30 days (10 days grazing and 20 days rest) and three rotations. The CG plots were grazed from mid-November to late December (48 days), with a rotation cycle length of 24 days (eight days grazing and 16 days rest) and two rotations. The rotational grazing system field experiment began in 2001. The Rs measurements were conducted in both WG and CG plots in 2010, after the trial site had been rotationally grazed for the previous 9 years. We have revised the abstract in the revised manuscript and added the specific rotational grazing methods in revised manuscript. Please see P1 L137-L143.

Page4 L26-27 Soil respiration is significantly affected by soil moisture and temperature, and whether the particularity of precipitation in September 2011 has an impact on soil respiration data measured in September?

Response from authors: We completely agree with the reviewer. We have analysed the relationship between monthly precipitation and soil respiration, soil temperature, soil

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moisture, soil microbial biomass carbon and soil microbial biomass nitrogen. There is a strong relationship precipitation between and those variables. We added the results in the revised manuscript, please see L193-L195 and L667-L669.

Page5 L2 Is there any reference or self-setting in the classification of grazing intensity? Please indicate the basis. Response from authors: We greatly appreciate your thoughtful comments. The classification of stocking rates was based on local habitat productivity, and the method of GI calculation was based on the number of wether sheep allocated to a specific GI treatment divided by the combined area of 1.5 ha (i.e., 2.7 sheep ha⁻¹ = 4 sheep/1.5 ha) for the three replicates in each grazing season (Chen et al. 2010).

Page5 L17-18 Diurnal and seasonal variations of soil respiration were different. Did the authors consider them during the measurement period?

Response from authors: We appreciate the reviewer's suggestion. We considered the difference diurnal and seasonal variations of soil respiration before conduct the experiment. We conducted 22 hour (between 6:00am and 10:00pm, at 2 hour intervals) measurements each day to examine the diurnal soil respiration. The early stage of herbage growth begins in mid May; aboveground grassland biomass peaked in mid September; grassland dormancy occurs by mid December. For these reasons, Rs was measured on six fine days in mid May, September, and December for seasonal variations of soil respiration. Please see L150-L153.

Page7 L15-17 The author can analyze the daily changes of soil respiration of winter grazing and summer grazing under the same grazing gradient to determine which grazing intensity and grazing mode has a great influence.

Response from authors: We appreciate the reviewer's comments that could help us improve our manuscript. As reviewer suggested, we analyze the daily changes of soil respiration of winter grazing and summer grazing under the same grazing gradient. We found grazing intensity with 0 sheep ha⁻¹ has a great influence on soil respiration in

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warm grazing plots; grazing intensity with 2.7 sheep ha⁻¹ and 5.3 sheep ha⁻¹ has a strong impact on soil respiration in cold grazing plots. We added the analysis in the revised manuscript in L 187-L189, L223-L230 and L667-L669.

Page8 L5 It is suggested that divide this part into two. The first part is to analyze the change of SMBC and SMBN under different grazing intensity and grazing mode, and the second part is to analyze the interaction between abiotic and biotic factors and structural equation model.

Response from authors: Thanks for these constructive suggestions. We added new subtitles which were “3.3 Effects of grazing management on soil temperature, soil moisture, aboveground biomass, belowground biomass” “3.4 Effect of grazing management on temperature sensitivity of soil respiration” “3.5 Structural equation models” in the revised manuscript. Please see L265-281 and L 288.

Page9 L27-28 The author has discussed enough. The small suggestion is that soil respiration is closely related to the change of A, and the change of the relationship between the two under different grazing intensity and grazing mode can be considered.

Response from authors: We are grateful for the reviewer's suggestion. We have discussed the annual soil respiration as follows: In addition, the effect of soil temperature on Rs can be explained by the distribution of seasonal precipitation and interannual precipitation. This study found a significant correlation between monthly precipitation and Rs; the precipitation of the semi-arid grassland peaked in September 2011, strongly influencing soil respiration. The significant interannual variations in Rs might be mainly caused by seasonal precipitation fluctuations. Please see L329 – L333.

Figures Fig. 2 The significance test results are not prominent, suggesting recommend the results which is marked significantly and omit insignificantly.

Response from authors: We greatly appreciate your constructive suggestions. We added the significance test results in figure 2. Please see L 722.

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Fig. 5-6 “(d) 5-10 cm in warm season grazing plots” should change to “(d) 5-10 cm in cold season grazing plots” in both Fig. 5 and Fig. 6.

Response from authors: Changes were made following your advices in the revised version. Please see L 752-L755 and L761-L764.

Reference Chen, X. J., Hou, F. J., Matthew, C. & He, X. Z.: Stocking rate effects on metabolizable energy intake and grazing behaviour of Tan sheep in steppe grassland on the Loess Plateau of Northwest China, *J. Agr. Sci.*, 148, 709-721, <https://doi.org/10.1017/S0021859610000511>, 2010

Please also note the supplement to this comment:

<https://www.biogeosciences-discuss.net/bg-2018-531/bg-2018-531-AC5-supplement.pdf>

Interactive comment on Biogeosciences Discuss., <https://doi.org/10.5194/bg-2018-531>, 2019.

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