



# Payments for Ecosystem Services: Background Information and Evaluation of Case Studies

## Introduction

This background information gives an overview of payments for ecosystem services (PES), which have become progressively more relevant for conservation or sustainable use of biological or non-biological resources or ecosystem functions. WWF offices are increasingly involved in designing and implementing PES schemes in field projects. This briefing aims to inform and support WWF practitioners in their work with PES.

### Part I: Background Information on PES

Part I provides relevant definitions and the policy context of PES with chapters on

- Natural Capital and Ecosystem Services
- What is a Payment for Ecosystem Service?
- Design of successful PES schemes
- PES as an Innovative Financial Mechanism under the CBD
- PES as an instrument to foster a 'green economy'

Background literature on PES is also referenced.

### Part II: Evaluation of Case Studies on PES Programs

In Part II, the experiences of developing countries and best practices and lessons learned is presented based on a literature review and survey of existing payment for ecosystem services (PES) programs **focused on the forestry sector**.

The survey reports on four long running PES programs (Costa Rica, Mexico, China, Brazil/Acre), extracts relevant lessons learned, and synthesizes recurrent themes associated with PES program design and implementation.

An overview and lessons learned derived from the latest comparative analysis of PES programs published by CIFOR in 2008 ([www.cifor.org](http://www.cifor.org)) is also provided.

The analysis of these operational PES programs can support WWF initiatives and offices to better understand the opportunities and barriers for future operationalization of PES schemes in WWF projects and programs.

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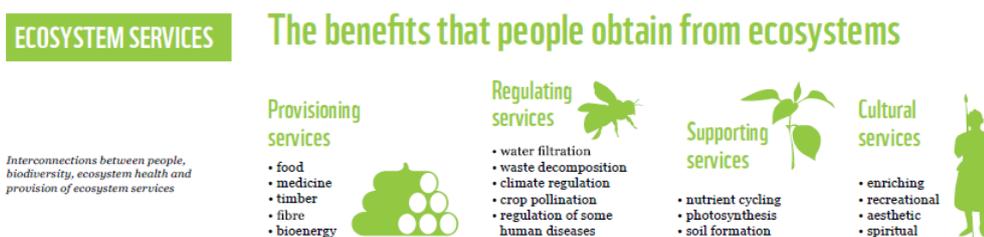
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## Part I: Background Information on PES

### Natural Capital and Ecosystem Services

'Natural capital' is a concept proposed by Pearce et. al. (1989) to underline the role of nature in the economy and human welfare and alongside other forms of capital (e.g. manufactured/man-made capital, human and social capital). Natural capital is the 'stock' of natural assets that yields a 'flow' of valuable services for society and economy based on ecosystem functions.

The Millennium Ecosystem Assessment (MEA, 2005) defined 'ecosystem services' as "the flow of benefits that people obtain from ecosystems". From an economic point of view, ecosystem services can be seen as the 'dividend' that society receives from natural capital. Maintaining stocks of natural capital allow the sustained provision of future ecosystem service flows, thereby helping to ensure enduring human well-being.



Living Planet Report, WWF (2012)

### What is a Payment for Ecosystem Service?

A 'payments for ecosystem services' (PES) is a direct and flexible incentive-based mechanism under which an ecosystem service user or beneficiary, whose decisions on the use of natural resources have an impact on the ecosystem service provision, pays in cash or in-kind to an individual, a community, or a government agency (OECD, 2010). Though the prime objective of PES schemes is **conservation or sustainable use of biological or non-biological resources or ecosystem functions**, they can also contribute to alleviating poverty and enhancing livelihoods according to the arrangements of the specific PES scheme (Carius et al., 2012).

FAO (2011) outlines that a PES scheme can be put in place when:

- a) the demand for at least one ecosystem service is clear and financially valuable to one or more 'buyer's';
- b) the provision of ecosystem services is threatened, but the adoption of specific land-use or land management practices has the potential to address the supply constraints;
- c) a trusted intermediary is available to assist both parties in developing the negotiation and provide expertise in the PES design;
- d) clear criteria are able to be established to ensure compliance of the contractual agreement by both parties;
- e) land tenure and usage rights are clear; and if
- f) there is a cross-sectoral coherence between existing policies and laws and PES requirements.

PES schemes can be found in all continents and mainly revolve around three groups of ecosystem functions (FAO, 2012):

1. water and soil-related services,
2. climate stabilization, and
3. biodiversity conservation.

Though mainly implemented at the project level and focusing on one particular service, an increasing amount of schemes are emerging at the national level and benefiting multiple ecosystem services simultaneously (FAO, 2012).

