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Landnutzung und Kohlenstoffhaushalt

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Titel
Soil carbon losses and estimation of erosion and decomposition by ? Carbon-13 in riparian soils under lowland rainforest transformation systems on Sumatra, Indonesia

Abstract
Indonesia´s forest is ranked among the Amazonian and the Kongo Basin as the largest tropical rainforest area worldwide. However, the country experiences a severe forest loss since the 1970s. Besides a growing population, the primary pressures are export-orientated timber production and a global commodity demand that lead to a permanent conversion from forest to agricultural areas. 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. C losses in rubber and oil palm plantations and rainforests were compared and the contribution of soil erosion and organic matter mineralization was estimated. Based on ? Carbon-13 along soil depth, two processes decreasing C stocks were distinguished: erosion and mineralization of soil organic matter (SOM). Depending on the shift of the ? Carbon-13 value of SOC in the topsoil from the linear regression calculated by ? Carbon-13 value with log(SOC) in the topsoil, modification of C turnover rate in the top soil was evaluated. Erosion was estimated by the shift of the ?Carbon-13 value of SOC in the subsoil under plantations. The Ah-horizons in non-riparian soils under oil palm and rubber plantations showed with 70% and 62 % a strong reduction in C content and a strong erosion: 35 ±8 cm in oil palm and 33 ±10 cm in rubber plantations. Within the riparian zones an inhomogenous spatial distribution of C content is expected, due to the trend of increasing C stocks from terrestrial through semi –terrestrial to wet conditions. By comparing decreasing ? Carbon-13 values of SOC in the topsoil to those in subsoil, a lower erosion in all transformation systems in riparian zones could be detected.