

Carbon stock and turnover in riparian soils under lowland rainforest transformation systems on Sumatra, Indonesia

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In many tropical areas, rainforests are being cleared in order to exploit timber and other forest products as well as plant crops for food, feed and fuel use. The determinants of different patterns of deforestation and the roles of resulting transformation systems of tropical riparian rainforests for ecological functions have yet received little attention in scientific research. Especially C stocks in riparian zones are strongly affected by climate and land use changes that lead to changes in water regime and ground water level drops. We investigated the effects of land transformations in riparian ecosystems of Sumatra, on soil C content, stocks and decomposability at the landscape scale.

We compare C losses in transformation systems and rainforests and estimate the contribution of soil erosion and organic matter mineralization. Further, these losses are related to changing water level and temperature increase along increasing distance to the stream. This approach is based on changing $\delta^{13}\text{C}$ values of SOC in the topsoil as compared to those in subsoil. The shift of $\delta^{13}\text{C}$ of SOC in the topsoil from the linear regression calculated by $\delta^{13}\text{C}$ value with $\log(\text{SOC})$ in the topsoil represents the modification of the C turnover rate in the top soil. Erosion is estimated by the shift of the $\delta^{13}\text{C}$ value of SOC in the subsoil under plantations. Further, the $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ soil profiles and their comparison with litter of local vegetation, can be used to estimate the contribution of autochthonous and allochthonous organics to soil C stocks. Preliminary results show strong increase of erosive losses, increased decomposition with land-use transformation and decrease of C stocks with decreasing water table.