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The Potential of On-farm Fence Lines for Livelihood Improvement in Kakamega, Western Kenya

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Abstract

Western Kenya is characterised by nutrient-depleted soils resulting from long-term unsustainable land use due to widespread poverty and a high population density. This desperate situation necessitates new approaches of managing the scarce land resources. Hence, we evaluated the potential of on-farm fence structures that cover about 4 to 5 % of the total area. These fences demarcate fields and homesteads, provide firewood and fruits, and are used as trash lines for maize stovers. Accordingly, we hypothesised that the soil below undisturbed live fences has a higher fertility status than the constantly tilled adjacent farmland. We further assumed that this effect varies by soil type and species that dominates the fence structure. Hence, we selected sites on Alfisols and Ultisols, the two dominant soil types in Kakamega District, with fence lines dominated by the following species: *i.e. Lantana camara, Tithonia diversifolia, Psidium guajava, Dracaena spp.* Topsoil samples were collected below the fence and with an increasing distance gradient and analysed for bulk density, aggregate stability, soil texture and pH, total nitrogen and carbon, available phosphorus and potassium, mineralisable nitrogen, and permanganate-oxidisable carbon. Additionally, in a greenhouse experiment the biomass of maize cultivated on the collected soils was determined and analysed for total nutrient uptake. Preliminary results indicate that the distance from the fence and the fencing species had a distinct effect on maize biomass accumulation on both soil types.

Chemical analysis revealed that depending on the fencing species soil parameters like pH, available potassium, and total carbon and nitrogen are positively influenced by the fence lines when compared to the adjacent field. In contrast, the amount of available P is in most cases reduced below the fence lines. These findings applied for both soil types but with a different extent.

Due to higher inherent fertility, on-farm fence lines have a significant potential for improving the livelihood of subsistence farmers in Western Kenya. By integrating high-value crops or trees in fences, valuable products such as firewood, timber, medicinal plants and fruits could be integrated into the farming systems and generate additional income, improve the people's health status and contribute to environmental conservation.

Keywords: Alfisol, *Lantana camara* L., soil quality, *Tithonia diversifolia*, Ultisol, *Zea mays*