The main 'buyer' in PES schemes is the public sector, which is able to raise funds at the national and international level (FAO, 2011). Vatn et al. (2014) concluded that public bodies – through taxes, fees, etc. – raised 99% of the financial resources involved for land-related PES and that "a majority of public payments are subsidies". The remaining 1% of direct trade is mainly comprised of the voluntary carbon market (Vatn et al., 2014). While private 'buyer's' tend to pay according to

what is delivered, public payments are typically flat rate, potentially differentiated according to type of land-use, and only offer enough to cover the 'seller's' opportunity cost rather than reflect the true monetary value of the environmental service (Vatn et al., 2014).

### **Design of successful PES schemes**

A successful PES scheme depends on funding availability – from implementation and operation to the cost of program maintenance and including continued payments to service providers (TEEB, 2010). Often, external funding, which can be raised through contributions from international organizations (e.g. World Bank, the Global Environment Facility) or from subsidies from national governments, is required to establish a PES scheme (TEEB, 2010). Additional financial support can be raised through earmarking revenues, collecting taxes, direct voluntary payments from beneficiaries, trust funds, user fees and charges, and public-private partnerships (see Table 8.1 in TEEB 2010 for various PES financing program schemes) (TEEB, 2010).

### **PES as an Innovative Financial Mechanism under the CBD**

In order to scale-up financing in support of achieving the Convention on Biological Diversity's (CBD) objectives, PES has been included in the list of 'Innovative Financial Mechanisms' under the Strategy for Resource Mobilization, which was agreed upon at the 9<sup>th</sup> Conference of Parties to the CBD.

**Goal 4** – *Explore new and innovative financial mechanisms at all levels with a view to increasing funding to support the three objectives of the Convention*

**Strategic objective 4.1** – *To promote, where applicable, schemes for payment for ecosystem services, consistent and in harmony with the Convention and other relevant international obligations. (UNEP/CBD/COP/IX/11, 9<sup>th</sup> Oct 2008)*

However, experts questioned if PES should be qualified as an 'innovative financial mechanism' since PES schemes have been applied for decades. It was suggested to talk more generally about 'biodiversity finance mechanisms' (Ogwal and Schultz, 2014). The CBD Secretariat requested governments to provide information about PES schemes which have been made available on the CBD website to share experience and promote further application. The list of PES schemes on the CBD website provides an overview of the range of PES examples and applications; for more information see <http://www.cbd.int/financial/pes.shtml>.

### **PES as an instrument to foster a 'green economy'**

Most PES schemes are applied at a local or regional basis. On a larger scale, they could also be recognized as a suitable contribution to the development and implementation of a national 'green economy', such as in Costa Rica (see Part III, Costa Rica Case Study).

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CBD <http://www.cbd.int/financial/pes.shtml> : broad information on PES schemes provided by CBD Parties may be used as a source for further reading.

CIFOR: [http://www.cifor.org/pes/ref/publications/all\\_publications.htm](http://www.cifor.org/pes/ref/publications/all_publications.htm) : list of publications on PES schemes with focus on forestry

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## Part II: Evaluation of Case Studies on PES Programs

The following analysis comprises a literature review and survey of existing Payments for Ecosystem Services (PES) programs that are **focused on the forestry sector**. The report concentrates on the experiences of developing countries and shares best practices and lessons learned from many activities and projects that have been undertaken in recent years to scale up global efforts to apply PES schemes.

The survey reports on four selected PES programs (Costa Rica, Mexico, China, Brazil/Acre) that have a long running history, extracts relevant lessons learned, and synthesizes recurrent themes associated with PES program design and implementation.

An overview and lessons learned derived from the latest comparative analysis of PES programs published by CIFOR in 2008 ([www.cifor.org](http://www.cifor.org)) is also provided which the reader may choose to read more about other programs.

### **Background on PES in the Forestry Sector**

The basic premise of PES programs in the forestry sector, whether at the national scale or local level, is the **voluntary establishment of conservation and/or forest management areas on private, community, or public lands**, where implementation success depends on cooperation with stakeholders using incentives most commonly in the form of payment for activities that foster conservation action. Ensuring a sustainable supply of goods and services from forests (e.g., erosion control, carbon sequestration, biodiversity conservation, watershed recharge, non-timber forest products, recreation etc.) to enhance their vital contributions to socio-economic development is fundamental for sustainable forest management (SFM). Yet, SFM in the tropics and subtropics is often less profitable than other land-uses because many of the goods and services forests produce lack formal markets. Hence achieving SFM requires, in part, the provision of appropriate economic incentives and instruments. In this regard, it is important to promote investment in and payment for all the goods and services provided by tropical forests.

PES have been in place for many decades, and they have been promoted as major means to addressing the challenge of financing SFM and forest conservation, with the potential for rendering significant positive social and economic outcomes. The use of PES is tailored to address a specific set of problems: those in which ecosystems are mismanaged because many of their benefits are externalities from the perspective of ecosystem managers. They aim to address market failure by providing incentives to land users to make it more desirable for them to sustainably manage forests than to degrade or deplete them. However, currently, many PES mechanisms are small-scale and scattered. Many of these programs have proven to be unsustainable without regular and strong external support.

