

# Organic crop practices affect long-term soil health

December 20 2019, by Krishna Ramanujan

---



Credit: CC0 Public Domain

Prior organic farming practices and plantings can have lasting outcomes for future soil health, weeds and crop yields, according to new Cornell University research.

The study recently published in the journal *Agriculture Systems* also breaks down how specific components of [soil](#) health—such as the abundance and activity of soil animals and soil stability—affect [crop productivity](#).

"With growing interest from farmers in being able to harness and exploit soil health, this research really helps us to get to the point of being more and more prescriptive about it," said Kyle Wickings, associate professor of entomology and co-author of the study.

Also, the study reinforced the understanding that soil animals, such as mites and other tiny critters living in soil, play critical roles in soil health and crop productivity.

Soil animals are known to break down crop litter while indirectly affecting microbial communities in the soil. The researchers' new findings suggest that measurements of soil invertebrates can inform assessments of soil health.

"When I think about crop management, nutrient amendments are not going to be the limiting factor [in crop productivity] for farmers in the U.S.," said Ashley Jernigan, a graduate student in Wickings' lab and the paper's first author. "Really, we need to be optimizing these biotic processes in our soil and focusing more on biotic measurements."

The study is important because unsustainable farming practices are depleting soils of biological activity and nutrients, leading to widespread concern about farmers' ability to grow enough food to keep up with global population growth.

In 2005, researchers started the Cornell Organic Grain Cropping Systems Experiment at a Cornell research farm in Aurora, New York. The experiment compared four cropping systems that varied in fertilizer

inputs, tillage practices and [weed control](#). Then in June 2017, the entire site—including the alleyways between plots—was plowed and seeded with sorghum sudangrass, to understand the long-term effects of previous management practices. By September that year, the researchers were gathering data on such things as soil invertebrate abundance, community structure, and [weed](#) and sorghum sudangrass biomass.

"The study highlights changes in weed populations, soil chemical, physical and biological properties, and crop productivity after 12 years of different types of organic crop and soil management practices," said Matthew Ryan, associate professor of soil and crop sciences, principal investigator of the cropping system experiment, and the paper's corresponding author.

Overall, they found that past nutrient inputs, how much soils had been disturbed, weed management and the preceding crop all produced lasting effects. For example, plots that had been managed with a reduced tillage system generally had better overall soil health, especially when looking at microbial activity. And plots under an enhanced weed management system had less impressive soil health, but better weed control.

"If weeds are adequately suppressed, reducing tillage in organic cropping systems can regenerate soil health and increase crop production," Ryan said.

They also looked at the alleyways between plots, where the soil health was very good due to a lack of soil disturbance. That led to a very high diversity of soil invertebrates.

Jernigan developed and ran statistical models to examine relationships driving future crop productivity across all the cropping systems. While strong science informs farmers about proper nutrient levels needed for [crops](#), modeling results revealed that crop production is limited by

factors such as microbial activity and soil aggregate stability (the ability of soil particles to stay clumped together for retaining air and water). And the model showed that soil invertebrates play important roles possibly by grazing on microbes, thereby stimulating microbial activity in soils.

**More information:** Ashley B. Jernigan et al, Legacy effects of contrasting organic grain cropping systems on soil health indicators, soil invertebrates, weeds, and crop yield, *Agricultural Systems* (2019). [DOI: 10.1016/j.agsy.2019.102719](https://doi.org/10.1016/j.agsy.2019.102719)

Provided by Cornell University

Citation: Organic crop practices affect long-term soil health (2019, December 20) retrieved 27 April 2024 from <https://phys.org/news/2019-12-crop-affect-long-term-soil-health.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.