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Spatial Aspects of Ecosystem Research in a Biodiversity Hot Spot of Southern Ecuador — An Introduction

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SPATIAL ASPECTS OF ECOSYSTEM RESEARCH IN A BIODIVERSITY HOT SPOT OF SOUTHERN ECUADOR – AN INTRODUCTION

JÖRG BENDIX and ERWIN BECK

With 1 figure

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The Andes of Ecuador are known as one of the “hottest” hotspots of biodiversity (BRUMMITT and LUGHADA 2003; BARTHLOTT et al. 2007, LIEDE-SCHUMANN and BRECKLE 2008). At the same time Ecuador suffers the highest annual rate (-21.5% between 1990 and 2005, FAO 2005) of deforestation in South America, belonging to the “Top Eleven” countries worldwide with regard to tropical forest destruction (MARSHAL 1999). In particular, the mountain forest is being chopped down legally as well as illegally at an alarming rate.

The major driver of deforestation results from poverty of the growing local population especially in the rural areas (HALL and PATRINOS 2006). The motivation of the people for clearing the native forest is to improve their living standards by gaining pasture and/or arable land. Degradation of the natural ecosystem, mostly by slash and burn, impairs its ecosystem services, a term that encompasses the trade-offs from the resources and processes of the (original) ecosystem for human livelihood and well-being (see e.g. DAILY 1997; MILLENIUM ECOSYSTEM ASSESSMENT 2005). While the so-called *provisioning services* (food, fuel, wood and fibre etc.) may increase, at least temporally, due to anthropogenic conversion of the ecosystem, the (ecosystem) *supporting and regulating services* such as the maintenance of an effective climate regulation function, balanced nutrient cycle and carbon sequestration are severely compromised, major factors which could locally mitigate the effects of global climate change. In particular ecosystem *preserving services* provided by its biodiversity are inevitably endangered by ecologically non-adjusted land use types. In the Andes of South Ecuador, pastoral land use can be considered the central *provisioning service* for the livelihood of the local population. Unfortunately, productiveness of the pastures suffers from an inappropriate use and method of maintenance by periodical burning. This holds also for the study area of

Management of a Megadiverse Mountain Ecosystem in South Ecuador” which investigates the tropical ecosystems of the upper San Francisco valley in the Provinces of Loja and Zamora-Chinchipec.

In that valley about 48% of the natural mountain forest below 2200 m a.s.l., and even 6% above that line, have been cleared mainly for use as pastureland, but about 40% of the pastures are heavily infested by a terrible weed, the southern bracken, whose growth and encroachment is favoured by the above mentioned land use practices resulting in an abandonment of the pastures within a decade or less (HARTIG and BECK 2003; GÖTTLICHER et al. 2009). Today, 25 multidisciplinary projects are working together in the research unit to finally derive science-directed land use scenarios and to design a sustainable land use system which at the same time preserves biodiversity and its underlying ecosystem processes, rehabilitates attenuated diversity and lost ecosystem services and guarantees better livelihoods for the local population. Many projects are jointly examining ecosystem functioning and usability on common study plots in the natural forest and on the pastures. Major insights in the ecosystem that were extracted from investigations, which have partly gone on for more than 10 years, have recently been published (BECK et al. 2008). However, to derive options for a sustainable management, science-directed recommendations must be valid not only for single plots but for a whole region, a demand that requires research on the landscape scale. Particularly, knowledge on the effects of different management strategies on the various ecosystem services is needed. Thus, one overarching endeavour of the ongoing research programme is on models addressing ecosystem functioning and services on a wider spatial perimeter (Fig. 1).

This special issue of “Erdkunde” exemplarily presents several of our comprehensive study projects

a great ecological research project (Fig. 1), the DFG funded Research Unit 816 “*Biodiversity and Sustainable* addressing models that are useful for an assessment of land use options.

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