PES has been developed and/or under implementation with the involvement of a number of local communities under various initiatives. Some of the longest running and most influential programs are the national and sub-national programs operating in Costa Rica, Mexico, China, and Brazil with established programs for avoided deforestation or reforestation of degraded landscapes. Similarly, the Food and Agriculture Organization (FAO) and other large global institutions like the World Bank, have been promoting PES for SFM and their work focus has included capacity building of mostly developing countries to develop and implement effective and viable PES mechanisms in these countries.

## **COSTA RICA CASE STUDY**

### **20 Years of PES in Costa Rica: Forest Conservation for carbon sequestration, landscape aesthetic, biodiversity conservation, water protection**

*Reference: Porras, I., Barton, D.N, Miranda, M. and Chacón-Cascante, A. (2013). Learning from 20 years of Payments for Ecosystem Services in Costa Rica. International Institute for Environment and Development, London.*

**Background:** Costa Rica has implemented its forest-based PES program, administered by the national government, since 1996 through its National Forest Law by recognizing four categories of forest environmental services. These include: mitigation of greenhouse gas emissions; hydrological services (drinking water, irrigation and energy production); biodiversity conservation; and providing scenic beauty. Payment for Ecosystem Service levels in Costa Rica are mostly fixed by hectare, with some small variations for forests located near water sources, or reforestation projects using native species. To account for ecosystem services each hectare of forest is assumed to provide the four ecosystem services (carbon sequestration, landscape beauty, biodiversity conservation and water protection) and each hectare of a specific land use receives a fixed payment level.

The program has had concrete positive impacts since its inception. Between 1997 and 2012, it has protected more than 860,000 hectares of forest, reforested 60,000 hectares and supported sustainable forest management in almost 30,000 hectares. More recently, it promoted natural regeneration of almost 10,000 hectares. This totals nearly one million hectares under the PES scheme at one time or another, as well as 4.4 million trees planted under agroforestry systems since 2003. By 2010, roughly 52 per cent of the territory was under some sort of forest cover, as compared the low in 1983, with just 21 percent.

The program is a mix of rules, regulations and rewards that invite stakeholders to respond to incentives and disincentives. The legal underpinning establishes the structure by which the PES

program secures funding, how it is managed, and who is eligible to participate. The National Forestry Fund (FONAFIFO) is the primary intermediary charged with administering the PES program. It signs legal contracts agreeing land use with forest owners, and monitors their compliance through local forestry technical facilitators (regentes forestales). In exchange for the payments, the landowners transfer the 'rights' to the ecosystem services to FONAFIFO, where they make up the wider portfolio of approved ecosystem services (ES) credits. FONAFIFO then sells some of these credits to its buyers.

The sources of demand, and therefore funding, for ecosystem services are:

Government funds, mainly through earmarked tax revenues from water and fossil fuels, as well as (in lesser amounts) from forestry and conservation trusts. Most notably amongst the taxes, an earmarked tax on fossil fuels collection has been implemented.

The private sector, through voluntary deals with private and semi-public companies (such as hydroelectric companies), as well as international sales of carbon credits and biodiversity-protection credits (which are planned for, but not yet available).

International banks and bilateral agencies through loans and agreements: The first international transaction for ecosystem services took place in 1997 with the sale of carbon credits to Norway. These were known as 'Certified Tradable Offsets' (CTO) and certificates were sold through the Chicago Climate Exchange. Also the country has targeted voluntary carbon markets that generate social and ecosystem co-benefits.

International loans, grants and other agreements: Loans and international agreements were mostly used at the beginning to finance the program. The World Bank provided a loan to strengthen the PES program, focusing on forest protection along the Mesoamerican biological corridor. The project, named Ecomarkets (2000–06), was co-funded with a US\$40 million grant from the Global Environmental Facility and national government funds for US\$9 million. It led to another project; Mainstreaming Market-Based Instruments for Environmental Management (Ecomarkets II, 2006–14) aimed at securing long-term financing for the program.

Voluntary agreements with local users: Less than 3 per cent of the program area is financed by private funds – and of these, hydroelectric plants are the principal clients. The basic form of these deals is through 'over-the-counter' transactions. Buyers purchase Certificates of Ecosystem Services and choose the ecosystem service they wish to pay for, whether watershed services, biodiversity, landscape beauty, or carbon sequestration. These tax-deductible, over-the-counter transactions are promoted as a corporate environmental and social responsibility.

