

Interactive comment on “Biogeochemical cycles and biodiversity as key drivers of ecosystem services provided by soils” by P. Smith et al.

P. Smith et al.

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Revisions made in response to reviewer comments on Soild-2-537-2015

Comments listed as “Comment:” Author responses listed as “Response:”

Response to Anonymous Referee 1 (SOIL Discuss., 2, C273–C276, 2015 www.soil-discuss.net/2/C273/2015/)

Comment: Biogeochemical cycles and biodiversity as key drivers of ecosystem services provided by soils Smith et al. General comments: The group of authors presents a review on soil functions, i.e. carbon cycling and storage, nutrient cycling and supply (with focus on N and P), water storage and filtration, as well as soil as a habitat for

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organisms. Background information on these aspects, which especially addresses human impacts on these functions, is combined with an overview on existing knowledge gaps and recommendations for management activities. The topics researched from about 170 references are backed by five tables summarizing major aspects of some of the soil functions and management effects thereon. Additionally three figures are presented. This is a well-written and concise manuscript, suited for publication in SOIL. It nicely summarizes the state-of-knowledge on several general aspects in soil functioning and will be of special interest for a readership from adjacent disciplines being interested in soil science. Yet some critical comments might be given. Due to the wide range of topics discussed, the synoptic information is in some cases rather superficial.

Response: We thank Referee 1 for these supportive and thoughtful comments. We have discussed these suggestions among the author team and agree with all of the points raised and the weaknesses identified. We will make these changes in full in a revision before publication in SOIL.

Comment: Specific comments - 540/2: It is rather the diversity than the richness (the latter being the number of different species).

Response: We agree. We have changed "richness" to "biodiversity".

Comment: 540-541: There are also other soil services defined, i.e. soil as source of raw materials such as sand or clay, soil as a surface for building infrastructure, soil as an archive for landscape development and history of human soil use (see for example Blum W.E.H., 2002, in: Land degradation - Contributions to the International Workshop “Land degradation” 5-6 December 2002, Ispra, Italy; Jones R.J.A. & Montanarella L.; Eds.). Similarly, also Fig. 1 is incomplete. It might be discussed whether soil formation is a service that soils provide to the ecosystem (see also 549/16).

Response: We have added these additional services and the reference.

Comment:545/6: This sentence is misleading. I guess the authors intended to say that

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aerobic soils exist where all transformation of SOM leads to CO₂ Actually the information reads like “all SOM is mineralized” so that no SOM would remain in soil.

Response: We agree – we have reworded accordingly.

Comment: 545/10: What is meant with the information “an element of the climate regulation service”?

Response: Soil C storage is just one element of climate regulation as it is only one of the biogenic greenhouse gases mediated by soils. Wording has been changed to clarify this.

Comment: 545/12-14: A reference is missing for the methane formation and oxidation.

Response: We added the following reference: “Reay, D, Smith, P. & van Amstel, A. (Eds.) 2010. Methane and Climate Change. Earthscan, London, 272 pp.”

Comment: 545/18-19: Change the sentence to “A decrease in soil C storage has been observed initially after fire, but . . .”. What kind of fire is this? The effect of fire very much depends on the occurring temperatures, which are largely different for example between a forest fire and burning of a stubble field.

Response: We agree. We have now added this context specificity.

Comment: 548/27: There are many other soils rich in pedogenic oxides. It is unfitting to reduce this statement to rice paddies alone.

Response: We agree. We have made the statement more generic and given the paddy rice reference as one example.

Comment: 550/26: Soils also provide the species of N and P suited as nutrients. Delete “when they are needed”; this is an euphemism.

Response: We agree – we have removed the whole qualifier: “. . .in the amounts and proportions needed, when they are needed”

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Comment: 550/27: What is meant by “buffering in soil organic matter”? Is it the fact that SOM amounts react rather slowly to changed conditions or is it the chemical buffering function of organic molecules’ functional groups?

Response: We meant storage – so we have removed reference to buffering as this was confusing.

Comment: 552/2-3: This statement is too general and oversimplifying. Numerous examples could be given showing the opposite.

Response: We agree. The text has been changed to: “In some regions of the world mineral fertilizer is applied in excess of plant requirement, but in other regions, in particular in Sub-Saharan Africa where economic constraints limit the use of fertilizers, productivity is still strongly limited by soil available N and other nutrients, notably P and K (N and P; Fig. 3)”.

Comment: 553, Section 4: This section very much repeats textbook knowledge. References are missing in most parts of this section.

Response: This review is meant to serve as a primer for non-specialists so we want to keep the detail at an appropriate level. But we have now added more references so that the reader can follow up.

