Tropentag, September 10-12, 2025, hybrid conference

"Reconcile land system changes
with planetary health"

Balancing conventional and agroecological farming for sustainable agriculture and food security: empirical insights from Tanzania

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Abstract

Climate change, rapid population growth, and persistent food insecurity continue to challenge agricultural sustainability in Sub-Saharan Africa. As global food demand rises and land pressures intensify, balancing productivity with environmental conservation has become a pressing concern. Conventional farming methods that rely on external inputs offer short-term productivity benefits but often lead to soil degradation and long-term sustainability risks. Conversely, agroecological farming practices such as the use of organic manure and cover cropping promote soil health and resilience but may not always provide immediate farm productivity gains necessary for smallholder farmers to sustain their food and income needs. This study examines the impact of adopting agroecological and conventional farming practices, both independently and in combination, on farm productivity and food security in Tanzania, where agriculture is a primary livelihood source for most rural households.

Using nationally representative data from the Tanzania National Panel Survey (NPS) 2020/2021 wave, comprising 4,500 farming households, this study employs a Multinomial Endogenous Treatment Effect (METE) model to correct for selection bias and estimate the causal effects of different farming practices.

The findings show that the integration of agroecological and conventional farming leads to superior productivity and food security outcomes, suggesting the complementary nature of these approaches. Farmers who combine organic and synthetic inputs experience improved soil fertility, nutrient retention, and long-term agricultural resilience, while those relying solely on either approach face trade-offs between short-term yields and sustainability, especially in the short-term. Adoption patterns are significantly influenced by factors such as farm size, access to credit, cooperative membership, and extension services. Furthermore, female-headed households encounter significant barriers in adopting sustainable farming practices due to structural constraints in resource access and institutional support.

These findings recommend for a more balanced approach integrating agroecological and conventional farming as the most effective strategy for enhancing productivity and ensuring food security while preserving soil health. Agricultural development efforts should prioritise integrated soil fertility management, expand financial services for smallholders, and implement gender-sensitive agricultural policies to enhance equitable participation. Strengthening agricultural extension services and market incentives will be crucial for scaling up the adoption of sustainable practices, fostering resilient food systems.

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Keywords: Agroecology, conventional agriculture, farm productivity, food security, sustainable farming, Tanzania