

## Effects of land use change on organic matter decomposition and soil acidification in tropical forests

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Soils are exposed to drastic land use change in tropical forests. We compared rates of soil acidification and organic matter decomposition between primary forest, *Macaranga* spp. natural secondary forest, *Acacia mangium* plantation, *Imperata* spp. grassland, and oil palm plantation in Bukit Soeharto Experimental Forest in East Kalimantan, Indonesia to extract the optimal scenario to minimize forest degradation. Experimental items include (1) litter bag tests using root and leaf litters and cellulose filter papers, (2) 30 year monitoring of soil carbon stocks under different land use change series (forest-grassland, forest-grassland-forest), and (3) analyses of proton budgets associated with plant uptake and solute leaching in plant-soil systems. The litter bag tests showed that land use changes to grassland and acacia or oil palm plantations can increase microbial activity to decompose cellulose in the Ultisol soil studied. Leaf and root decomposability depends strongly on plant traits, with faster turnover of oil palm and grass litters. Land use change from forest to grassland exhibited the greater soil C storage for initial 10 years due to considerable root litter inputs, while net increase in soil C storage during 30 year land use changes is greater for forest-grassland-forest scenario due to low decomposability of forest litters. Soil acidification rates caused by nitrification were greater in acacia and oil palm plantations than in grassland and natural forests. These data suggests that grassland can contribute to build-up of soil organic matters in short-term fallow (< 10 years), while changes to natural secondary forests can maximize soil C storage and mitigate soil acidification in longer fallow period. Acacia and oil palm plantations have the greater risk to increase soil acidification, although proton budgets can provide knowledge on minimum N application or lime requirement in acacia and oil palm plantations to ameliorate soil acidity.

Keywords: Soil acidification, Soil organic matter, Tropical forest