

The effect of land use change on soil properties of high Andean ecosystems in southern Colombia

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Abstract

The Paramos, which are high Andean ecosystems in the tropical South America, are considered “water factories” for cities, farmlands and industries, because they regulate 80% of the water supply. Soils are mainly responsible for this water regulation, because of their high amounts of organic matter, high porosity and low density. However, replacing native vegetation with cattle grazing and cropping is damaging these soils and their hydrologic functioning. We measured the infiltration rates, N and C contents, organic matter, bulk density and C:N ratios in soils across six land covers in Paramo Paja Blanca (Southern Colombia): shrubs, cushion plants, tussock grasses, forests (native covers), pastures for cattle grazing and potato crops (human uses). The mean infiltration rate of grazed soils averaged 0.30 mm, 80% lower than under native vegetation. Grazed soils also tended to be hydrophobic, and were compacted with 30% higher bulk densities (0.7-0.8 g/cm³) than soils under native covers. Furthermore, these soils showed 75% lower contents of organic matter, organic C, and N, than in native covers, reflecting the mechanic and chemical damages that grazing produces in this region’s volcanic soils. Soils with potato crops also showed reduced levels of C, N and higher densities than native covers, but not as prominent as in grazing soils. These results reveal the negative effect of land use change in Paramo Paja Blanca and the accompanying risks to the regulation of water supplies for 7 small cities located downstream.

Key words: Paramo, soils, land use change, infiltration,