Solid Earth Discuss.,
doi:10.5194/se-2016-18-AC2, 2016

Solid Earth Discussions

Interactive comment on "Effect of soil coarseness on soil base cations and available micronutrients in a semi-arid sandy grassland" *by* L. Lü et al.

L. Lü et al.

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Received and published: 14 March 2016

Comments from Reviewer #1:

Comment: In the Introduction the processes including soil coarsening around the world are briefly mentioned, but they are not mentioned along the text. It would be important to discuss which factors are driving soil coarsening in the study area.

Response: We added information related to soil coarseness in the context. Please see Line 41-42, Line 55-64, Line 78-81, and Line 88-92. And now, the driving factors of soil coarseness in this area can be found in Line 55-59 and Line 90-92.

Comment: In the Study area the authors should induce a reference to some other factors which affect desertification in this region, such as vegetation, lithology (bedrock,

sediments?) or aeolian processes (significant?)

Response: The information with reference to other factors has been added. Please find in Line 109-114.

Comment: Are soil layers different along the sections? If it is homogenous, mention it. If soil layer show distinct features, this might have affected your sampling and therefore your experiment. Please clarify it.

Response: We agree with the suggestion. This information has been added in Line 129.

Comment: Another thing which you may have influenced your data at depth are cryogenic processes. The area records freeze-thaw cycles during at least 4-5 months per year. Freeze-thaw cycles affect the vertical structure of the soil through cryoturbation activity. How this process may have affected your data?

Response: The reviewer brings up a good point and we have expanded our speculation related to freeze-thaw cycles. Please see Line 302-305.

Comment: You present nice data about soil base cations and available micronutrients at different depths, but you do not discuss how they influence soil formation processes (pedogenesis). Response: This information has been added in Line 310-313.

Comment: Tables are OK, but the paper would substantially improve with 1/2 new figures including the site location, soil sections, etc.

Response: This figure has been added as Fig. 1. Mr. Xiao helps to create this figure, so we added him as a co-author.

Comment: Line 41 add comma after world; Line 97 change expect to 'expected'; Line 109 after mm, change to 'which defines the area as semi-arid'. Response: These has been corrected in the context. Please see Line 41, Line 100, and Line 115.

Comments from Reviewer #2 (Dr. Martine Van der Ploeg):

Comment: I suggest to include a description of the pedogenesis of the area where the study was carried out.

Response: This kind of description has been added in the context. Please see Line 120-123.

Comment: In the description of the experimental design, I have two questions: Page 5 line 13 mentions species composition. What was the composition? And base on the transplantation species procedures, would the authors expect a difference in start conditions of micronutrients, was it checked? And if there were differences, how do the authors expect this to play out over the experimental period of two years?

Response: Thanks for bringing a nice point. First, the information of species composition was listed in Line 146-149. Second, the conditions of micronutrients would be different among treatments at the beginning because their concentrations were mainly determined by the proportion of clay or SOM concentration. And species composition was the same for all treatment plots at the beginning which would not influence micronutrients at this time (this information has been added in Line 146). The role of soil fine particles and SOM concentration in shaping micronutrient distribution has been discussed in Line 261-287. Frankly, we did not check the conditions of micronutrients at the start of the experiment. In our further work, we will analyze micronutrients in both plants and soils to see the response of soil micronutrients to plant uptake along with the experiment going on.

Comment: Related to the previous comment: The vegetation could be a bit more embedded in the discussion with reference to other studies in that aspect. Were there differences observed in plant composition after two years and how could these have affected the micronutrients?

Response: Thanks for this comment. Actually, we think net primary production can have greater impact on availabilities of soil base cations and micronutrients than plant community composition under different soil coarseness degree. Because higher plant

biomass and higher plant nutrient demands would induce mobilization of these nutrients. Related information has been added in Line 281-284.

Comment: Page 3 line 3 “and are” instead of “as well as”

Response: This has been corrected. Please see Line 67.

Comment: Page 3 line 14 cause a decrease

Response: This has been corrected. See Line 78.

Comment: Page 3 line 15 decrease of

Response: This has been corrected. Please see Line 79.

Comment: Page 10 line 17-20 I would suggest to reference Van der Ploeg et al. 2012. They show that plant species composition and local variations in chemistry are also related to differences in microtopgraphy. The microtopgraphy may be induced by species differentiation itself. This may be an important factor in the grassland systems here as well, and may also determine difference between the current and other studies in terms of micronutrient species distribution. Another interesting reference in that respect is Burke et al. 1999.

Response: Nice point. We have also cited these two references here. Please see Line 310.

Comment: Fig. 2 panel c and Fig. 3 panel d: Were there no differences found, or are the indications for significant difference missing? If first, please mention in caption, if second, please include in Figure.

Response: There were no differences found. We have mentioned this in the figure captions. Please see Line 517, 525.

