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Role of native and exotic woody vegetation in soil restoration in active gully systems (southern Ecuador)

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Revegetation projects in degraded lands have the potential to recover essential soil functions. If vegetation restoration is combined with bioengineering techniques, such as the construction of retention dams in active gully systems, soil restoration could be enhanced. One important aspect of this process is the role of vegetation on restoration of soil chemical and physical properties. There is currently a lack of knowledge on the potential of soil restoration in active badland systems, as most studies have concentrated on the direct and visible effect of revegetation on erosion control.

The aim of this study is to evaluate the role of revegetation and bioengineering works on the restoration of soil physical and chemical properties. The analyses are realized in a highly degraded area of 3 km2, located in the lower part of the Loreto catchment (Southern Ecuadorian Andes). First, the soil physical and/or chemical parameters that are most sensitive to track environmental change were evaluated. Second, the role of vegetation on soil restoration was quantified. . Soil samples were taken in sites with different vegetation cover, land use and physiographic position. The following physical and chemical parameters were measured: volumetric water content (θsat, θact), bulk density, pH, texture, organic matter, C and N content.

Our first results do not show a clear relationship between volumetric water content at saturation (θsat), bulk density, or C content. The saturation water content does not vary significantly between different sites, or land use types. However, significant differences are found between sites at different stages of restoration; and this for most chemical and physical soil properties. Vegetation cover (%) appears to exert a strong control on the C content in the mineral soils. The highest C values are found in soils of forest plantations with Eucalyptus and Pinus species. These plantations are located in areas that were previously affected by active gullying. Our results show that the establishment of a protective vegetation cover is an important factor in soil restoration.