Tropentag, September 18-21, 2016, Vienna, Austria

"Solidarity in a competing world — fair use of resources"

The Influence of Conventional and Organic Farming Systems on Soil pH and Organic Carbon Storage in Nitisols

Noah Adamtey[1], David Bautze[1], Martha Musyoka[1], Edward Karanja[1], Anne Muriuki[2], Monicah Mucheru-Muna[3]

[1]*Research Institute of Organic Agriculture (FiBL), Dept. of International Cooperation, Switzerland*
[2]*Kenya Agricultural Research Institute, National Horticultural Research Center, Kenya*
[3]*Kenyatta University, Environmental Sciences, Kenya*

Abstract

Concerns about soil acidification, low soil organic matter content and the impact of climate change on food security in the tropics necessitated the search for farming systems that can improve crop productivity, profitability, environmental sustainability and increase soil carbon storage. The specific objectives of this study were to measure the effect of organic and conventional farming systems on soil pH and SOC storage or loss in the humid zone of the Central highlands of Kenya. Conventional (Conv) and organic (Org) farming systems were compared at Chuka on Humic Nitisols with high inherent soil fertility and rainfall; and at Thika on Rhodic Nitisols with low soil fertility and rainfall under two input levels. Under the high-input system (High), high amounts of fertilisers, pesticides and irrigation water was applied to mimic commercial-scale production; whilst in the low input system (Low) low amounts of fertilisers and pesticides was applied under rain-fed conditions to mimic smallholder production. The conventional systems received synthetic fertilisers and cattle manure, whilst the organic systems received compost, mulch and crop residues. The trials which started in 2007 consisted of a 6-season -3-year crop rotation. At the end of six years, Org-High raised soil pH from 5.80 to 6.96 and 5.32 to 6.32 at Chuka and Thika. Conv-High raised pH to 5.84 at Thika but reduces pH to 5.57 at Chuka. The pH of Org-Low and Conv-Low were similar (5.70 and 5.55). Though it was not significant about 11.3 t ha^{-1} of SOC was stored under Org-High at Chuka and this was 85 % higher than 6.1 t ha^{-1} stored under Conv-High. At Thika Org-High and Conv-High loss SOC but the loss was 32 % higher under Conv-High. On the contrarily, under Conv-Low about 8.8 t ha^{-1} of SOC was stored and this was 63 % higher than 5.5 t ha^{-1} stored under Org-Low. The study concluded that high input organic farming has the potential to improve soil pH and SOC in the tropics, but this is dependent on site conditions, the quality of organic input material and management practices in the organic system.

Keywords: Conventional farming, high and low input systems, organic farming, soil organic carbon storage, soil pH

Contact Address: Noah Adamtey, Research Institute of Organic Agriculture (FiBL), Dept. of International Cooperation, Ackerstrasse 21, 5070 Frick, Switzerland, e-mail: noah.adamtey@fibl.org