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Soil Fertility and Soil Parameter Changes in Different Land-Use-Systems After Conversion of Natural Forest to Agricultural Land

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Abstract

Conversion of natural forest to agricultural land by small-holders is a crucial factor for deforestation in Indonesia. According to a common hypothesis, the decrease of soil fertility due to unsustainable land use-systems can force small farmers to clear new land for growing crops with acceptable harvest results. The situation in Central Sulawesi is unusual because of mostly fertile soil with high pH.

In the vicinity of Lore Lindu National Park in Central Sulawesi, Indonesia, soil samples were taken from 75 farmers fields in 5 villages and analyzed for their plant-nutrient content. Samples were taken from three different land-use-systems, maize-fields (annual crop), coffee and cocoa-plantation (agroforestry) fallow fields and from natural forest as comparison. The sites were selected according to their age after clearcutting of forest, to estimate the change of soil parameters in time after the conversion of forest to agricultural land (“false time series”-approach). The soil was analyzed for org. Carbon, nitrogen, pH, phosphorus and the macronutrient cations. For every site information about the site-history, age, previous management was collected.

Additionally to this survey, input- and output-fluxes of nutrients were measured intensively on selected sites to estimate the mechanism of the change of soil parameters and to find the crucial factors affecting soil fertility. On the selected sites (maize, agroforestry and forest) lysimeters were installed to measure leaching, and harvest export of nutrients was measured. Rain samples were taken to measure input of nutrients and the input by fertilizer-application was measured. With data from climatic stations nearby a simple water-balance was calculated to estimate the leaching and evapotranspiration.

Keywords: Forest conversion, land use systems, soil fertility