**Experiences:** Costa Rica pioneered the use of the PES approach in developing countries by establishing a formal, country-wide program of payments, the PSA program. The PSA program has worked to develop mechanisms to charge the users of environmental services for the services they receive. It has made substantial progress in charging water users, and more limited progress in charging biodiversity and carbon sequestration users.

Looking forward, program managers expect to increase its environmental effectiveness by defining and using 'priority criteria' for allocating payments, targeting the areas that most need protection and/or regeneration. The socio-economic benefits of the program are also important, especially where the PES is the main permanent source of cash, for example in indigenous communities and remote rural areas. As the program matures, efforts are being made to improve overall governance, with more focused efforts to reduce transaction costs, the creation of local offices in areas of high risk of deforestation, a clearer institutional structure that promotes inter-sectorial cooperation (for example, between government ministries), legal and technical capacity building for program managers, and simplified contracts with clearer guidelines. Administrative flexibility of the program has been key to developing monitoring, evaluation and feedback systems that facilitate continuous innovation and adaptation.

**Outcomes and Lessons Learned from Administration:** Types of PES program activities based on scale of intervention: The majority of payments for very small farms (less than 5 hectares) are captured by individuals in agroforestry and reforestation contracts. Payments in very large farms (1000 to 2000 hectares) go mostly for forest protection and reforestation. The bulk of PES contracts are for forest protection, many of which are farms with a high proportion of forest cover, which has restricted landowners from carrying out income-generating activities. This discouraged potential participants who either did not have large properties already covered in forest, did not want or could not afford to dedicate large tracts of their land to forest alone.

Conservation gaps: In order to address conservation gaps that have been found within the PES program, the country has begun to adopt a 'landscape' approach to conservation: a holistic approach, looking at local economies and agriculture, eco-tourism and other benefits of the envi-

ronment beyond biodiversity alone. Within the wider strategy addressing conservation gaps, the PES program has established two concrete environmental objectives: Protect existing forests: eliminate conservation gaps (forests with no protection status at risk of change), increasing protection of existing forests on private land to reach a target of 256,000 hectares by 2030, and promoting connectivity between forests through biological corridors to facilitate the movements of flora and fauna. This objective includes regenerating degraded areas and secondary forests: including regenerating forest in 8500 hectares of degraded areas through agroforestry systems; and support 20,000 hectares of 'secondary' forests (re-grown after deforestation).

Clearer understanding of opportunity costs: Program managers need a clearer understanding of the 'opportunity costs' of forest activities – the revenue and benefits which the landowner foregoes by choosing to sign up to PES. This requires an understanding of profits from forest activities, regulations regarding land use, and the drivers of changes in land use (more discussion on this below).

PES Site Targeting: Better targeting of PES program activity areas (based on forest type, landowner, additionality case) can help improve cost-effectiveness and reduce the budget required to meet the program's objectives.

Improve communication channels to promote PES program and minimize conflicting policies: Communication channels need to be widened to include other institutions whose policies directly or indirectly influence the provision of ecosystem services (such as the agricultural and urban sectors), and those institutions and groups which may help to improve the cost-effectiveness of the program and its evaluation and monitoring.

Options to implement PES including affordable credit: For reforestation, FONAFIFO's experience suggests that a combination of PES and affordable credit works best to encourage small and medium-scale farmers to participate. It therefore signed an agreement for approximately US\$12 million with the German Cooperation Bank (KfW) for the protection of forests and recovery of deforested lands in the northern region of Huetar Norte. FONAFIFO also reached an agreement with the government of Japan and the World Bank to co-fund the REFORESTA project targeting the promotion of sustainable forestry amongst small- and medium-scale farmers through a combination of PES and accessible credit.

Issues with Payment Schemes: Although some initial studies and literature reviews assessed the value of forest ecosystem services, as part of the general consultation process before the introduction of the PES program, the final level of the payments was a somewhat arbitrary decision. Payments for reforestation reflected subsidy levels prior to the introduction of the program, and payments for forest protection were based on the price of renting land as pasture, as an approximation of the opportunity cost of forested land. Although differentiated payments – and auctions – have been suggested to increase the program's effectiveness, fixed payments (or very slightly differentiated payments) are simpler to understand and manage; they can also be more transparent and cheaper to implement. This is the approach currently taken by the PES managers in Costa Rica. Improvements are needed to better represent costs and true land values.

Freeing up resources through lower payments in areas with lower opportunity costs and/or lower risk of deforestation would allow program managers to raise the competitiveness of PES in areas where opportunity costs and/or the risk of deforestation are higher. Raising the competitiveness of PES could be achieved through a mix of better targeting and enforcement of regulations regarding land use changes and higher PES services.

In addition, different payment levels and contract time scales, differentiated over different term lengths with higher payment rates for longer contracts could help improve PES delivery and sustainability. However, the relative merits of different approaches for spatial differentiation of payments compared to the current uniform system have to be balanced against the relative transaction costs of the different approaches. So far, program managers have not opted for differentiated payments, primarily on the grounds of transparency and fairness.

