

Interactive comment on “Refining physical aspects of soil quality and soil health when exploring the effects of soil degradation and climate change on biomass production: an Italian case study” by Antonello Bonfante et al.

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A note upfront from the submitting person: This review was prepared by Jasmin Kesselring, master students in earth system science at the University of Zurich. The review was part of an exercise during a first semester master level seminar, which I (co-) organize. We would like to highlight that the depth of scientific knowledge and technical understanding of these reviewers represents that of master students. We enjoyed discussing the manuscript in the seminar, and hope that our comments will be helpful for the authors.

C1

Bonfante et al. use physical soil properties, such as aggregate stability, surface and subsurface hardness and available water capacity, to describe and model soil health and quality. They try to predict the change in these parameters and therefore in the soil characteristics due to climate change and under different forms of soil degradation. For that, they modelled the soil-water-atmosphere system using a SWAP model and the RPC 8.5- IPCC climate model.

General comments: Bonfante et al. tried to quantify soil health and quality by describing the soil phenoforms rather than soil genoforms. This seems reasonable as the phenoform of the soil takes the past management of soil into account, e.g. possible degradation. To use the IPCC climate model to predict changes in soil health is also quite reasonable as this model is approved by many countries and available globally. However, the results of these climate scenario are somewhat unclear to me. The results of the modelling process are not put into relation with soil health. This could be as the IPCC model has big uncertainties and no clear evolution of the soil in the future can be made. Maybe the influence of future climate on the soil health could be expanded in the discussion.

The paper states clearly, that physical soil properties can be used to quantify soil health. In class we discussed soil health and soil quality and came to the conclusion that it is a function of physical, chemical and biological factors. I do not understand how the soil health can be quantified only using one aspect, when they all influence each other and are dependent on one another. Does the paper conclude that analysing the physical properties is sufficient to derive soil quality? Or were the chemical and biological properties neglected in the paper because they have not been measured?

There are too many conclusions. Not all conclusions are actually discussed in this paper, or are general statements rather than derived from the results of this paper. For example, the conclusions 2 and 5 were not mentioned in the discussion.

The material and methods part of the paper is quite repetitive, and a lot of information

C2

already has been established in the introduction section. For example, the soil physical aspects (L131 pp) have already been mentioned and explained in the introduction section (L44 pp). Further, the chapters 2.2 and 2.3 which are both about the modelling process and mention the same information multiple times. For example, both the SWAP and IPCC climate model are described in 2.3 and 2.2.

– Detailed comments:

Please be consistent when new abbreviations are introduced. Sometimes the explanation with the whole word comes after the first use of the abbreviation.

L90/92 What are these soil series that are described? Is it some form of soil profile archive?

L158-163 This part describes again aspects of the soil function 1. Maybe this could be summed up in one part with the other aspects of function 1 in L131.

L169/222 Be consistent and write either h -theta or $\theta(h)$.

L182 Why does Y_w always have to be lower than Y_p ? Couldn't there be a season with more precipitation than usual.

L210 You state that actual Y_a values can't be determined for future scenarios. Would that not be a problem, as you use the Y_a/Y_w -ratio as the soil health indicator?

L226 What is meant with LAI evolution

L276 Inconsistent use of a footnote

L287 Why is this part called Results and 'Comments' when there is a separate Comments-part later on?

L291/298 Use either Figure or Fig

L385 only the physical properties of the soil where described in this paper. Can the soil-water-plant-atmosphere model also be used for biological or chemical properties?

C3

L400 Why is this approach the only one which allows to explore possible effects of climate change?

Table 2 R di pearson should be Pearson's R

Interactive comment on SOIL Discuss., <https://doi.org/10.5194/soil-2018-30>, 2018.

C4