2. A comparative assessment of soil biodiversity and physicochemical characteristics in conservation and conventional smallholder farms in Kenya

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Abstract

Soil health is essential for sustainable crop production. However, distinct farming practices poses varying impacts on soil biodiversity and the physicochemical characteristics of the soil. Conflicting information exists about the effects of conservation and conventional farming practices on soil health. This study assessed soil biodiversity and physicochemical properties of soils in 20 conservation and 20 conventional smallholder farms in Meru, Tharaka Nithi, Kirinyaga, and Laikipia counties in Kenya. Soil samples from the smallholder farms was collected at 0 to 30 cm depth. Plot quadrats in combination with transect line sampling design were applied in all farms. Pitfall traps and heat extraction were used to extract earthworms, termites, and ants from the soil. Soil organisms' species richness and organisms' diversity were analyzed using Margalef's Diversity Index and Shannon's Index of Diversity, respectively. Different analytical techniques were used to determine the soil's physicochemical properties. One-way ANOVA was used to determine the significant differences between the two farming systems in the counties. The percentage of carbon, phosphorus, potassium, and pH values showed a significance difference between the conservation and conventional farms studied, while no significant difference was observed in the percentage nitrogen. A total of 5947 soil organisms were recorded in all the farms in the four counties. Out of the total soil organisms encountered 83.6% and 16.4% was recorded for conservation and conventional farms respectively. The results of soil organisms on Shannon's Index of Diversity, Shannon's Evenness Index, and Species Richness Diversity Index showed no significant differences, except for the species abundance which was significantly higher in conservation farms than conventional farms. In conclusion, conservation farms showed higher soil biodiversity and nutrient-rich soils than conventional farms. These findings imply that conservation farming methods create favorable conditions that promote the growth of soil organisms.

Keywords: *Soil biodiversity, conservation farming, conventional farming, physico-chemical properties, smallholder farms*