

# Depleted soil locks rural farmers in trap of ultra-poverty

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Credit: SC Department of Agriculture

One of the thorniest questions in economic development is why sub-Saharan Africa is home to most of the world's extreme poor, who suffer from persistent, grinding poverty that can last for generations.

One answer is a grim cycle in which depleted soils bury rural farmers in deep poverty and keep them there, say Cornell researchers.

"We all take dirt for granted," said Chris Barrett, professor and director of Cornell's Charles H. Dyson School of Applied Economics and Management. "As folks talk about development strategies, you don't often hear them talking about the importance of maintaining or rehabilitating soils on which rural poor people's livelihoods depend."

Barrett and his co-author, Cornell doctoral candidate Leah E. M. Bevis, have pulled together the emerging strands of a new body of research on the subject and identified interventions that have the potential to break the poverty trap. Their paper, "The self-reinforcing feedback between low soil fertility and chronic poverty," was published Nov. 23 in the journal *Nature Geoscience*.

Barrett and Bevis tie together bits of empirical evidence that hint at the reinforcing relationship between chronic poverty and depleted soils. For example, poor soils often prevent rural farmers from growing enough food to feed themselves or to sell. As a result, they lack the resources to improve or even maintain the soil, and the cycle continues.

A less-recognized mechanism pivots on the mineral content of soil and its effect on human nutrition and health. Most of the minerals we take in – from iron to zinc and selenium – come from the soil in which our food is grown or on which the animals we eat have grazed. If a child has suffered micronutrient deficiency in utero or during the first couple of years of life, she will never attain her cognitive and physical potential. "And that is an irreversible loss of human capital, quality of life, economic productivity, citizenship capacity – depleted soil is part of where that all originates," Barrett said.

But soil scientists don't study mineral-depleted soils extensively, and economists "have completely ignored" it, Barrett said.

To date, studies have only described the close associations between

chronic poverty and depleted soils. Now biophysical scientists and social scientists must collaborate on longitudinal, multidisciplinary research that link causes and effects and identify interventions that could stop the cycle of poverty, Barrett and Bevis say.

Possible interventions include improving soils with mineral-enriched fertilizers, better educating farmers, and financial instruments such as credit and insurance that would help the poor invest in their soils.

These interventions could have larger implications, Barrett added, because ultra-poverty centered disproportionately in rural Africa is breeding a population that's both relatively unproductive and vulnerable to ideologues.

"Shouldn't we be worried about this, and shouldn't we be thinking about how best to intervene? I don't know if [soil](#) investments are the best way of dealing with that, but it certainly is on the roster we should be considering," Barrett said. "And right now virtually nobody even thinks about that as an option."

**More information:** Johannes Lehmann et al. The contentious nature of soil organic matter, *Nature* (2015). [DOI: 10.1038/nature16069](https://doi.org/10.1038/nature16069)

Christopher B. Barrett et al. The self-reinforcing feedback between low soil fertility and chronic poverty, *Nature Geoscience* (2015). [DOI: 10.1038/ngeo2591](https://doi.org/10.1038/ngeo2591)

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