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Payments for Environmental Services in Costa Rica: A Forest Site Selection Tool Based on Spatial Diversity of Environmental Service Provision, Risk and Opportunity Costs

TOBIAS WÜNSCHER¹, STEFANIE ENGEL¹, SVEN WUNDER²

¹ZEF - Centre for Development Research, University of Bonn, Germany

²Centre for International Forestry Research (CIFOR), c/o EMBRAPA Amazônia Oriental - Convênio CIFOR, Brazil

Abstract

The payment for environmental services (PES) is a widely acknowledged and increasingly popular market-based financial instrument for the conservation of natural forest resources. The payment acknowledges the services forests provide to society (e.g. water regulation, carbon sequestration and biodiversity protection) and thus their crucial role at the very beginning of the food chain, e.g. for the provision of irrigation water. The payment helps to internalise negative externalities of deforestation into the decision-making process of forest land-owners and presents a compensation to the forest-owner for protection costs and foregone revenues from alternative uses. Costa Rica is the only developing country to have implemented a nation-wide PES programme and it plays the leading role in experimenting with new structural designs.

However, we find that the scheme's additionality in the delivery of environmental services can be highly improved. Currently, the program's selection process pays little attention to actual service delivery of a forest site, and it does not consider spatial differences in risk of deforestation and opportunity costs of forest conservation. This means that funds are lost to forest sites which provide few environmental services, are in no danger of deforestation and have low opportunity costs (it can be assumed that many sites could be integrated into the programme with a lower payment because application numbers of forest owners are about three times higher than funds can pay for, showing that today's fixed per ha payment exceeds opportunity costs).

For these reasons we designed a site selection tool which takes above mentioned spatial differences into account. The tool is based on geographic information system (GIS) technology. It comprises valuation scores for carbon, water, biodiversity and scenic beauty services, deforestation probabilities and opportunity costs and thus combines interdisciplinary expertise in a joint product. Data which could not be provided by secondary sources was raised in own field surveys. The tool simultaneously analyses the information of the total number of potential forest sites and employs a maximisation function to select those sites which maximise benefits at constant expenditure. To our knowledge this is the first selection mechanism that considers the trade-offs between several not perfectly correlated environmental services.

Keywords: Biodiversity, carbon-sequestration, Costa Rica, environmental services, forest conservation, market-based instrument, natural resource management, payments for environmental services, site selection, targeting, water services