Comment: 553/26: “cultural services such as landscapes and water bodies”. These are not truly soil ecosystem services. Soils are parts of landscapes, while surface water bodies belong to the part of the hydrosphere not overlapping with pedosphere.

Response: We agree – we have changed the wording to show that soils contribute to these cultural services as vital ecosystem components – but are not truly soil ecosystem services.

Comment: 555/3: I agree that macropores very much control the “transmission of water through the soil”. However, why would macropores define the water holding capacity of soil?

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Response: We agree that they by themselves do not – we have removed this statement.

Comment: 555/23: The term “excessive precipitation” is inadequate. A positive water balance is found in many regions of the Earth and does not necessarily lead to waterlogging in soil. Vice versa, waterlogged soils are also found in regions (lowlands) without “excessive precipitation”.

Response: We agree – we removed the statement about “excessive precipitation” since waterlogging can occur in many situations.

Comment: 560/23: Nitrogen fertilizers produced by the Haber-Bosch process are synthetic fertilizers. If other (mined) fertilizers are also meant, then the authors should write “mineral fertilizers”.

Response: We agree: “synthetic” changed to “mineral”.

Comment: Table 2: Regular organic fertilizers such as manure or compost are not mentioned (in contrast to biochar).

Response: We agree – we have added organic fertilizers: manures and composts

Comment: Table 4: Land use change should have more than aesthetic implications.

Response: We have added (under cultural services): change from traditional practice.

Comment: Table 5: The “production of (precursors to) industrial and pharmaceutical products” is mentioned as a provisioning service impact from all management actions. Yet, this use of soil biota is rare and thus, assumed consequences on this function are rather speculative.

Response: We do not agree – About 90% of known antibiotics were isolated from soils, so we have left the statement in.

Comment: Technical comments – 540/3: Correct to “functionality”.

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Response: Done

Comment: 542/22: Change to “waterlogged soils, e.g. peats (Smith et al., 2010)”.

Response: Done

Comment: 5542/26: Correct to “components”.

Response: Done

Comment: 543/1: The way the sentence is written, it might be misinterpreted that the maximum depth of peat soils is 8 m.

Response: Reworded.

Comment: 543/5: Correct to “bicarbonate”.

Response: Done

Comment: 544/27: Add a bracket to “(Thevenot . . .)”.

Response: Done

Comment: 545/9: Here and elsewhere: Change “PgC” to “Pg C”.

Response: Done throughout

Comment: 546/16: Correct to “provide”.

Response: Done

Comment: 548/21: Why is this in contrast? Skip this term. –

Response: Done

Comment: 548/25-26: Suggested to skip the comparative by changing to “occurrence is very much geographically restricted”.

Response: Done

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Comment: 549/19: Correct to “soils continue”. - 550/8: Change to “production and (future) “.

Response: Done

Comment: 551/22: Correct to “Generally”.

Response: Done

Comment: 552/8: Correct to “through”.

Response: Done

Comment: 552/20: Correct to “of P and N”.

Response: Done

Comment: 554/6: The authors should add a reference to the end of this sentence.

Response: We already have two references that cover all aspects of the sentence so no new reference added.

Comment: 559/24: Correct to “synthesis is” or “syntheses are”.

Response: Done

Comment: 563/2: Correct to “achieving”.

Response: Done

Comment: 564/15-16: Incomplete sentence, rewrite.

Response: Done

Comment: 564/19-20: “but we know enough to start to make a difference now”. This euphemism is very imprecise and could mean all or nothing. Delete.

Response: Agreed. We have changed to: “but best practices are well characterised, even though knowledge is incomplete, so can be implemented immediately”

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Comment: Tables and figures: Often it is referred to the tables and figures at the end of the respective section, making them an appendage that is only marginally mentioned in the text.

Response: We agree. We have now made more reference to the tables and figures in the text.

Response to Anonymous Referee 2 (SOIL Discuss., 2, C412–C412, 2015 www.soil-discuss.net/2/C412/2015/)

Comment: The focus of and motivation for the review by Smith et al is entirely appropriate for SOIL, and the experience of several of the co-authors is certainly highly respected and global, and the reader might expect a seminal overview of the ecosystem service delivery by soils. Surprisingly, it is not very good, and I would expect that several of the authors would come to the same conclusion as me if they were given this paper to review, i.e. that it needs a complete redraft to be acceptable for publication.

Response: We are sorry that the review did not meet the expectations of referee 2. Referee 2 does not specifically say what he/she found “not very good” about the manuscript, or exactly what he/she would like to see in a redraft of the paper, which makes the comments rather difficult to deal with. We have, however, revised the manuscript substantially in response to the comments of Referee 1 (see above), which we hope addresses Referee 2’s call for a complete redraft.

Interactive comment on SOIL Discuss., 2, 537, 2015.

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