Abstract

Effects of landslide deposition on soil physiochemical properties were investigated in this study. We established (1) a data set that compared the differences in soil properties between 1977 survey and current soil survey data for soil samples undergone with and without the occurrence of landslides, and (2) a series of sampling sites with varying degrees of landslide effects. The soils comprise of higher rock content and lower O and A horizon thicknesses after landslide deposition and lead to increase soil pH, inorganic C content, and base saturation. By contrast, for the regions without significant landslide depictions, the soils comprise of less rock content and the biological and pedogenic processes facilitate the formation of O and A horizon thicknesses and leads to a lower pH value and higher organic C, total N, and CEC contents.

Introduction

Landslides are important natural disturbances in tropical and temperate areas. In this study, we evaluated the effects of landslide deposition on soil physiochemical properties from a sedimentary rock in a moist montane forest ecosystem in Xitou, central Taiwan (Figure 1). Specifically we asked how did topsoil properties change after landslide deposition? And, how did the degree of landslides affect these properties?

Materials & Methods

The sampling design comprised two sets. The first set involved using the historical soil survey data conducted in 1976 (Ho, 1977) and the re-sampled soil samples at the same locations that had and had not experienced the landslide deposition to compare the changes of soil physiochemical properties. The second set focused on evaluating the changes of soil physiochemical properties along a landslide/non-landslide sequence to test how a varying degree of landslide effects on soil physiochemical properties (Figure 2).

Results & Discussion

- Comparing soil properties at the same location between 1977 and 2012, the results showed that the landslide depositions resulted in a raised pH by 1 unit, and the values of SOC, N content, and CEC reduced by 30 to 70% (Table 1).
- Changes in soil physiochemical properties along the landslide/non-landslide sequence were apparent (Figure 3; Table 2). The results indicated that soil pH, bulk density, inorganic carbon, and base saturation increased following the landslide deposition and that the greater severity of the landslide was the greater these increases were.
- By contrast, the thickness of O and A horizon, soil organic carbon, total nitrogen, and cation-exchange capacity significantly decreased following a landslide, and the level of decrease declined as the extent of the landslide declined.
- The exchangeable potassium, calcium, magnesium, and available phosphorus contents were unaffected by landslide deposition.

Summary

The differences of soil properties where landslide depositions had and had not occurred in Xitou can be illustrated by the conceptual model in Figure 4. Both geomorphological (landslide) and pedogenic (non-landslide) processes play important roles in affecting soil properties.