Biogeosciences Discuss., 9, C112–C115, 2012
www.biogeosciences-discuss.net/9/C112/2012/

Biogeosciences Discussions

Interactive comment on "Nitrous oxide emission reduction in temperate biochar-amended soils" *by* R. Felber et al.

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Received and published: 16 February 2012

We regret that reviewer 2 judged that the presented work does not advance our knowledge of biochar effects on GHG of temperate soil. We do admit as already explained in the answer to reviewer 1 that we "overloaded" the manuscript with interpretations which are poorly substantiated with the presented data and hide the valuable information to the important topic of using biochar amendment as a mitigation option in intensive agriculture systems.

The primary interest of applying biochar to soils has been improvement of soil fertility in the tropics. As a side effect, biochar became of interest based on findings that it reduces N2O emissions from these soils. In contrast soils of temperate regions have been only scarcely investigated. Our experiment is one of the first of its kind in

temperate soils and our work shows that there is a significant N2O reduction potential from temperate soils as well.

Comment: *This work adds to the several which are currently coming into press that address the effect of biochar (BC) addition on the production of GHG from temperate agricultural soils. While the stated hypotheses are sound, the work is flowed and cannot test them. Overall, this work does not advance our understanding of BC effects on the GHG of temperate soils. Major flows are:*

Comment: *1. The work is conducted over a period of only 3 months. This is by far too short a period to inform about the "evolution of GHG emissions from soils over time" as a result of BC additions – which is a prime aim of this study.*

Repsonse: The terminology 'over time' has also been questioned by the first reviewer has it may cause misunderstanding. We clarify that we measured N2O and CO2 fluxes at the beginning and end of a 3-months incubation period and will revise the text accordingly.

Comment: *2. Not only the laboratory incubation was conducted for only 3 months – but during this period gas emissions were sampled only at the beginning and end of the incubation. Again too little a sample to be really informative.*

Repsonse: The question is how to decide when a sample becomes really informative? Certainly there is more information delivered from replicated measurements than from just single measurements. Various published studies measured GHG fluxes only once and we show that the biochar effect is sustained over the three months in temperate soils – this finding is new.

Comment: *3. The work is basically conducted on pseudo-replicates. The soil collected from the field was homogenized into one sample - dividend into subsamples for BC additions. Each Biochar was added to a one soil subsample - homogenized - and then divided into lab replicates.*

BGD

9, C112–C115, 2012

Repsonse: Performing laboratory incubations on homogenized subsamples drawn from a composite field sample is not uncommon (e.g. Webster et al. 2000) as the goal of the experiment is typically not to estimate field heterogeneity or to make statements on the soils behavior in situ but to quantify the effect of treatments. We can hardly imagine, in reverse, that one would recommend not to thoroughly mix the (heterogeneous) biochar before adding it to soil in order to minimize effects of different particle size etc.

Comment: *Additionally the biochar used in this study have a pretty low C concentration (55-67%), and I wonder how representative would, anyway, be those findings. This assuming that the concentration was measured correctly – often on BC samples the EA has to be tuned (higher temperatures of combustion) to combust the charred material – and I would suggest the authors to look into this possibility.*

Repsonse: The elemental analysis at our Institute has been adopted to the measurement for various types of black carbon in a previous study (Leifeld, Org. Geochemistry, 2007). Biochar is, as black carbon in general, a collective for materials with a wide range of properties. Biochars with similar C-concentrations as in our study were reported e.g. by Atkinson et al. (2010), Bruun et al. (2011); Glaser et al. (2002), Major et al. (2010).

Comment: *Overall the work is poorly structured – with as many as 20 tables and no headings in the material and methods and results, and the English language needs significant revision.*

Repsonse: We apologize for the high number of tables – they were considered as an appendix in the BGD version but due to a technical error they now appear as regular tables in the text. Most of them will explicitly be listed as supplementary materials in the revised version of our manuscript. We think it is important to present not only aggregated figures and statistics but the measured data itself. The revised text will be copy-edited and subheadings will be inserted.

BGD
9, C112–C115, 2012

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Interactive comment on Biogeosciences Discuss., 9, 151, 2012.