Problems with providers of services-groups vs individual contracts: During the first years of the program (1998–2002) many contracts were handled as group contracts. These projects pooled together groups of (usually small-scale) farmers in one collective contract, with the aim of minimizing transaction costs. In practice, problems emerged such as the inability to enforce compliance among all members of a group. This led to the abolition of a single collective contract in favor of individually signed contracts with group monitoring.

Lack of additionality could harm efficiency of PES program: Elements of additionality emphasized now, but not before as much. Areas that are priority for PES program must have threat associated with their participation. E.g. areas under pressure/suitable for agricultural development. This

helps ensure less participation from marginal lands (w/marginal ES: hectares of forest that do not have sufficient additionality claims). Although the requisite of additionality is not explicit in the PES program design or the law that frames the program, it is important for international carbon projects like REDD, and it also makes economic sense to target actions that have positive outcomes that would not have happened otherwise. Finding areas that ensure additionality is increasingly difficult and more expensive. As the 'cheap' conservation of remote areas is exhausted, conservation must focus on areas with stronger competition for land use, like urbanisation or high-value export crops.

Impact Evaluation: There is a weakness of impact evaluation studies to date, on PES; studies have focused exclusively on changes in forest cover, mostly deforestation rates, without distinguishing between forest types and their biodiversity conservation value. This limits the ability of the PES program to evaluate actual environmental services delivered.

Additionality claims and PES targets missing the mark: Studies show additionality claims have been weak throughout implementation of PES program: The study of PES contracts found that most contracts were located on land with very low probability of deforestation, suggesting low additionality from the payments. The main reason cited was ecotourism bringing value to forests, but also the enforcement of other conservation policies, like the ban on land-use change. Further study indicates that PES is not meeting its target, as in 2005, only a third of the land under PES was located in land important for hydrological services, and between 30 and 65 per cent in areas key for biodiversity.

Site selection-prioritization: One of the main concerns about landowners' voluntary participation in PES is the quality of forests enrolled in the program. Although potentially cheaper than establishing protected areas there is no guarantee that PES will protect forests that are more at risk. A purely voluntary approach does not necessarily create the continuous blocks of protected forest necessary to provide biological corridors, buffer zones to protect key water sources, roaming space for large animals like jaguars, or forest on slopes that help reduce the risk of flooding. This can only be achieved by spatial targeting, where the PES takes the initiative to prioritize areas it deems to be a conservation priority, through engaging with landowners or providing special incentives. Spatial targeting can be done by directing the payments towards areas more likely to generate ecosystem services.

For the Costa Rican PES case, authorities have been trying to correct these mistakes by implementing a more rigorous consultation process that defines the conservation gaps and priorities for conservation strategies. Although enrollment in the program continues to be voluntary, the introduction of the priority matrix is expected to result in better spatial targeting. The priority matrix awards higher points to forest protection applications located in pre-selected areas, such as forests in conservation gaps, biological corridors, indigenous territories and those located around important water sources.

Problems with transaction costs: A strategy is needed to improve social outcomes and program efficiency to reduce transaction costs. Transaction costs may dissuade the scheme administrators from admitting small landowners as this will increase the overall number of participants, costs of administration, and reduce economies of scale); and also costs directly incurred by the participants may discourage them from participating in the scheme (e.g., costs associated with developing management plans). Participation emphasis has been on large landholders (e.g., 300- greater than 1000 ha) reflecting 65% of budget in the case of Costa Rica. Expense and technical know-how limitations have kept small holders down in numbers in terms of participation.

Co-funding from soft loans and technical assistance: Co-funding has been an important instrument to promote participation and benefits for small-scale landowners. The money obtained through the PES is regarded as a crucial co-investment for activities like reforestation, forest management and agroforestry, and promotes the economic attraction of forest activities.

Land Tenure: PES program has been instrumental in helping clarify land tenure.

The problem with short-term contract terms: The short-term nature of contracts is a problem. While it satisfies farmers' desire to enter and exit the program within a reasonable period of time, it does not give confidence in long-term biodiversity conservation outcomes.

More on opportunity costs versus geographic priority setting: A point system designed to prioritize properties that can enroll in the PES program has been developed. It is expected that this approach will generate better outcomes than the first-come, first-served system used in the early years of the program. However, a purely geographical approach to prioritizing areas does not guarantee that farmers living in these areas will participate. A better understanding of opportunity

costs, and what affects the likelihood of forest conversion in the context of PES can help improve the program design, moving towards a more tailor-made suite of incentives that improve the quality and quantity of ecosystem services.

