

RESPONSE TO COMMENTS FROM EDITORS AND REVIEWERS

Dear Editor,

We inform you that the manuscript has been revised following the comments given by the reviewers. We appreciate the revision developed, and the comments and suggestions given to improve the manuscript. We explain below in detail all the changes made in the manuscript in response to the comments.

Anonymous Referee 1

In general the authors have done a very good job in commenting the most pertinent literature and compiling this in a comprehensive and well structured review. With no doubt this work would be of interest to SOIL readers.

I highly recommend this work to be published in SOIL with a minor revision.

GENERAL COMMENTS:

Introduction

In Page 465 Line 5. The paragraph starting with "Nonetheless ..." It seems to me that what is here being compromised is the services that a healthy soil will provide. I will suggest the authors to introduce here this, more modern, term of soil ecosystem services.

Daily, G.C. 1997. What are ecosystem services?. In: Nature's Services: Societal Dependence on Natural Ecosystems (ed G.C. Daily), pp. 1 – 10. Island Press, Washington, DC

Kremen, C. & Ostfeld, R.S. 2005. A call to ecologists: measuring, analyzing, and managing ecosystem services. *Frontiers in Ecology and the Environment*, 3, 540 – 548.

Millennium Ecosystem Assessment (MA). 2005. Ecosystems and Human Well-Being: Synthesis [1]. Island Press, Washington. 155pp.

<http://www.unep.org/maweb/documents/document.356.aspx.pdf> (last time visited 11/11/2014)

We have included the new sentence "Soil provides ecosystem services (benefits people obtain from the soil) such as as food, water, timber, and fiber; regulating services that affect climate, floods, disease, wastes, and water quality; cultural services that provide recreational, aesthetic, and spiritual benefits; and supporting services such as nutrient cycling. (Millennium Ecosystem Assessment, 2005)."

We have included the reference:

Millennium Ecosystem Assessment: Ecosystems and Human Well-being: Synthesis, Island Press, Washington, DC, 2005.

In Page 465 Line 24. The paragraph explaining the aims of the work is reiterative and needs rephrasing. "This paper aimed", "This paper synthesizes", "This review incorporates"

Rephrased as:

This paper aimed to provide new insights through review of soil quality assessments in different scenarios linked to forest management, agricultural management, urban systems and land use changes. The selection of indicators or indices to assess soil quality in an effective and sensitive way in terms of the ecological ambient and the purpose of the assessment is synthesized. Major concerns about the effect of land use or management is incorporated to select suitable

indicators, providing evidence about the interrelationship between soil quality, environmental quality and human health.

In Page 466 Line 3. The sentence is not relevant nor necessary "We have reviewed the most significant literature including 119 articles published since 1991."

We have deleted this sentence

In Page 467 Line 2. The paragraph starting with "One of the..." needs rephrasing for clarity and including Doran's paper title is not necessary here.⁷

Replaced by: One of the greatest challenges for researchers is "translating science into practice" through identifying soil indicators capable of showing rapid changes in the ecosystems performance, needed by land managers and decision makers to assess the economic, environmental, social and health impacts of management practices.

In Page 467 Line 15. Again, introducing here the concept of soil ecosystem services would be appropriate.

He have included here: "SQ indicators are measurable properties or characteristics which provide information about the ability of the soil to provide essential environmental services." We have not explained the concept since it is already included in section 1.1. Introduction.

In Page 467 Line 19. The reference to Larson and Pierce (1991) is not easily available. Will suggest to mention the first citation Larson and Pierce (1991) as in Larson and Pierce (1994) that is easily available.

Larson, W. E. and Pierce, F. J. 1994. The dynamics of soil quality as a measure of sustainable mangement. Pages 37 - 51 in J. W. Doran, D. C. Coleman, D. F. Bezdicek and B. A. Stewart, eds. Defining soil quality for a sustainable environment. SSSA Special Publication 35. Soil Science Society of America, Madison , WI, USA.

Done. Rephrase as: "Larson and Pierce (1991) (cited in Larson and Pierce, 1994) suggested a minimum data set (MDS) for SQ assessment,..."

This new reference has been included in the reference list.

Would recommend merging the introduction sections 1.3 and 1.4 in a single section, 1.3 "Approaches to assess soil quality and the selection of suitable indicators."

Done. Both former sections have been merged into a unique section 1.3. with the proposed title

Agricultural practices and soil quality indicators

In Page 470 Line 14: May be it would be useful to highlight that Liu et al. (2014b) validated their SQI (Liu et al., 2014a) in low productive albic low-yielding soils from Eastern China.

