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Beasts, Balances and Boundaries in Soil Science

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This is both an exciting and a challenging time to be a soil scientist. Societal interest in soil is thriving because of its pivotal role in food security, climate change, and biodiversity. But this interest comes with serious responsibilities, within the context of a scientific climate dominated by perverse incentives for funding and publishing. In this Philippe Duchaufour lecture I would like to reflect on some of the balances we should aim for, and the boundaries we should acknowledge, as soil scientists. I will do this for field of climate-related soil research; for the role of soil ecology in the transition towards sustainable agriculture; as well as for academic publishing.

The soil takes center stage in discussions regarding climate change mitigation. However, the focus is mostly on large-scale carbon sequestration (LSCS). There almost seems to be a dichotomy within the scientific community regarding the potential and desirability of LSCS, with exceedingly optimistic assessments finding their way to policy documents, and more critical publications on the limits or usefulness of LSCS apparently ignored. I will highlight some fundamental boundaries to large scale carbon sequestration, notably the amount of carbon available through photosynthesis. As a possible way forward, I will stress the importance of focusing on improving soil functioning rather than on increasing the carbon stock size.

The need for a transition towards more sustainable forms of agriculture while maintaining high productivity is broadly acknowledged within the scientific community. Such forms of agriculture should both include a high degree of circularity as well as a larger reliance on the benefits that soil biota provide. However, these two aspects are often not studied in relation to each other. Earthworms provide an instructive case in this respect. It is clear that they are beneficial to crop growth – the literature even suggests an overall increase of 25% in crop yield in the presence of earthworms. Yet, this number is not realistic as many primary earthworm studies do not represent realistic systems. In particular, we should not claim that earthworms can compensate for the removal of nutrients through harvest. This can only be done through replenishment of nutrients from elsewhere – preferably in a circular manner. I will discuss how earthworms and other biota could positively affect nutrient recycling in future agricultural systems that will receive new, circular forms of soil amendments.

Finally, scientific publishing is in crisis. Scientific articles are in many ways the basic building blocks of scientific careers, and yet the publishing process is overstretched and flawed. This is mostly related to imbalances: especially between those who pay and those who earn; and between those who write and those who review. I will highlight some of these imbalances, which are to some

extend geographic, and will discuss to what extent switching to an open publishing model will resolve them. I will end with some thoughts on how to improve the publishing process, including a call for more cooperation between editors across journals to keep scientific publishing viable.