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Interactive comment on “Testing functional trait-based mechanisms underpinning plant responses to grazing and linkages to ecosystem functioning in grasslands” by S. X. Zheng et al.

Anonymous Referee #1

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In this paper, the authors evaluate plant traits in grazed and ungrazed grassland sites in Inner Mongolia. This is the fourth paper using what seems to be the same data set to evaluate differences between grazed and ungrazed sites. In addition to analyzing the same data for this paper as was used in three previous papers, they borrow text from their previous papers for some of the sections of this paper. I had so many questions about the data and the presentation that I was not able to focus on the results. Much of the writing is very difficult to understand and requires substantial editing. The data from 6 sites were collected during an 18-day period in late July and early August 2007. According to data presented in Chen et al. (2011), 2007 was a relatively wet year. I raise this point because many of the plant traits Zheng et al. measured are sen-

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sitive to growing season conditions including SLA (Dwyer et al 2014). This means that data from a single growing season may not be representative of a general response especially since grasslands are characterized by a strong relationship between above-ground net primary production and annual and growing season precipitation (Huxman et al. 2004). While this does not negate the value of the data presented by Zheng et al., it is cause for a little circumspection in the interpretation of the results. I also have concerns about their interpretation of what they refer to as field hold capacity because water availability is such an important driver of ecosystem responses in grasslands. It would be clearer if they used “water holding capacity” or “field capacity” to refer to this variable, but that is not the issue I am concerned about. They claim, on page 13167, line 6, that “...field hold capacity (F, an indicator of soil moisture)....”. It is only an indicator of potential of a soil to hold water against the pull of gravity. It only represents soil moisture in environments that are wet enough to fill the soil to capacity and the Inner Mongolian grasslands with annual precipitation between 300 and 400 mm do not qualify. Although I suspect that their meadow, with the highest water holding capacity, receives water inputs in addition to precipitation, such as run-on or from a shallow water table. Besides the high water holding capacity, the high soil carbon value (12%) in Table 1 suggests subsidized net primary production. This brings up a correction that must be made to Table 1 and throughout the text - the Walkley-Black dichromate oxidation method provides an estimate of total soil carbon not soil organic matter as it is referred to in the text. A statement in the text that needs to be clarified to facilitate evaluation of the results is the sentence “In contrast, the grazed sites, located outside the fence of ungrazed sites, have been managed as free grazing pasture (mainly by sheep) since 1950s, thus they have about 60 years of grazing history (Zheng et al., 2010).” I found the Zheng et al. (2010) paper and it provided no additional information. In fact, here is what it says on the issue “The grazed sites, located outside the fence of the ungrazed sites, have been managed as free grazing pasture (mainly by sheep) since 1950s, thus they have about 60 years of grazing history.” I also found a PLOS ONE paper entitled “Scale-Dependent Effects of Grazing on Plant C: N: P Stoichiometry and

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Linkages to Ecosystem Functioning in the Inner Mongolia Grassland." Here is the sentence it used to describe the grazed sites "In contrast, the grazed sites, located outside the fence of ungrazed sites, have been managed as free grazing pasture (mainly by sheep) since 1950s, thus they have about 60 years of grazing history." The issue of whether all sites were grazed by sheep or if cattle or another large herbivore grazed some of them is unresolved. The effects of different species of grazers can be large and account for some of the differences observed among sites. Now I want to return to the issue of the generality of these results. We know that grasslands are characterized by year-to-year fluctuations mostly in response to variability in precipitation (Noy-Meir 1975). A single year's data is a sample from a distribution of responses each associated with an amount and seasonal distribution of precipitation. While we often learn interesting things from individual year's responses, they do not provide a sound basis for making generalizations. In my opinion, Zheng et al. make too many unwarranted generalizations in this manuscript. For instance, the first sentence of section 4.5 "Our findings have important implications for understanding ecosystem structure and functioning and managing arid and semiarid grasslands." They go on to generalize about responses of arid and semiarid grasslands to global change much if not all of which seems unwarranted.

Literature Cited

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