



Tropentag, September 10-12, 2025, hybrid conference

“Reconcile land system changes
with planetary health”

Soil productivity management strategies in the sub-humid agro-ecozones: vermiculture tea as a potential option

FELIX MATHERI¹, EDWARD KARANJA², MILKA KIBOI³

¹*International Centre of Insect Physiology and Ecology (icipe), Felix Matheri, Kenya*

²*International Centre of Insect Physiology and Ecology (icipe),*

³*Research Institute of Organic Agriculture (FiBL), International Cooperation,*

Abstract

Vermiculture juice has gained wide importance among smallholder farmers in sub-Saharan Africa as a viable soil amendment, replacing common organic and synthetic inputs. However, its effectiveness as a sole amendment or in combination with other inputs has not been tested under field conditions. We conducted a participatory on-farm field study in Murang'a County of Kenya, to evaluate the effects of sole vermiculture juice (Vermi), in combination with other organic amendments (VermOrg) and synthetic fertilisers (VermInt) on soil nutrients and crop yield. The soil inputs were applied following rates used by the farmers in the region and not as recommended by the Ministry of Agriculture. We ran the field experiment under a 3-year maize-based crop rotation over 8 years (2016–2023) under orthic Acrisols. The trials were rainfed and experienced frequent dry spells and crop failure in the long rains of 2019 and 2022. There were no significant differences in organic carbon, pH, and total nitrogen among the treatments during all sampling stages, and less variation within sampling years. Properties such as phosphorus, calcium, and magnesium had mixed outcomes within the sampling years. For example, Mehlich phosphorus was significantly higher in VermOrg in 2019 but was lowest in 2021 and highest in 2023. Sole vermiculture juice yielded significantly higher maize grain in all experimental seasons, except during the long rains of 2018, when there were no significant differences among the treatments. Despite this, the yields of this treatment (0.43 to 2.06 Mg ha⁻¹) were lower compared to the region's maize yield potential of 6 to 8 Mg ha⁻¹. VermInt recorded significantly higher potato tuber yields in all years (0.69 to 3.76 Mgha⁻¹), which were substantially lower than the yield potential. The overall low yields were mostly due to low input application rates, a common small-scale farmer's practice. Our study highlights that sole vermiculture tea is a viable soil amendment alternative. However, we recommend optimal application of nutrient rates to attain yield potential.

Keywords: Agroecology, Crop productivity, Organic farming, Smallholder farmers, soil fertility, Sustainable agriculture, Tropical climate conditions