Table . Comparing the Potential and Viability of PES in different scenarios

		statutory rights to deforest		
		yes	no	uncertain
associated conservation cost		Opportunity costs of alternative land use	Costs of monitoring and enforcement	Perceived opportunity costs + costs of imperfect monitoring and enforcement
Profits of alternative activities	High Profits	Areas suitable for pineapple production, for example: PES does not compete	PES may help only if regulation is strongly enforced, but there will be high pressure for forest conversion. May require higher levels of payments	Uncertain. PES may not compete if perceived benefits are high compared to risks of detection
	Low Profits	PES will help increase viability of conservation but higher PES levels may be required	PES highly competitive. Lower levels of payments may be acceptable	Uncertain – PES may help discourage illegal change; but pressure for change is low

Reference: *Porras, I., Barton, D.N, Miranda, M. and Chacón-Cascante, A. (2013).*

**Measuring performance- monitoring:** While there has been much effort to target the program towards conservation priorities, little work has been done to prove the impacts of the program it's targeting, or funding mechanisms to ensure delivery of the ES. The Costa Rican PES focuses on relatively easy-to-measure indicators, like hectares of land, rather than assessing one type of ecosystem service. Limited evidence in the form of specific metrics like number of species, or impacts on key species has been gathered to show that these services (with the potential exception of carbon sequestration) have increased due to the effects of the program, and obtaining this evidence could be very expensive.

**A word about additionality claims and indigenous communities:** Because of the large tracts of land they manage, indigenous communities play an increasingly important role in the program, although the additionality from these lands is low because of their typically low risk of deforestation.

By directly targeting indigenous communities, participation has significantly increased, from 3 per cent of budget allocation in 1997 to 26 per cent in 2012. These social impacts are very important, as PES is one of the few sources of cash in these communities.

## MEXICO CASE STUDY

### Mexico PES- Forest-based Conservation for Hydrological Services

References: *Alix-Garcia, et al. 2009. Lessons Learned from Mexico's Payment for Environmental Services Program, within: Payment for Environmental Services in Agricultural Landscapes. Natural Resource Management and Policy Volume 31, 2009, pp 163-188.*

*Alix-Garcia, et al. 2012. Two-dimensional evaluation: the environmental and socioeconomic impacts of Mexico's payments for hydrological services program.*

<https://www.aeaweb.org/aea/2013conference/program/retrieve.php>

**Background:** Between 2003 and 2011, the Mexican National Forestry Commission (CONAFOR) allocated 520 million USD to enroll more than 3.1 million ha in programs of payments for hydrological services or biodiversity services via forest conservation projects, under a 5-year contract commitment period. This has made Mexico's program one of the largest in the world. Sufficient time has passed to extract various lessons from both the political process that led to the program as well as the impact of the payments on recipient communities and, to some extent, on their forest management behavior.

This PES program focuses on a service that the forests provide in provisioning fresh water, in terms of quality and quantity. Although the relationship between forest cover and water flows is highly debated, there are positive effects of forests on water quality, if not always on quantity. For this reason, the original PES program proposal focused on the watersheds defined as overexploited, as well as on cloud forests, which are thought to have a particularly strong relationship with water quantity.

**Experiences:** The PES program started with a pilot program. The initial idea, proposed by the Instituto Nacional de Ecología (INE) together with academics from the Universidad Iberoamericana (UIA), was to target payments towards areas of the country defined as “high” or “very high marginality” (marginality references the level of socio-economic standing of communities related to other areas in the nation) according to a municipal marginality indicator based on information from the population census (2000). The program started as a pilot program administered by an outside institution before launching into a larger, nationwide payment scheme. In October of 2002, the proposed two year pilot project began, with the following features: The pilot included 100 ejidos; the project would be focused on water services; the beneficiaries would be ejidos and communities with forests in “priority watersheds,” meaning those that are both overexploited and serving as the principal water source for large population centers.

The program contracts gave payments for a specified area of forest within each community’s boundaries according to the dual price system of \$40/ha/yr for cloud forest and \$30/ha/yr for other types. In most cases the contract specified that removal of trees from the community’s entire forested area (even outside of the area for which payments were being made) constituted a contract violation and subsequent non-payments. Contracts were assessed and renewed on a yearly basis based upon contract compliance the previous year. Monitoring was conducted on a random sample of participants using satellite imagery and/or site visits. The criteria for selecting properties were three: 1) Properties with forests with more than 80% density (i.e., hectares with more than 80% tree cover), 2) located in overexploited aquifers, and 3) with nearby population centers greater than 5,000 inhabitants. Applications for the program were received from 25 states, but only 15 actually received PES contracts, with nearly 127,000 hectares enrolled.

