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Interactive comment on “Effects of fresh and aged biochars from pyrolysis and hydrothermal carbonization on nutrient sorption in agricultural soils” by M. Gronwald et al.

M. Gronwald et al.

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Received and published: 7 May 2015

Dear Referee, Thank you a lot for your comprehensive review and useful suggestions. Your comments brought this paper really forward.

Anonymous Referee #2 (C74-C76) Received and published: 09 April 2015.

1. Terminology: ‘biochar’ is used as a term, which groups material produced by very different procedures (pyrolysis and hydrothermal carbonization). I would replace this term by just talking of chars when both types of materials are addressed. Biochar is by definition charcoal, which is produced by pyrolyses. I do not agree with the use

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of this term for material that was produced by hydrothermal carbonization because it confuses the reader.

Reply: Both you and reviewer #1 criticized rightly the large number of different terms used. Therefore, we decide to only use the term 'char' when we talk about both char types and to only use the terms 'pyrochar' or 'hydrochar' separately when we talk about one of them. Additionally, we wrote a definition for these terms in the introduction and how we use them throughout the manuscript (revised manuscript page 2, line 20-32). Accordingly, we changed the term 'biochar' in the main title of the paper to 'char'.

2. The paper is very long and contains a lot of data. While nine chars, produced by different procedures from different feedstocks, were used for laboratory batch experiments, only chars produced from *Miscanthus* were used for field incubations.

a) This is pointed out in 2.1, where the production procedures are described. This sentence should be moved to point 2.2, where the field experiments are described.

Reply: Thank you for this hint. We moved the production process of the chars used in the field experiment to section 2.2 "Field ageing".

b) In my opinion, the logic of the paper would benefit, if the authors concentrated either on the laboratory experiments or only on chars produced from *Miscanthus* feedstocks.

Reply: In this matter, we cannot fully agree with you. If we used laboratory data only, we would conceal information on contrasting field results against better knowledge which does not seem scientifically sound. On the other hand, if we used the *Miscanthus* field data only, we would lose all information on the other feedstocks such as the risk of phosphorous leaching from digestate-based chars (lab data). While further chars certainly should be tested in the field in future, the laboratory results are necessary to decide which ones might be promising and which ones might be risky.

3. The main point of the paper, reduction of nutrient sorption, is seen in the field experiments, but not very evident, when looking at the obtained during the batch ex-

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periments. Here, chars from *Miscanthus* do show very little effects on nutrient removal. In general laboratory experiments should be carried out to elucidate processes, while field experiments are carried out to investigate behavior under natural conditions. I recommend to report first the field data and then some selected data of the laboratory experiments designed to elucidated the processes and generalization underlying the field observations (soil type, feedstock, washing).

Reply: We considered to restructure the paper as recommended, but finally decided to keep the current structure in order to facilitate a better story line: Starting from the variety of effects depending on char type and ending with one field experiments and the question of persistence of the effects. When we would show the field observations first, readers might that the laboratory experiments deem unnecessary. While we can understand your reasoning, we decided to keep the original structure of the paper for the following reasons:

a) If we were showing only selected data from the laboratory experiments, we would lose the objective of the design of the lab experiments, i.e. to systematically compare different chars, feedstocks and soils.

b) Furthermore, we would lose information on topics which are not relevant in this specific field experiment (e.g. on phosphorous leaching), but generally relevant also for further studies.

c) In our opinion, the story of the paper is more consistent if the more theoretical laboratory experiments are shown first and the step to the “real world” second.

However, we followed your suggestion and shifted the focus more towards the field experiment. We extended the discussion on the results of the field experiment and shortened the results section on the laboratory experiments accordingly, to both improve the readability and to avoid lengthening the manuscript.

4. In summary the authors should work on the story of their manuscript, the way that

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the readers are guided to be persuaded of the main important conclusions of their paper.

Reply: We revised our manuscript in order to better guide the reader through our “story”. We deleted all concentration numbers from the test in the result section to make it more easily and fluently readable. Moreover, we shortened the manuscript, in particular the results section by 20%.

Interactive comment on SOIL Discuss., 2, 29, 2015.

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