We need to change how we think about soil, says new research

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With the U.K. reaching record temperatures this summer along with the driest conditions since 1976, ongoing concerns about food security, wildlife habitats and biodiversity, having a healthy soil system is more

vital and challenging than ever before. But what does the term "soil health" mean and how should we measure it? New research from Cranfield and Nottingham Universities says that how we think about, measure and study soil must be changed to give a better understanding of how to manage this resource effectively, with academics proposing an entirely new approach for assessing soil health.

Jim Harris, Professor of Environmental Technology at Cranfield University, led the research and says: "Although 'soil health' as a term is quite widely used now, it is problematic as it means different things to different people, and there is no single agreed way to measure the overall health of this system.

"Through this research, we want to start the conversation about how we move to a holistic picture of soil health assessment, looking at the interconnected elements of this universally important system. Taking steps towards a bigger-picture view of soil health could help make a huge difference to some of our big challenges, not least the climate crisis."

Range of measures will help assess direction of travel

Current approaches measure individual soil properties and use these to try and assign a single number giving an overall soil health "score," but the researchers argue that this does not reflect the wider system perspective that's needed to fully assess the condition of a soil and its health over time.

Dr. Dan Evans, a 75th Anniversary Research Fellow at Cranfield University who co-authored the paper commented: "Just as we don't have a single measure or score for human health, because this can't reflect the complexities of the whole body, we should not rely on a single score for soil health. Taking in a range of measures to look at the whole

system will mean we can fully understand the direction of travel—is soil getting better, or worse?"

Whole-system approach measures four key areas

The researchers propose a whole system approach to assess soil health, based on a new hierarchical framework which takes in several measures:

- Signs of Life—characterizing the organisms existing in soil
- Signs of Function—the extent to which soils process materials
- Signs of Complexity—the extent to which soil components are connected and interdependent
- Signs of Emergence—the extent to which soils respond and recover to multiple stressors

Sacha Mooney, Professor in Soil Physics at the University of Nottingham added, "This new approach can be applied to all soils and moves us closer to an interdisciplinary understanding of the 'whole picture' of the soil system, rather than separately considering the individual pieces of the jigsaw."

Professor Harris continued: "It is hard to understate the importance of having a healthy soil system—it supports wildlife and biodiversity, reduces flood risks, stores carbon and gives us food security. Moving towards this new model of assessment is going to help land users and governments to sustainably manage our global soil resources for future generations."

The research paper, "A new theory for soil health," was published by the *European Journal of Soil Science*.

More information: J. A. Harris et al, A new theory for soil health, *European Journal of Soil Science* (2022). DOI: 10.1111/ejss.13292

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