Regional Integrated Silvopastoral Ecosystem Management Project – Costa Rica, Colombia and Nicaragua

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Short title: The PES Experience in Costa Rica, Colombia and Nicaragua.

Key Message: Unique system of using a scoring index to measure ecosystem services and provide payments related to these scores.
Silvopastoral systems are integrated land use systems in which trees or shrubs are combined with livestock and pasture production on the same unit of land (Devendra & Ibrahim 2004).

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1. What was the problem?

Pasture-based cattle farming has dramatically modified the rural landscapes on a continental scale and has been recognized as a process with huge environmental and social impacts. In Latin America and the Caribbean region, there are currently more than 602 million hectares occupied by permanent pastures, which accounts for more than 33% of the said region (Chará & Murgueitio 2005). Cattle production and ranching has long been an important cause for both the loss of natural habitat and biodiversity and the driving force behind deforestation in Costa Rica, Colombia and Nicaragua.

Despite the correction of many governmental policies that encouraged deforestation, pressure from expanding livestock production has continued to result in large-scale deforestation. After the initial period of high yields, soil fertility gets depleted and grass cover diminishes, resulting in soil erosion, contamination of water supplies, air pollution, further loss of biodiversity, and degradation of landscapes. Poverty, unemployment and inequitable land distribution has forced many landless peasants to clear the forest for subsistence farming and has forced many small farmers to sell cleared land to livestock farmers. In addition to deforestation and loss of natural habitat and biodiversity, the extension of grazing land for extensive cattle ranching has resulted in the release of significant amounts of carbon dioxide (CO_2) into the atmosphere. The livestock sector generates approximately 18% of global greenhouse gas emissions, exceeding the emissions of transport in Costa Rica, Colombia and Nicaragua. About 2.4 billion of the estimated 4.5 to 6.5 billion tons of annual net additions of carbon (C) to the atmosphere are derived from livestock related land-use for livestock products (Hansela et al. 2009, Pagiola et al. 2007).

PES is a market-based approach to conservation financing based on the twin principles that those who benefit from environmental services (such as users of clean water) should pay for them, and that those who contribute to generating these services (such as upstream land users) should be compensated for providing them (Pagiola et al. 2007).

The Regional Integrated Silvopastoral Ecosystem Management Project (RISEMP) was implemented as a pilot project for a period of five years from 2002 to 2007 in Costa Rica, Colombia and Nicaragua. It was financed by a U.S. $ 4.5 million grant from the Global Environment Facility (GEF) and implemented by the World Bank. The project was also developed with the support of the multi-donor Livestock, Environment and Development Initiative (LEAD), hosted by the Food and Agriculture Organisation (FAO). In the field, it was implemented by local non-governmental organizations (NGOs); in Colombia - Centre for Research on Sustainable Agricultural Production Systems (CIPAV), in Nicaragua - The Institute of Research and Development of the University of Central America (NITLAPAN-UCA) and Tropical Agricultural Research and Higher Education Center (CATIE) in Costa Rica (Pagiola et al. 2007, World Bank 2008).

The RISEMP was an integrated payment for ecosystem services (PES) scheme implemented in Costa Rica, Colombia and Nicaragua in 2002 by the World Bank. It addressed problems associated with pasture-based cattle farming by compensating land users who adopted silvopastoral practices in degraded pasture areas. It is also considered to be an alternative approach to reducing CO_2 emissions from livestock related deforestation. In addition to providing incentives to farmers to adopt silvopastoral practices that generate environmental services, it was also designed to assess whether payments for environmental services could change behavior and to measure the extent to which silvopastoral practices contributed to improved livestock production. The RISEMP was implemented in 265 farms in Costa Rica, Colombia and Nicaragua, and was divided into two groups per country: those receiving payments for 2 and 4 years respectively (Hansela et al. 2009, World Bank 2008).

2. Which ecosystem services were examined and how?

The RISEMP was introduced in three areas: Quindío, in Colombia; Esparza, in Costa Rica; and Matiguás-Río Blanco in Nicaragua. A financial analysis was undertaken in order to clarify whether investments in silvopastoral systems were financially viable, and to ascertain the impact of payments for environmental services. This was done by conducting a benefit cost analysis for seven different models of representative farms, with different livestock production systems. This analysis was carried out throughout the duration of the project (Pagiola et al. 2004, World Bank 2008).

