Abstract

Microbial parameters have been used to monitor changes in soil quality. Soils from four land use systems common in East Africa and present in the Mt. Kilimanjaro region: (1) montane forest, (2) savannah (3) maize fields and (4) *Chagga* homegardens were used in laboratory incubations to assess the effects of landuse changes on soil quality. Soil organic matter mineralization and the following microbial parameters: microbial biomass C, mineralization quotient, metabolic quotient and activities of four enzymes: β-glucosidase, cellobiohydrolase, phosphatase and chitinase were determined. Microbial biomass C content, β-glucosidase, cellobiohydrolase and chitinase activities were higher in natural systems compared to agricultural soils. High phosphatase activity observed in all land use types reflected strong phosphorus limitation in andic soils of the Mt. Kilimanjaro region. Chitinase activity in montane forest soils was 3 times higher than in *Chagga* homegardens. Mineralization quotient and cellobiohydrolase activity best exhibited the effect of land-use changes on soil quality in the Mt. Kilimanjaro region. Cellobiohydrolase activity was up to 3 times higher under natural ecosystems compared to agroecosystems. A high percentage of microbial biomass C content in total organic C and low metabolic quotient were observed in *Chagga* homegarden soils. Soil enzymes (especially cellobiohydrolase) best distinguished between natural and agricultural ecosystems, and are therefore useful for monitoring changes in soil quality. In conclusion, the measured microbial parameters clearly show that the microbial organisms in traditional *Chagga* homegardens system have high substrate use efficiency. This demonstrates that traditional agroforestry systems promotes soil fertility and are more suitable for agricultural production in the tropics compared to monocropping systems like maize plantations.