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Payments for Ecosystem Services Using Product Bundles to Prevent Deforestation in Tropical Montane Cloud Forests

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Abstract

Tropical mountain cloud forests (TMCFs) represent endangered ecosystems found worldwide in the tropical regions. Although TMCFs account only for 1.4% of the world tropical forest area, they harbor 50% of the known neotropical higher plant species and high levels of endemism. Besides, they deliver to societies outstanding ecosystem services (ES) such as: increased water retention and quality, soil carbon sequestration, and biodiversity richness.

Many authors agree that deforestation due to land use change is the main threat to TMCFs, and it has been reported in the 1990s that their deforestation rate was higher than any of the other tropical forest biomes. Smallholder farmers, led by uncertainty in crop yield, food insecurity, tenure conflicts and climate impacts, have, among others, extensively contributed to deforestation. Costa Rica has been a pioneer nation on the enforcement of payments for ecosystem services (PES), aiming at the decrease in deforestation rates and conservation efforts. In spite of the large areas successfully reforested and preserved in the recent years, PES leave behind a number of smallholder farmers who are excluded to establish market relations because clear land rights are essential to participate in the trade of ES. Moreover, whilst many studies have dealt with ES separately, this research intends to evaluate their effect in bundles. The environmental value that TCMFs represent in terms of natural resources and biodiversity as well as the rural communities that they support, makes necessary to re-evaluate PES design if we aptly want to preserve both biodiversity and rural livelihoods. This research includes both biophysical and social sciences approaches aiming at:

The Development of an evaluation model and its application to the ES that can be provided by TCMFs with special interest in water, soil carbon, and biodiversity. Geographic information system (GIS) models will be employed to evaluate and combine the ES in bundles, this will provide a better understanding of ES interactions and will help in the decision-making process.

The understanding of stakeholders' perceptions and interests in designing PES. These will combine scientific and local knowledge and a development strategy aligned with local interests instead of rigid environmental policies or socioeconomic external factors.

Keywords: Biodiversity, bundles, GIS, land tenure, payments for ecosystem services, soil carbon, tropical montane cloud forests, water regulation