

Review SOIL 2016-7

Manuscript title: Feeding the world with soil science: embracing sustainability, complexity and uncertainty.

General comments:

The manuscript provides a timely and thorough reflection of soil science limitations to address important challenges in the search for sustainable development trajectories, that are holistic enough to capture the complexities associated with context diversity, and that recognize and effectively adapt to an increasingly uncertain future. It is argued that an important limitation to embracing the sustainability, complexity and uncertainty dimensions in current agricultural scientific enquiry is largely driven by the failure of defining them in a way that facilitates linking knowledge to action. The author rightly proposes a pragmatic approach that uses five tangible goals to guide the internalization process of these three dimensions into the design of soil management strategies to meet the SDGs, namely, (i) producing food where it is most needed, (ii) decoupling agricultural production from its dependence on non-renewable resources, (iii) recycling and making efficient use of available resources, (iv) reducing the risks associated with global change, and (v) restoring the capacity of degraded soils to provide ecosystem services. Soil scientists are further challenged to be more critical and encouraged to examine the relevance, credibility and legitimacy of their research contributions to solving the world's problems. In order to contribute to fill gaps identified the author thoroughly reviews the definitions of sustainability, complexity and uncertainty. This is followed by a systematic examination of soil research priorities to achieve the SDG Goal #2 Food Security and Nutrition that clearly links each of the five tangible goals described above with approaches to embed the perspectives of sustainability (what needs to happen), complexity (what we know/should know) and uncertainty (foresee and minimize what could go wrong) into future soils research efforts. This is an excellent thought-provoking manuscript of broad international interest that elegantly articulates challenges and opportunities for soil scientist in the 21st century. It makes a needed call for reflection and critical thinking in future research to ensure that soils research is intimately linked to relevant development problems thus effectively contributing to achieve the SDGs in general and the SDG Goal #2 Food Security and Nutrition in particular. I fully recommend the manuscript for publication in the SOIL journal and have included a few suggestions for consideration.

Scientific questions/issues:

P3 L8-11 Suggest including the following reference to support the statement in this sentence:

Prell C., Hubacek K., Reed M., Quinn C., Jin N., Holden J., Burt T., Kirby M., Sendzimir J. 2007. If you have a hammer everything looks like a nail: traditional versus participatory model building. *Interdisciplinary Science Reviews* 32(3): 263-282.

P4 L4-10: While these goals effectively cover key opportunities in agricultural research, item (iv) probably needs further unpacking to be more useful. Can global change be disaggregated into key components and goal/research prioritized?. For instance, in table 2, priority 4, the focus seems to be on climate change adaptation research and maybe this priority needs to be clearly stated.

P9 L9 There is recent research that would nicely complement this statement. Suggest considering the three key issues highlighted by Coe et al (2014) as determinants of large scale adoption following sentence: ...Often the problem is much more complex than that....

Coe R, Sinclair F, Barrios E. 2014. Scaling up agroforestry requires research 'in' rather than 'for' development. *Current Opinion in Environmental Sustainability* 6: 73-77.

P20 Suggest the following revision in Table 2, priority 4, complexity research approaches:

'Understanding the relationship between functional diversity of soil organisms and adaptive capacity in the face of climate change'

Specific comments:

P11 L19 ...outbreak. This is due TO risk spreading, or...

P18 L22 ...were only observed in 55% of the....

P27 L1 Correct publication year to 2015.