**Outcomes and Lessons Learned from Administration of PES Program:** Institutional arrangements were insufficient at outset of program commencement to support demand- leading to poor implementation: CONAFOR received many more demands than it could finance from its start in 2003. With only three employees to review, catalogue, and evaluate 900 proposals, several changes were made in order to expedite the process. First, a combination of misinterpretation of the rules and the fact that there was only one geographical technician to analyze the satellite images resulted in the elimination of the criterion of forest density in favor of forest coverage, meaning that only properties that were more than 80% covered with forest were selected. This resulted in the selection of much larger properties, and with lower population density and generally lower probability of deforestation than with an 80% forest density.

Insufficient consideration/representation of eligible lands caused by lack of resources (remote sensing) to assess and enroll many properties: CONAFOR had considered monitoring the program through high-resolution satellite images. However, insufficient time and staff meant that satellite images of potential properties were not purchased, with the result that properties located in regions where images had not been purchased were not allowed in the program. In addition, if the properties were not already georeferenced, they could not receive payments since placing them on a satellite image would be impossible. Finally, in the communities with forest extraction activities, it was often impossible to determine if the area chosen for environmental payments overlapped with area earmarked for tree harvests.

Later establishment of a “point system” helped identify eligible lands and prioritize projects for funding: In 2004 CONAFOR again received applications far in excess of what it could finance. By this time, however, a shift of management within CONAFOR had resulted in a point system approach: payments were allocated by giving a point for each of the criteria listed in the rules of operation and contracts awarded to those properties with the highest point values.

**Results of Implementation, 2003-2004 Pilot: Positives and Negatives**

Exploited aquifers were not properly targeted- environmental service target missed: According to the distribution of PES hectares based on watershed, it was discovered that payments were not going to areas where the aquifers were overexploited. Essentially no hectares under PES were forests in aquifers that qualified as extremely or strongly overexploited. About 78 and 85% of the PES hectares, in 2003 and 2004, respectively, were in aquifers that were not over-exploited, with the remainder of the hectares in aquifers that qualified as moderately overexploited.

Low additionality detected in enrolled forest lands: Based upon the distribution of forest area among participants according to deforestation risk estimates, where risk is determined by exogenous community characteristics, it was observed that most of the participant forests had low and very low deforestation risk indices, suggesting that they would have been conserved even in the absence of the program.

Reported compliance (no deforestation) was relatively high, and PES program has elevated level of surveillance and monitoring of forests: In 87% of the communities surveyed, participants declared that they had respected the contract, while 26% stated that they had deforested over the past two years. In most cases, the activities implemented as a result of the program included increasing the surveillance of forestlands and revision of rules regarding the extraction of forest resources.

Random compliance monitoring- results indicate compliance was strong: A review of payments delivered from PES revealed that payments had not been withheld from any of the survey participants, suggesting that either compliance has been very good or the monitoring system is not very effective. Monitoring of the contract after the first year of operation was performed randomly in 28 ejidos (22%) in 2004. All monitored ejidos met contract requirements.

Costs of operation- nearly 20% of PES budget required: The annual cost of operation and monitoring for the first year of operation was estimated at \$714,285, yielding an average cost of \$5.6 per hectare absorbed by CONAFOR. Compared to payments of \$30/hectare, this indicates that administrative costs represent 19% of the PES budget.

Need for technical assistance: It is also important to note that, with the exception of the two cases in Northern Mexico, the communities received no technical assistance in the design of their PES implementation schemes, and in fact were not even aware of their contractual requirements in detail. Without technical assistance or experience in forest management, it has been a concern that communities have weak management plans in place.

Misunderstanding of the program objectives: None of the communities visited for research were aware of the clear objectives and rules of the program. None of them realized that the payments they were receiving were meant to be in compensation for the watershed recharge services provided by the forest. In several cases, interviewees stated that they thought the payments were a poverty-alleviation mechanism somehow linked with forests. Poor understanding of program objectives could have implications on efficacy of PES program, though this was not explored scientifically in this case.

Leakage: Leakage was observed in two cases in the ejidos in Northern Mexico. In one case, cattle were removed from the forest to be entered into the program and were subsequently placed in another area not previously used for grazing.

Another phenomenon which is related to leakage was the occurrence of use of the program as a way of receiving payments for land which the ejido has existing plans in place to later convert the forest for production in the future.

### **Results of Implementation, post 2004: Positives and Negative**

Results indicate downward deforestation trends and limited but positive poverty alleviation: Overall findings were that program reduced forest degradation and deforestation by over 60% on participating lands, and that on average there was a slight household wealth increase for beneficiaries evaluated.

PES program impacts not impoverishing participants, but no large financial gains being seen either: Analysis shows that PES is not making households worse off, which is a major concern in REDD+ negotiations. At the same time, it does not appear to be conferring large surplus rents to individual landowners. A possible explanation is that much of the payments are being used to increase forest management and patrol activities. Associated labor costs of forest management are high for beneficiaries and are large in respect to the payment amounts they receive.