The environmental service index was developed in order to assess levels of ecosystem services provided and provides payments closely correlated to these levels. The environmental service index attempts to assess the level of environmental services generated by different types of land use. It combines two indices: an index for biodiversity and an index for carbon sequestration (FAO 2010, Pagiola et al. 2007).

LAND USE	BIODIVERSITY INDEX	CARBON SEQUESTRATION INDEX	ENVIRONMENTAL SERVICE INDEX (ESI)
Annual crops (annual, grains, and tubers)	0	0	0
Degraded pasture	0	0	0
Improved pasture with recently planted trees	0.3	0.4	0.7
Windbreaks (per km)	0.6	0.5	1.1
Diversified fodder bank	0.6	0.6	1.2
Shade-grown coffee	0.6	0.7	1.3
Diversified timber plantation	0.7	0.7	1.4
Riparian forest	0.8	0.8	1.5

(Source: FAO 2010)

The biodiversity index assigned a number from 0.0 to 1.0 from most unfriendly (degraded pasture and annual crops) to most biodiversity friendly (primary forest). Within this range, a panel of experts assigned points to each land use by taking into consideration factors such as the number of species, their spatial arrangement, stratification, plot size, and fruit production. Similarly, the carbon sequestration index assigned points to different land uses according to their capacity to sequester stable carbon in the soil and in hard wood. The two indices were then added to arrive at a single environmental services index, which finally influenced the level of payment. In each of the three project countries, 30 farms were monitored to evaluate the impacts on productivity and socioeconomic indicators (FAO 2010, Pagiola et al. 2007).

3. Did the examination of ecosystem services generate impacts on decision-making or policies and, if so, how?

The PES scheme implemented through the RISEMP was innovative in its approach as it established a differential payment scheme according to the degree of environmental service being provided. It eliminated the inefficiencies of paying a flat fee per hectare for conservation irrespective of the level of conservation effort applied by the farmer. The direct beneficiaries included small and medium-sized landowners (10-80 hectares farms), depending mostly on livestock and food crop production, with an average annual income from the farm of about US $3,000. This scheme allowed farmers to decide how much conservation they were willing to undertake (GEF 2009). The farmers who received PES were divided in groups of 2 and 4-year schemes, receiving $75 and US$110 per incremental ecological point, correspondingly, after the ESI payment increase in 2005. On the other hand, the funding agency Global Environment Facility fulfilled the other requirement of a PES scheme, which is paying for the provision of environmental services. Their role in the project was to fulfill the role of 'buying' biodiversity conservation services on behalf of the global community. Another important aspect of this project was the implementation of workshops and meetings with local farmers' organizations, agricultural and environmental scientists, and government environmental organizations. A series of training courses were also carried out

for farmers and proved quite successful as it helped introduce farmers to the new production technologies and research methodologies (World Bank 2008).

The RISEMP had been successful in demonstrating and measuring the effects of the introduction of payment incentives to farmers for the adoption of integrated silvopastoral farming systems. Accumulated PES per farm between 2003 and 2008 was US$2,500, US$2,400 and US$2,300 for Costa Rica, Nicaragua and Colombia, respectively, resulting in 12,262 hectares of improved biodiversity and carbon sequestration indices by the end of implementation (the target was 12,000 hectares). Many other environmental benefits of silvopastoral systems demonstrated were the improvement of water infiltration; soil retention; soil productivity; reduction of fossil fuel dependence (e.g. substitution of inorganic fertilizer with nitrogen fixing plants); diversification of farm benefits; scenic beauty enhancement; and land rehabilitation (World Bank 2008). Carbon was sequestered both in the soil and above ground in the trees that were planted through the project. A resource monitoring methodology was developed which was used to measure carbon sequestration and biodiversity conservation. Carbon stocks measured in silvopastoral habitats were higher than in degraded lands, and emission of greenhouse gases was found to be lower in silvopastoral habitats (GEF 2009).

The following are examples of policy uptake by Colombia, Costa Rica and Nicaragua following the completion of the Regional Integrated Silvopastoral Ecosystem Management Project:

Colombia: For Colombia the silvopastoral project marked an important landmark, as it was the first time that an effective payment was made in recognition to the environmental services provided by a productive sector in carbon sequestration and protection of the biodiversity. The experiences of this project were used by FEDEGAN (National Farmers Organization) to develop a program for mainstreaming silvopastoral systems for sustainable management of cattle production at a national level. The project provided training to experts of FEDEGAN with respect to managing silvopastoral systems and monitoring and evaluation of environmental services. FEDEGAN has earmarked funds for credit with the national bank (FINAGRO) and in collaboration with CIPAV, CATIE and other organizations, is in the process of developing a project for conservation of biodiversity in cattle farms, which will be submitted to GEF. The regional cooperation of Quindio used experiences of the silvopastoral project to formulate policies and incentive schemes for the conservation of water resources within key watersheds. In addition, Government of Colombia is developing a National PES Strategy where the project has served as an important reference; the scaling-up operation will contribute to the strategy's development (World Bank 2008).

