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Soil degradation and rehabilitation in the tropical mountain rainforest region of South Ecuador

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The tropical mountain rainforest of South Ecuador is one of the hotspots of biodiversity (Beck et al., 2008). This unique ecosystem is threatened by deforestation and subsequent land degradation. Large areas have been converted by slash-and-burn practice into pasture land (Göttlicher et al., 2009). Due to the invasion of the tropical bracken fern pastures become unproductive and are abandoned. One important land-use option in the area is to take abandoned pasture land either back into agricultural or silvicultural production. To identify the most suitable land-use option for the rehabilitation of these degraded areas from the ecological as well as socio-economical point of view different indicators are applied. Indicator development is based on data obtained during about ten years of research in the study area (www.tropicalmountainforest.org). Links between ecological indicators, especially soil quality, and the economic valuation of the different land-use systems will be presented.

The research area in the Cordillera Real an eastern range of the South Ecuadorian Andes is located at about 2000 m above sea level, close to the “Estacion Científica San Francisco”, about halfway between the provincial capitals Loja and Zamora. The mean annual air temperature is 15.3°C with an average annual rainfall of 2176 mm. The main soil type is classified as Cambisol according to WRB 2006 (Potthast et al., 2011). Along a land-use gradient (natural forest, active and abandoned pastures of different age with the grass Setaria sphacelata or the bracken fern Pteridium arachnoideum as dominant plant species, abandoned pastures with successional bush vegetation) physical, chemical and biological indicators of soil quality were determined. Special attention has been paid to the response of soil microorganisms to land-use change by means of biomass, activity and community structure (Hamer et al., 2009; Potthast et al., 2011).

The assessment of soil quality strongly depends on the management goal for specific sites. In the present study two probably conflicting management goals exist: plant productivity and re-establishment of the function of soils as habitat and gene reservoir as it is provided by the tropical mountain rainforest. Therefore, two different soil quality assessment schemes are developed. The first is based on the frequency distribution of data obtained along the land-use gradient whereas the second takes into account the soil data of the natural tropical mountain rainforest as reference to assess the “degree of naturalness”. The results show different rankings for soil quality depending on the management goal. Combining the two approaches is a good alternative to meet the biased challenges of land-use systems on soil quality and to monitor the success of soil rehabilitation processes.

References

Beck, E., Bendix, J., Kottke, I., Makeschin, F., Mosandl, R. 2008. Gradients in a tropical mountain ecosystem of Ecuador. Springer, Berlin.

Göttlicher, D., Obregón, A., Homeier, J., Rollenbeck, R.T., Nauss, T., Bendix, J. 2009. Land-cover classification in the Andes of southern Ecuador using Landsat ETM+ data as a basis for SVAT modelling. International Journal of Remote Sensing 30: 1867-1886.

Hamer, U., Potthast, K., Makeschin, F. 2009. Urea fertilisation affected soil organic matter dynamics and microbial community structure in pasture soils of Southern Ecuador. Applied Soil Ecology 43: 226-233.

Potthast, K., Hamer, U., Makeschin, F., 2011. Land-use change in a tropical mountain rainforest region of Southern Ecuador affects soil microorganisms and nutrient cycling. Biogeochemistry DOI: 10.1007/s10533-10011-19626-10537.