Abstract

Land use change can affect terrestrial C stocks, resulting in increased CO_2 flux from soil to the atmosphere. In Africa, conversion of natural ecosystems to agricultural lands is the most common land use change. This study investigated the effects of six land use types occurring in Mt. Kilimanjaro ecosystems i.e. (1) lower montane forest (2) grassland and (3) savannah (natural ecosystems) (4) Chagga homegardens (semi-natural ecosystem) and (5) maize fields and (6) coffee plantation (agroecosystems) on microbial biomass carbon (MBC) and dynamics of ^{14}C labelled glucose added into soil. Decomposition of ^{14}C labelled glucose and its incorporation into microbial biomass in surface soils (0–10 and 10–20 cm) were determined. MBC decreased significantly with increased intensity of land use. Mineralization of the ^{14}C labelled glucose occurred in two phases with contrasting rates: 0–10 days (6–18% of ^{14}C d^{-1}) and 15–65 days (<0.1% of ^{14}C d^{-1}). Land use intensification in agroecosystems led to an average increase of glucose decomposition of 14%. The decay rates of the labile C pool in intensively used agricultural lands were up to three times higher compared to natural ecosystems. The incorporation of ^{14}C glucose into microorganisms ranged between 1 and 7% of ^{14}C input in all soils, and was highest in savannah. Agricultural intensification decreased C content in soil through increased mineralization of organic substances and negatively impacted the upper soil layer more compared to the lower one. Based on these results we conclude that semi-natural ecosystems (e.g. Chagga homegardens) are more sustainable in Mt. Kilimanjaro ecosystems compared to intensive agroecosystems.