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photo: FAST Trial, Brigitte Dorn

Mercator Research Program | Call 3

Nitrogen Cycling and Soil Microbial Communities in Integrated Organic Farming Systems

Background

Traditionally, organic farming uses conventional tillage practices for weed control, even though tillage has numerous negative effects for soil and promotes nitrogen (N) losses. Conservation tillage (reduced or no-till) can reduce soil erosion, preserve soil structure, maintain soil biota, and stabilize soil organic matter, thereby reducing N loss. However, weed control remains a challenge. The integration of fast growing cover crops with conservation tillage methods is a potential best management strategy for organic systems. However, there is little research about less harmful soil preparation practices that could help organic systems improve N cycling and it is unknown how such integrated organic farming practices affect N availability, stabilization, and loss.

Objective

The overall research objective is to compare how efficiently organic and conventional farming systems utililize N under different tillage practices and cover crops. The study examines which combinations may tighten the N cycle by concentrating it between the soil and crops within the agricultural landscape.

Research Approach

Soil sampling at Agroscope's 'Swiss Farming Systems and Tillage Experiment' (FAST); physical soil fractionation; quantitative functional gene assays; stable isotope analysis; and soil incubation experiments.

Relevance and Expected Outcomes

This project will identify farm management practices (i.e., tillage practices and cover crop species) that provide the highest supply of N to plants while preventing environmental losses. The results will inform strategies and models for sustainable agroecosystem management and help organic farmers in Switzerland and beyond to realize the potential of integrated organic farming systems.

Food System Challenges Addressed

Weed control, soil health, resource use efficiency, sustainable land use

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