Costa Rica: The policy impact of RISEMP in Costa Rica was not as pronounced as it was in Colombia due to the fact that Costa Rica already had prior efforts and existing PES-initiatives before RISEMP. The project did enhance these prior PES efforts in the country through the collaboration between RISEMP and the National Fund for Forestry Financing (FONAFIFO) to design and implement a regulation for payment of environmental services in agro forestry systems including silvopastoral systems. Under this payment system farmers are paid U.S. $ 1.6 per tree in a three-year period and many farmers have been benefiting from this payment system. FONAFIFO also developed the Ecomarkets 2 project which will work on watersheds similar to that of the pilot area in Costa Rica, and this project will use the experiences and methods developed by the GEF silvopastoral project for payment of environmental services. In addition, FONAFIFO agreed to continue PES to cattle farmers for those land use systems that qualify for PES under its system (e.g. trees in pastures, secondary and plantation forest) (World Bank 2008).

Nicaragua: The RISEMP created awareness and provided information to policy makers in Nicaragua as regards the PES-model. Through the RISEMP, the local authorities of the Matiguas-Rio Blanco watershed in Nicaragua were encouraged to develop a system for PES

for the conservation of water resources in the recharge zones. NITLAPAN also provided technical assistance to FDL (Local Development Bank), which was a reputable rural finance bank that provided agricultural credit at a national level. Recent experiences showed that cattle farmers who accessed credit from FDL were investing in unsustainable farming practices that were associated to pasture land degradation. Based on the lessons learned in the GEF-silvopastoral project, FDL was supported to develop a green credit package for investing in biodiversity friendly silvopastoral systems (World Bank 2008).

4. Lessons learned

The RISEMP faced three major challenges that would be useful for policy makers and proponents of PES to know and understand. First among these was the perceived unattractiveness of magnitude of the payment especially if viewed against the cost—relatively a large start-up investment—to participate. This was a problem because the landowners' lukewarm reception to the project critically limited the ability of RISEMP to attain its objective of influencing the landowners' decision with regard to land use, and steer the landowner's choices of farm technology towards an environmentally-sustainable direction.

The second challenge for the project was the risk of creating perverse incentives due to the design of the payments, wherein landowners were paid based on incremental improvement on the land. Since the landowners were to be paid initially according to the marginal changes on the use of the land, an incentive for landowners to "degrade" the land in order to make the base condition of the land low was unwittingly created. There was, of course, a natural limit to this purposive degradation, as it was unlikely that the landowners would degrade the land to a point where the land value lost due to the degradation would be permanent, and the cost of the effort to degrade would be more than the expected payments from the project. The expectation, however, was that the landowners were aware of the cost of degradation, and were careful not to exceed the payments by the project for the land improvements.

The third problem identified by the RISEMP managers and proponents was the fact that landowners were still able to engage in environment-damaging activities in other parts of the land that were not directly engaged in RISEMP. This situation posed the problem of negating the gains brought about by the adoption by the landowners of the RISEMP technologies.

To address the first challenge, RISEMP provided a small up-front payment to the participating landowners in order to blunt the investment need to participate in the project. This also addressed the time lag between the investments and the returns. RISEMP also eliminated the time cap on the payments—as long as the landowners participate in the project, the payments would continue—effectively reducing the unattractiveness of the payments because RISEMP offered a continuous flow of income.

The perverse incentive problem was addressed by modifying the contract between the landowners and RISEMP—prohibiting the burning of pastures and the cutting of primary and secondary growth forests. In addition, payments were made available for pre-existing environmental services generated by the land, effectively rewarding the participants for using environmentally-sustainable farm technologies prior to RISEMP.

And finally, payments to the landowners were modified so that they were based on net points earned by the entire land instead of gross (based solely on positive points earned for using RISEMP technologies), with potential negative points earned if some parts of the land had environment-damaging activities or technologies. This created an incentive for landowners to use and adopt land management technologies that were consistent with the technologies under RISEMP.

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