

RESPONSE TO REFEREE

Dear Associate Editor

Thank you for a further chance to clarify our paper “Soil carbon sequestration by three perennial legume pastures is greater in deeper soil layers than in the surface soil” (MS No.: bg-2015-174). We thank the referee for pointing out the lack of clarity in two paragraphs of the Discussion. Below we outline our response to the Referee.

We trust that the manuscript is now acceptable for publication in *Biogeosciences*.

Yours sincerely

Professor FengMin Li, for all the authors

Referee:

Although the authors have improved the manuscript, there still remains one contradictory argument and one vague paragraph in the discussion chapter.

L 230-234: I don't understand what do the authors want to say here? Definitely when a part of soil is inhabited by roots they will take up water and deposit C. What is contrasting here that the authors want to point to? I think it's pretty straight forward as is reflected in authors' own argument later in the discussion where they make a point that the water extraction from deep soil layers by plants is an indication that roots were present and depositing C thereby resulting in SOC sequestration.

Response:

We agree that this sentence was not clear and that the issue of roots and carbon sequestration deep in the profile is more fully and clearly discussed later in the Discussion. We have therefore deleted this sentence.

Referee:

L 240-260: This whole argument is vague and unclear. First of all, one is not sure which shoot:root ratio corresponds to which species? Moreover, I could not understand between which three parameters the 1:3:1 ratio is? Apparently, the authors estimated root biomass using a certain shoot:root ratio based on the measured aboveground biomass. Then they compared the sequestered SOC with the total estimated root biomass. But the authors continuously kept referring to estimated SOC (do they want to say estimated root biomass?) and the measured SOC. Honestly, I could not understand what were they saying.

Response:

Most of the paragraph referred to has been rewritten to clarify the comparisons between the increase in SOC stock measured over the 7-year period and the estimated root carbon

produced by the three species over this time. Part of the difficulty was the referee's misunderstanding of the shoot:root ratio which was 1.3:1, not 1:3:1. To ensure that other readers do not misunderstand the ratio, we have chosen to use the root:shoot ratio (0.77:1), not the shoot:root ratio (1.3:1) in the revised version as we believe that the root:shoot ratio is clearer. We have also pointed out that the same ratio was used for all three species and have more-clearly spelled out the calculation of the accumulated root carbon from the measured aboveground biomass. The accumulation of carbon by roots is clearly identified as such and not referred to as estimated SOC. We trust that the Discussion is now much clearer.