We have rephrased the sentence as: "Liu et al. (2014b) validated their SQI (Liu et al., 2014a) in low productive albic soils from Eastern China, and observed significant correlations between the SQI and crop yield."

Forest management and soil quality indicators

In Page 471 Line 4: Something is missing in the sentence starting "Most research..." please rephrase.

Rephrased as: "Previous research mainly focused on the assessment of SQ to promote highest forest productivity."

In Page 171 Line 8: Rewrite the sentence with something like "Also to assess forest SQ the most used indicators are SOC, followed by."

Rewritten as: "In order to assess forest SQ, the most used indicators are SOC, followed by pH,..."

In Page 171 Line 11-15: The paragraph starting with "In the last years..." is vague and not clear, please rephrase.

Rewritten as: "In the recent years, there has been a general concern about the importance of soil biological indicators and their ecological relevance to assess SQ, and some authors have included in their studies microbial indicators such as microbial community composition"

Land use Change and soil quality

In Page 474 Line 24-28: The comment in relation to the work by Ruiz et al. (2011) is unnecessary. The authors described their findings when using a macroinvertebrate QI that may or may not been in agreement with any other work performed using different QIs. In general they found very high QIs for 3 of the 5 forest systems they studied (out of 22 systems for which IBQS were computed) and only 2 give medium average I will said values. Furthermore literature reporting higher QI in crops/pastures than in some forest can be found elsewhere.

We have deleted the comments about the reference Ruiz et al. (2011): "This result is not in agreement with the major part of studies regarding SQ and perhaps, more integrative indices based on different properties would provide more accurate information regarding SQ. The IBQS was based on the fact that the number of species decreases when the level of land-use intensification increases (Decaëns, 2010). "

References

Apart from the literature mentioned above, the authors may consider including other relevant references related mainly with the relevance of SOM and their fractions for SQ: Arias et al. (2005) Soil health—a new challenge for microbiologists and chemists. *International Microbiology* 8: 13-21

Miralles et al. (2009) Soil quality and organic carbon ratios in mountain agroecosystems of Southeast Spain. *Geoderma* 150: 120-128.

We included both references in the manuscript as:

"Miralles et al. (2009) observed that most soil properties measured in forest soils from Southeast Spain were highly correlated with SOC. They established SQ indicators consisting of ratios to SOC, which inform about the specific activity (per C unit) or performance of the organic matter, independently of its total content. These authors concluded that these ratios are more effective to assess SQ since they provide information about soil resilience." in Section 3.

"Soil organic carbon (SOC) has been suggested as the most important single indicator of SQ and agricultural sustainability since it affects most soil properties (Reeves, 1997; Arias et al., 2005)."

Arias et al. (2005) reviews new insights about including microbial properties in soil health assessment by improvement in the available techniques. With regard to SOC, they comment its importance because it controls most of soil properties.

MINOR and TYPO ERRORS:

Page 464

Line 22: Change "were" with "where"

Done

Line 27: Change "spectroscopy" with "spectroscopic"

Done

Page 465

Line 3: Change "media" by "medium" or "compartment" or "factor"

Replaced by "medium"

Page 466

Line 22: "medium" is a singular whereas "media" is the plural form. Any way I will use here another term i.e. "aspects"

Replaced by "aspects"

Page 467

Line 17: "immense" is too much "a wide range" would be more appropriate

Replaced by "a wide range"

Page 469

Line 14 Change "weighting of different" with ""weighting different"

Write "weighing different"

Page 471

Line 6 Change "concerns" with "concern"

Done

Line 7 Write "made a shift in research focus towards the sustainability..."

Done

Line 8 Change "nutrients level" with "nutrient values"

Done

Line 11 Change "aggregates" by "aggregate"

Done

Line 13 Use an alternative word for "relevance"

Replaced by "importance"

Line 14 Change "aggregates" by "aggregate"

Done

Page 473

Line 15 Delete "cause"

Deleted

Page 480

Line 7 Change "highly" with "often"

Done

Line 9 Change "level" with "aspects" or "features"

Changed by features

Line 15 Change "great" with "wide"

Done

Line 17 Change "curves" with "functions"

Done

Line 25 Change "were" with "where"

Done

Line 26 Rephrase to avoid duplications "new"

Rewritten as "Further efforts should be carried out to establish new methodologies"

Page 481

Line 1 highlight "per se" use semicolon or italics

Written in italics

Anonymous Referee 2

In page 471 line 4: please review the sentence, that is not clear.

We have replaced the sentence "Most research aimed at assessing the consequences of management practices on SQ with regard to forest productivity." by "Previous research mainly focused on the assessment of SQ to promote highest forest productivity".