Please also note the supplement to this comment:
http://www.solid-earth-discuss.net/se-2016-18/se-2016-18-AC2-supplement.pdf

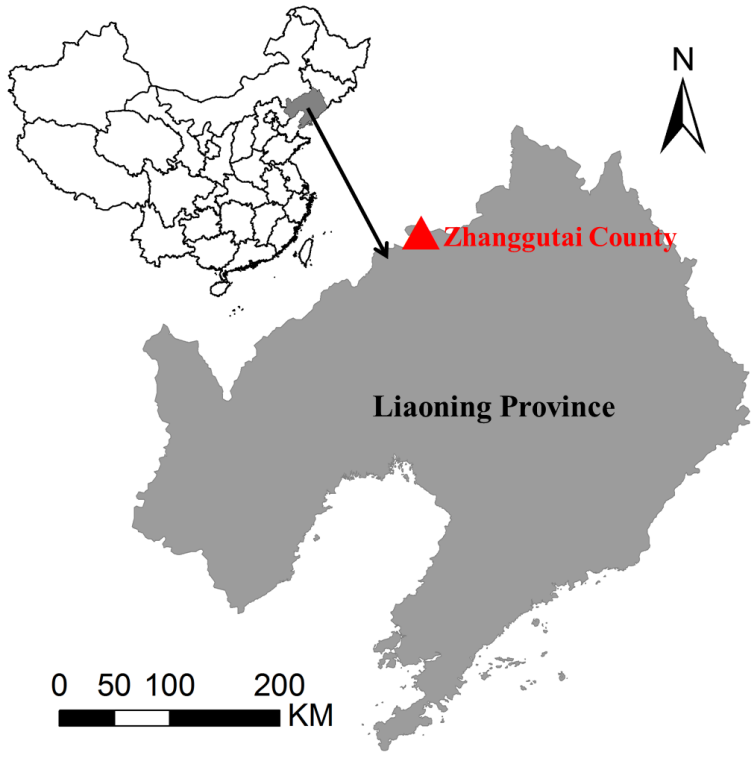

Fig. 1. Location of the experimental site.

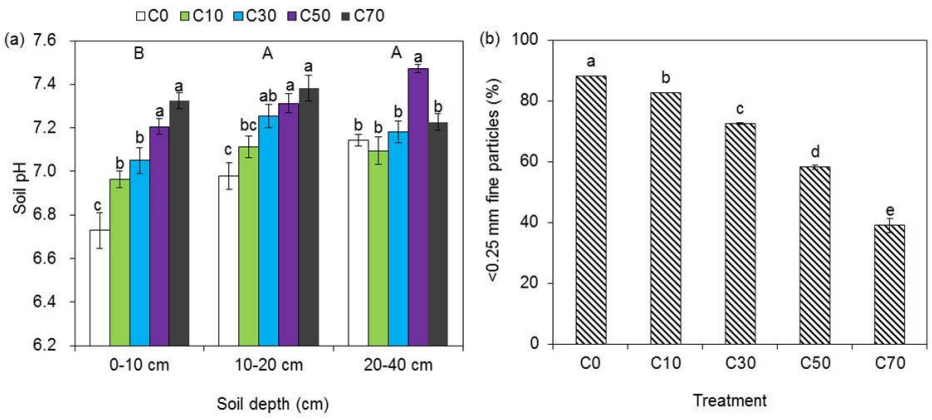

Fig. 2. Soil pH values for three soil depths (a) and proportion of soil fine particles (< 0.25 mm) for 0-10 cm soil in different soil coarseness degrees of 0% sand addition (C0), 10% (C10), 30% (C30), 50% (C5

C7

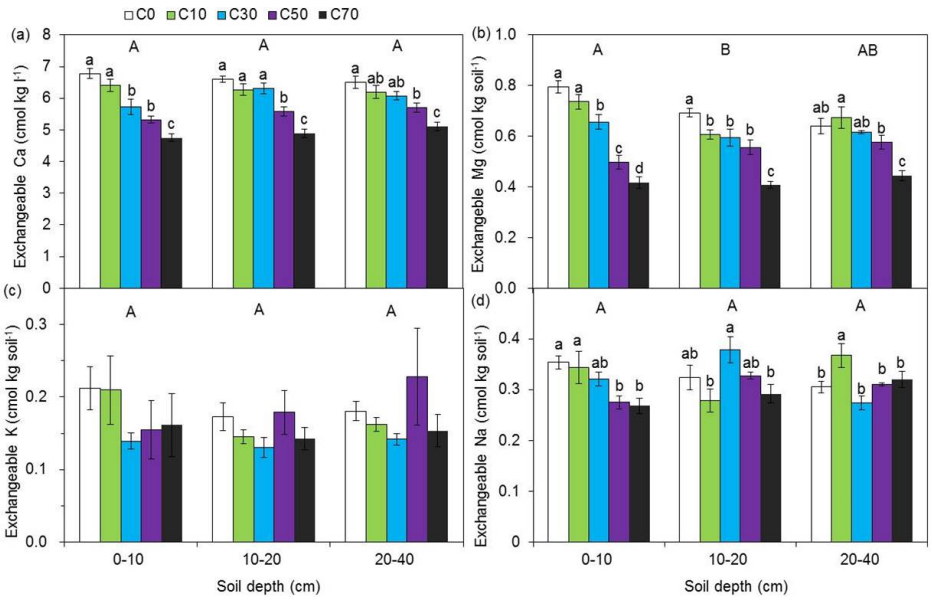

Fig. 3. Soil base cations of exchangeable Ca (a), Mg (b), K (c) and Na (d) for three soil depths in different soil coarseness degrees of 0% sand addition (C0), 10% (C10), 30% (C30), 50% (C50) and 70% (C70). D

