Geophysical Research Abstracts
Vol. 15, EGU2013-10893, 2013
EGU General Assembly 2013

Soil organic matter dynamics and mechanisms of carbon stabilization in soils with conversion from secondary forest to grassland in central Philippines

Ian Navarrete (1), Suzette Lina (2), Marife Corre (1), Edzo Veldkamp (1), and Victor Asio (2)

(1) Georg-August University of Goettingen, Soil in the Tropical and Subtropical Ecosystem, Goettingen, Germany (ian-navarrete@daad-alumni.de, ++49-551-393310), (2) Department of Agronomy and Soil Science, Visayas State University, Baybay, Leyte, Philippines

Large portions of the deforested areas in Southeast Asia in general and in the Philippines in particular have been replaced by grassland, but the dynamics between the soil organic carbon (OC) inputs after forest conversion into grassland and the original OC are poorly understood. Also, quantitative data on the C stabilization is important to understand, assess and predict the long term effect of land-use change, but soil C stabilization mechanisms are not fully considered important when studying land-use change. We measured the soil OC content to depths of 100 cm in paired forest and grassland plots across soil types (i.e. Ferralsols, Andosols, Alisols) in Leyte, Philippines. The natural 13C abundance of the soil organic matter was also analyzed to distinguish between forest- and grassland-derived OC in the grassland soils. Oxalate- and pyrophosphate extractable iron and aluminum oxide concentrations were also analyzed and the relationships between soil mineral phase variables and the forest- and grassland-derived OC were examined. Forest-derived OC in the grassland soil accounted for 89-99% of the total OC in Ferralsols, 63-79% of the OC total in Andosols and 56-73% of the total OC in Alfisols. The loss of forest-derived soil OC and the accumulation of newly derived OC were higher in Alfisols that was under grassland for long period compared to the other soils. The decrease in the original OC was higher in the surface soil compared to the lower depths regardless of soil types. Oxalate and pyrophosphate extractable iron and aluminum were found to be the best predictors of OC concentrations in the bulk soil, SOC-derived from forest and SOC-derived from grassland in Andosols, whereas a positive relationship between pyrophosphate-extractable iron and aluminum and soil OC was observed in Ferralsols and Alisols. This result suggests that the accumulation of newly derived OC and the subsequent loss of the original OC were driven by the changes in the mineral-stabilized OC, rather than the changes in the content of newly derived OC. Furthermore, the results of this study indicate that the strong stabilization of OC by Al/and or Fe-organic matter complexes explained the relatively small net C loss from soil OC after land-use change.