Evaluating the effectiveness of payments for ecosystem services in a spatially explicit conservation planning framework

Zayra Ramos-Bendaña[1,2], Lee A. Vierling[2], Pablo Imbach[1], Freddy Argotty[1]

[1]CATIE 7170, Cartago, Turrialba, Turrialba 30501, Costa Rica, zramos@catie.ac.cr, [2]University of Idaho, Moscow, USA

Payments for ecosystem services (PES) have gained much attention as a promising option for attaining conservation objectives on privately-owned lands. The current PES concept is based on the assumption that conservation problems originate from market failure, and that such an incentive-based instrument will allow this problem to be resolved through financial transfer from beneficiaries to providers. A further condition is that PES providers secure the provision of ecosystem services through specific land-use practices.

Costa Rica pioneered a nation-wide PES program in 1997. Several recent studies assessing the impact of Costa Rica's PES scheme on achieving conservation goals use 'avoided deforestation' as a proxy for effectiveness. However, this proxy does not offer an appropriate measure of the effectiveness of PES allocation, because provision of the ecosystem services is not quantified in space or time. A spatially explicit approach where ecosystem services are mapped is therefore needed. We submit that a conservation planning framework (CPF) can provide an effective platform for building spatially explicit benchmarks to evaluating the effectiveness and management of PES, especially in cases such as Costa Rica where a "baseline condition" is difficult to delineate.

We ask: *how do the actual allocation of PES contracts and the current selection criteria compare with an optimal scenario (benchmark) based on ecosystem services mapping?* We use the Nicoya Peninsula, Costa Rica, to study biodiversity conservation, water provision, and carbon storage and sequestration in different policy scenarios. We use the spatially explicit tool 'Marxan with zones' to assess the effectiveness of PES allocation within a policy-mix context. This policy-mix context is comprised of a ban to forest conversion (Forest Law 7575, in place since 1996), Protected Area designation, and PES. We focus on the PES protection modality, because most of the high financial investment goes into this program and because most of the selection criteria are spatially explicit.

We compare four scenarios: (a) the actual allocation of PES contracts (selected farms from 2007 to 2012); (b) an optimal scenario based on current PES conservation and social selection criteria; (c) an optimal scenario based on only current PES conservation criteria; and (d) an optimal scenario based on ecosystem service maps. To compare the scenarios we apply congruence, overlap and irreplaceability analyses.

We expect that through a spatially explicit CPF, new opportunities will arise for conserving bundled ecosystem services, providing measures of spatially explicit PES allocation effectiveness, and exploring the synergies and trade-offs between criteria. For example, preliminary results show when considering social criteria (e.g. farms smaller than 50 ha) the selection frequency of some areas increase; these areas are not necessarily of high conservation priority. Looking at these tradeoffs could help to provide recommendations for improving PES selection criteria.

Landscapes are dynamic and an approach that allows the integration of different policy priorities in a spatially and temporally explicit way opens opportunities for having an instrument that could provide benchmarks that adapt with changes in the provision of ecosystem services and the policy context, and provide valuable information for stakeholder's decision making processes.