

# New research shows agricultural impacts on soil microbiome and fungal communities

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New research shows shade-grown coffee farms alter the soil microbiome and fungal communities, and provides new insight into how coffee farm management decisions impact the entire agricultural ecosystem. Credit: Roshan Patel/Smithsonian's National Zoo and Conservation Biology Institute

New research from Smithsonian's Bird Friendly Coffee program

highlights a type of biodiversity that often gets overlooked: soil bacteria and fungal communities. For over twenty years, Smithsonian research has shown that coffee farms with shade trees protect more biodiversity than intensified, monoculture coffee farms.

The new research, [published](#) in *Applied Soil Ecology*, shows that [soil bacteria](#) and fungi on coffee farms also respond to the intensity of coffee farm management.

To conduct this research, the team collected soil samples on coffee farms in Colombia, El Salvador, and Peru and used DNA analysis to profile bacterial and fungal soil on farms with different management regimes. They found that farming coffee as a monoculture alters the soil microbiome in both community composition and [species diversity](#). But not all shade-grown [coffee farms](#) were the same.

The soil microbiomes on farms with native [shade trees](#) were different than on farms with non-native, introduced species of shade trees as well. Soil microbiomes in the tropics are poorly understood, and this research demonstrates the incredible diversity within soils in tropical agricultural landscapes across Latin America.

This research also furthers our understanding of how coffee farm management decisions impact that entire agricultural ecosystem, which in turn impacts the production of coffee and the livelihoods that depend on it. As biodiversity is declining globally at an alarming rate, agricultural landscapes can play an important role in conserving unique species and ecological processes that enable agriculture to thrive.

**More information:** Steve Kutos et al, Farm management and shade tree species influence coffee soil microbiomes in Central and South America, *Applied Soil Ecology* (2024). [DOI: 10.1016/j.apsoil.2024.105571](#)

Provided by Smithsonian National Zoological Park

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