

Interactive comment on “Soil carbon sequestration by three perennial legume pastures is greater in deeper soil layers than in the surface soil” by X.-K. Guan et al.

Anonymous Referee #2

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Comments on work of Guan et al.

This is simple and nicely conducted field experiment showing that the soil C sequestration induced by legumes may have been underestimated in many studies omitting to prospect deep soil layers. This study presents other interesting results: 1) a steady SOM accumulation over the 7 years of study challenging the common idea of limited capacity of soils to sequester C (Smith, P GCB 2014), 2) the SOM accumulation is not simply linked to plant production challenging another common belief. These findings are of interest for the readership of Biogeoscience and deserve to be published. I provide here some recommendations with the aim of improving the interpretation of results.

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Based on your results, it seems that the persistence of legumes is not guaranteed: the biomass from all legume species peaked around 2006 and then decreased. Could you interpret this result?

Your material and methods section does not specify whether legumes have been fertilized with P, K, S etc. The lack of fertilization combined with substantial plant forage exportation may have led to nutrient depletion in soil responsible of the decrease in legume biomass production.

How has the plant cover evolved during these 7yr of experiment? Have you observed the invasion by other plant species?

The C sequestration under legumes treatments is quantitatively important. To allow the readers to make his own idea on the feasibility of such C sequestration, could you compare this soil C sequestration to estimated GPP and NPP of these cultures (roughly estimates are always better than nothing).

Finally, this SOM accumulation involves the sequestration of nutrients including N that must enter into the system. Could you estimate the amount of N sequestered in SOM? Comparing this amount with an estimation of N fixation by these three legumes may help to understand the difference of C sequestration between legumes.

Interactive comment on Biogeosciences Discuss., 12, 10115, 2015.

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