Geophysical Research Abstracts
Vol. 18, EGU2016-4280, 2016
EGU General Assembly 2016

Impact of landform and type of land use on soils developed over granite in the monsoonal climate of North-East India

Paweł Prokop (1), Bogusława Kruczkowska (2), Hiambok Jones Syiemlieh (3), and Anna Bucała (1)

(1) Institute of Geography and Spatial Organization, Polish Academy of Sciences, Department of Geoenvironmental Research, Jana 22, 31-018 Krakow, Poland (pawel@zg.pan.krakow.pl, abucala@zg.pan.krakow.pl), (2) Institute of Geography and Spatial Organization, Polish Academy of Sciences, Department of Geoecology and Climatology, Twarda 51/55. 00-818 Warszawa, Poland (b.przewozna@twarda.pan.pl) , (3) North-Eastern Hill University, Department Geography, Shillong – 793022, India (hjsyiemlieh@rediffmail.com)

Soil properties are determined by the factors such climate, organisms, topography, geology, and time. Despite human activity will be recognized as part of biotic factors or distinct from other organisms it change soil directly or indirectly by changing both soil morphology and the underlying soil-forming processes. Thus it is difficult to distinguish soil properties modified only due to human impact.
A small hilly catchment (3.9 km2) at an altitude of 1750–1800 m a.s.l. was selected for the investigation of landform and land use impact on soil properties. The climate is monsoonal with 14oC of mean annual temperature and 2400 mm of mean annual rainfall. The catchment is underlain by deeply weathered (up to 20 m) granite with abundant corestones embedded in sandy grus. Soils have been classified as sandy-loam and silty-loam Ultisols. Site has relatively uniform climate and parent material, so that a large proportion of the local soil variation can be attributed to landforms and land use changes within them.
Thirty soil samples from topsoil (depth up to10 cm) were analysed from two landforms: flat ridge and the middle part of 150 m length slope (15o) with three types of land use: natural deciduous forest, cultivated land (potatoes, cabbage) and 20-years old pine forest on former cultivated land. Physical (texture, bulk density) and chemical (pH, C, N, P, K, CEC) soil properties were analysed. Significant differences between the means of soil properties were identified using the t-statistics, with a level of probability of 5%.
Impact of landform on topsoil properties was visible under all three land use types. Soil under natural deciduous forest on flat ridge has statistically significant less sand, higher content of C and N in comparison to soil profile localized on slope. The differences between ridge and slope under pine forest and cultivated land were limited to some chemical properties such content of C, N and CEC, while statistically significant differences in physical properties were not observed due to homogenization of topsoil during tillage.
Contrasts in soil properties between three types of land use within the flat ridge were smaller than the contrast on slope. Soil under pine forest has highest pH and C, N content both within ridge (4.8, 4.24%, 0.37%) and slope (4.8, 3.46%, 0.27%) in comparison to natural deciduous forest (ridge 4.4, 3.42, 0.27%; slope 4.6, 2.32%, 0.20%) and agricultural land (ridge 4.7, 2.94%, 0.27%; slope 4.5, 2.43%, 0.23%). This indicates relatively fast recovery of topsoil chemical properties on the former cultivated land.
The effects of cultivation on deep weathered granites, despite severe erosion on slopes, are less negative for environment than on surrounding areas built of quartzites with limited thickness of parent material.