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Stock, turnover and functions of carbon in heavily weathered soils under lowland rainforest transformation systems

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Tropical rainforest are experiencing worldwide a strong lost through deforestation and transformation into agricultural systems. Land use changes in such ecosystems leads to major modifications of soils properties and processes. One indication of it are the losses of organic carbon content (Corg); an important soil fertility parameter in heavily weathered soil. Between 1985 and 2007, Sumatra (Indonesia) has lost half of his remaining natural rainforest, which currently covers only 30% the island. The deforestation is still ongoing and the main drivers of deforestation are oil palm, rubber and timber industries.
Our study aims to identify and quantify the impacts of lowland rainforest transformation systems (TS): oil palm, rubber and jungle rubber plantations on soil organic carbon (SOC) and nitrogen (SON) quality, turnover and stocks and so, on soil fertility and functions. We hypothesize that transformation of natural lowland rainforest changes not only C stock and budget throughout quantity and quality of C input, but also DOM production and water consumption by vegetation, leading to a relocation of C in the subsoil. This should be reflected in C and N content in soil profile horizons as well as their δ13C and δ15N isotopic signatures. We will evaluate also C stability through biological, thermal and chemical stability in bulk soil and aggregate fractions.
The TS investigated, including lowland rainforest as reference sites, are located in Jambi Province (Sumatra). Soil has been described and sampled per horizon on 4 replicates of each TS in 2 different regions (32 sites) in Autumn 2012.
As hypothesized, first results show strong effects of forest transformation on C and N content, as well as on isotopic signatures of soil. Those results will also be used further to select DOM sampling depths and adequate horizons to perform sorption and incubation experiments.