SOIL Discuss.,
https://doi.org/10.5194/soil-2018-14-AC1, 2018

Interactive comment on "Assessment and quantification of marginal lands for biomass production in Europe using soil quality indicators" *by* Werner Gerwin et al.

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Received and published: 27 August 2018

Dear Referee #1,

we would like to thank you very much for your comments on our manuscript, particularly for your generally positive assessment of this contribution. Please find below our response to your specific remarks:

- Section 2.2.1, page 7, paragraph 6-17: I would suggest to shift these paragraphs to the discussion section.

=> We agree, these two paragraphs will be shifted to the end of chapter 3.3 in the

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discussion section (p. 13).

- Section 2.2.2, page 7, paragraph 25-30. I would suggest to describe why you choose 500m x 500m spatial resolution and the procedures adopted for downscaling/upscaling. Moreover, a reference to EPSG system should be provided.

=> We agree. The paragraph in Section 2.2.2 after Table 4 will be modified as follows:

Pan-European datasets of the European Soil Data Center (ESDAC) have been primarily used whereas data from the HWSD were used for areas or parameters not covered by the ESDAC datasets, especially for Ukraine. The resolution of the original input datasets varied from 250 m to 5 km. A uniform cell size of 500m was applied to all datasets previous to the analysis. The resolution was selected following the resolution of the geospatial data available for soil texture classes from ESDAC. The selection was based on the fact that soil texture is itself one of the basic indicators for the calculation of SQR (B 1) and also a parameter for the calculation of two additional basic indicators (B 5 & B 6). Thus, the application of its resolution was selected to reflect substrate variations across Europe. Resampling for discrete data (e.g. land use) was performed using the nearest resampling algorithm whereas bilinear interpolation was applied for continuous data.

The coordinate reference system is ETRS89-LAEA Europe, EPSG:3035.

Latitude of Origin: 52 N Longitude of origin (Central Meridian): 10 E

Each raster dataset was reclassified based on the SQR field manual, the SQR Assessment scheme according to BGR (2010) and adaptations made by BTU CS within the SEEMLA project.

- Section 3.2.1, page 10, paragraph 1-5: You are encouraged to include some references on your assumption “these areas are, therefore, primarily not within the focus of the SQR assessment method”.

=> The SQR method is originally restricted to assessing “soil’s suitability for cropping

and grazing" (Mueller et al, 2007, p. 5) and is, therefore, focusing on cropland and grassland (Müller et al., 2010). For that reason the SQR indicators were chosen to validate the productivity function of soils and were, therefore, mainly applied to arable land (Henning et al., 2016). As wide parts of marginal lands, particularly those characterized by very low soil fertility, must be regarded as basically not suitable for traditional agriculture, their assessment was not within the primary focus of the SQR assessment method and methodological issues might arise. However, the SQR method can be generally applied to soils regardless of their quality, thus, also to soils of marginal lands and our study showed that the SQR system seems to be applicable also to assessing marginal lands. Against this background we suggest to modify the mentioned sentence in the manuscript as follows:

"The SQR system was primarily developed for valuating soil productivity functions related to traditional agricultural land use (Mueller et al., 2007, 2010) so that the assessment of land marginality is not within the original focus of the method."

- Section 3.3, page 12, paragraph 20-24: when you state "the most frequent hazard indicator" you mean "the most extensive/widespread hazard indicator". Please, explain.

=> In this paragraph the statistical analysis of the importance of the different hazard indicators is presented briefly. A more detailed description can be suggested as follows:

"Regarding marginal lands in Europe three SQR hazard indicators turned out to be most widespread (Tab. 7 and Fig. 11): 47.3 % of the marginal lands are characterized by shallow soils (H 6: soil depth above hard rock), 13.8 % are affected by unsuitable soil thermal regimes (H 12) and 3.2 % are endangered by drought risks (H 7). Shallow soils are frequent in the Mediterranean region as a result of extensive erosion processes in the past as well as in Scandinavia with young post-glacial soils. Drought risks are mainly restricted to the Iberian Peninsula whereas unsuitable soil thermal regimes are typical for the Northern parts of Scandinavia and the Alps, both with harsh climatic conditions."

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- Section 3.3, page 13, paragraph 5-10. How you produced map in Figure 12? I guess some species/group of species might have overlapping growing conditions, resulting in overlaps of marginal lands suitability of these crop. Could you better explain how you dealt this issue?

=> The map shown in Fig. 12 is the result of applying the demands of selected bioenergy plant (as shown in Tab. 3) to the identified soil and site characteristics. Most signatures in this map indicate groups of potentially suitable bioenergy crops (e.g., basket willow is part of the upper three signatures of the legend, in each case combined with other crops). Thus, the map already shows several overlapping zones for some crops, e.g., willows and poplars could be cultivated alternatively (combined with different other crops) in wide parts of Europe. An additional sentence is suggested in the end of this paragraph to make this more obvious:

“Particularly, basket willows and poplars have large overlapping potential growing areas in Western and Central Europe and can be found, therefore, in different groups of bioenergy crops of Fig. 12.”

References

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