Geophysical Research Abstracts
Vol. 19, EGU2017-4012-1, 2017
EGU General Assembly 2017

Soil Productive Lifespans: Rethinking Soil Sustainability for the 21st Century

Daniel Evans
United Kingdom (d.evans3@lancaster.ac.uk)

The ability for humans to sustainably manage the natural resources on which they depend has been one of the existential challenges facing mankind since the dawn of civilisation. Given the demands from this century's unprecedented global population and the unremitting course of climatic change, that challenge has soared in intensity. Sustainability, in this context, refers to agricultural practices which meet the needs of the present without compromising the ability of future generations to meet their own needs. Ensuring sustainability is arguably of greatest importance when resources, such as soil, are non-renewable. However, there is as yet no tool to evaluate how sustainable conservation strategies are in the long-term. Up to now, many pedologists have assessed sustainability in binary terms, questioning whether management is sustainable or not. In truth, one can never determine whether a practice is ultimately sustainable because of the indefinite nature implied by "future generations". We suggest that a more useful assessment of sustainability for the 21st century should avoid binary questions and instead ask: how sustainable are soils? Indeed, how many future generations can soils provide for? Although the use of modelling is by no means a novelty for the discipline, there are very few holistic models that encompass the fluxes and dynamic relationships between both mass and quality concomitantly. We therefore propose a new conceptual framework - the Soil Productive Lifespan (SPL) - that employs empirically derived residence times of both soil mass and quality, together with pathways of environmental change, to forecast the length of time a soil profile can provide the critical functions. Although mass and quality are considered synergistically, the SPL model allows one to assess whether mass or quality alone presents the greatest limiting factor in the productive lifespans of soils. As a result, more targeted conservation strategies can be designed. Ultimately, we argue that the SPL framework presents an exciting shift for evaluating sustainability. Interim performance indicators currently employed to measure sustainability are only able to assess whether soils still meet the needs of the present and thus only half of the sustainability agenda. We argue that the SPL framework has the ability not only to evaluate conservation based on current soil productivity but also to model the degrees to which soils can meet the needs of future generations.