C8

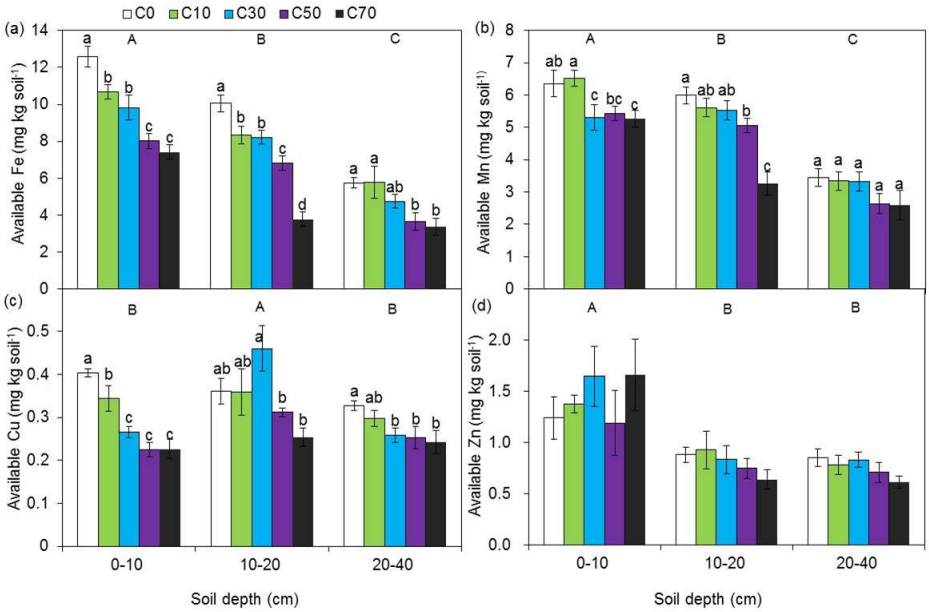

Fig. 4. Soil available micronutrients of available Fe(a), Mn (b), Cu (c) and Zn (d) for three soil depths in different soil coarseness degrees of 0% sand addition (C0), 10% (C10), 30% (C30), 50% (C50) and 70%

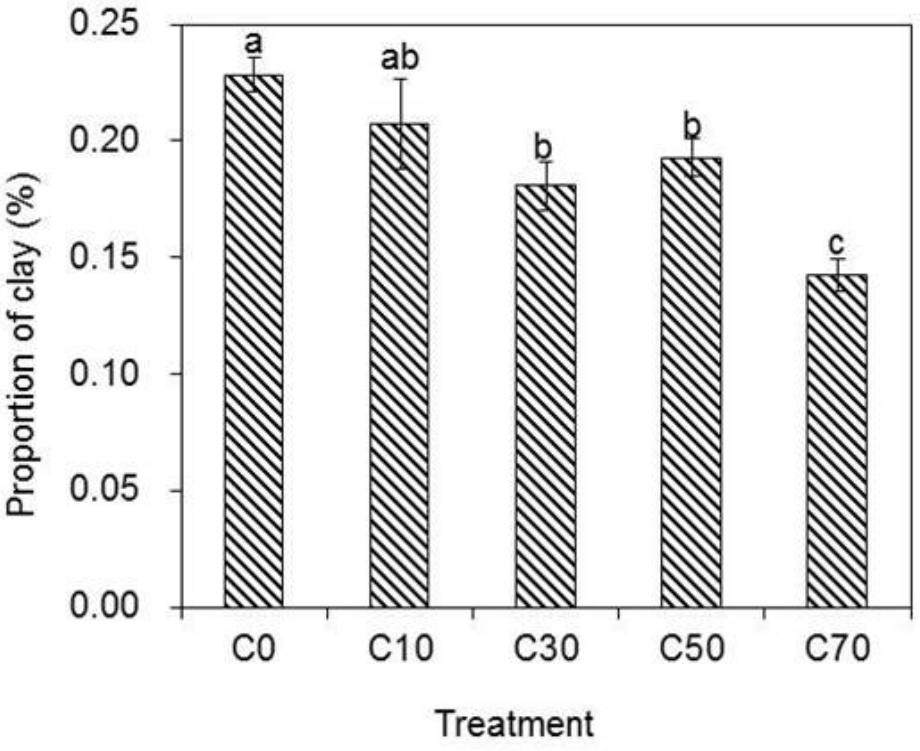

Fig. 5. Fig. S1 Proportion of soil clay particles for 0-10 cm soil in different soil coarseness degrees of 0% sand addition (C0), 10% (C10), 30% (C30), 50% (C50) and 70% (C70). Data represent mean ± SE (n=6).