Conservation gains stronger by targeting higher quality lands- but threatens to limit benefits to fewer participants: Gains in avoided deforestation could be made by better targeting to high quality lands (for instance near urban areas and with lower slope) but this would not necessarily address poverty reduction. Alternatively, focused and higher payments may help bring in lands that are at higher risk of deforestation, thereby inducing some positive wealth impacts, but this would mean higher payments to fewer individuals unless the program budget is also expanded.

Focus funds on communal lands: Authors suggest that to better target high conservation value land and thereby affect positive change for hydrological services, program should focus on pay-

ments to communally-owned properties, which are poorer on average and also show higher avoided deforestation impacts.

## CHINA CASE STUDY

### **China's Cropland Restoration Program: Sloping Land Conservation Program (Slcp)**

*Reference: Yin et.al., 2013, Designing and implementing payments for ecosystem services programs: Lessons learned from China's cropland restoration experience. Forest Policy and Economics, 35, 66-72.*

**Background:** China's PES program involves large-scale restoration of degraded cropland (revegetation with grasses or reforestation with "economic forests" or "ecological forests") and other fields under its Sloping Land Conversion Program, or SLCP. The SLCP is the largest PES program in the developing world and has been in place for over a decade, long enough for its ecological, socioeconomic, and institutional effects to provide lessons learned. A key impetus for the installation of this program was to reduce water and soil erosion and increase China's forest cover and area by retiring steeply sloping and marginal lands from agricultural production, mostly in western China. The program is based on retirement of land from agricultural use, and afforestation of degraded land. Subsidies for the program have until now been both in cash and in kind. The program stipulates that farmers who convert degraded and highly sloping cropland back to either "ecological forests" (defined by the State Forestry Administration as timber-producing forests), "economic forests" (orchards, or plantations of trees with medicinal value) or grassland will be compensated with 1) an annual in-kind subsidy of grain, 2) a cash subsidy, and 3) free seedlings, provided to the farmer at the beginning of the planting period.

**Experiences:** The scale of China's SLCP PES program which began in 1999 is expansive. In just the first 4 years of the program, 15 million farmers entered the program. Estimates are that the SLCP will affect some 40-60 million rural households upon completion. Yet this program run by the central government, is faced with a number of challenges associated with inefficiency and ineffectiveness of some of its core programmatic practices and policies. Key points emerge from the ecological, socioeconomic, and institutional perspectives.

Restoring degraded cropland is a complex, long-term, and arduous endeavor, and therefore it is crucial to understand the properties of the cropland under restoration and the services that the recovered forest/pastoral ecosystems will generate, and properly deal with the diverse and changing situations of ecological restoration and economic development. The following summary list, below, highlights the ecological, socioeconomic, and institutional considerations deemed most important in the case of the Chinese SLCP PES program.

**Summary of Outcomes and Lessons Learned from Administration:** Need for solid, long-term pilot project demonstrations prior to scale-up: With only two years of pilot projects behind them, the SLCP program authorities rushed to the formal launch of the SLCP when the requisite capacity (e.g., agents and action plans) and infrastructure (e.g., nurseries and seedlings) were not ready yet. As a result, the program caused a lot of confusion and waste during its early stage. Planners did not know how much, how long, and in what way to subsidize farmers for participation before the program was initiated. This has led to widespread overcompensation and quick convergence of different programmatic options down to just the of planting mixed tree species. While that option was extended, compensation funds for lost grain yields was cut back. Starting with a longer but gradually phased-out schedule could have reduced uncertainty for the program and thus offered farmers more confidence in continuing their participation. Adequate piloting, demonstration, and planning are crucial steps before scaling up a PES program.

Need to better link PES markets with actual services being provided- better measurements and proxies that are constantly under revision: Ecosystem markets supplied by restoration are out of step with the science and practice of ecological restoration, and so restoration projects are not necessarily providing all the services of healthy ecosystems. Thus, until there is an improved (scientific) basis for linking restoration actions to changes in biophysical processes and ecological features that result in the delivery of specific ecosystem services, restoration-based markets and trading schemes are risky and may not fulfill the desired outcomes of the PES program.

Adaptive Management: Restoration can be risky if local ecological conditions as well as local human needs are not adequately assessed so that suitable solutions can be found and capacity and acceptability built for the program. Adopt an adaptive management strategy that incorporates learning, feedback, and flexibility to ensure sustainable local adoption and compatibility.

Sustained maintenance and management to ensure delivery of PES: Must be aware that restoring marginal cropland is complex and costly requiring sustained efforts of maintenance and management. Without this, a restored ecosystem can be easily degraded again by reconverting or other potential disturbances at any time. In the case of the SLCP program in China, other than hiring a few locals to patrol the forestlands, little follow-up treatment was carried out. Understanding of the ecosystem services provided (for example, targeted indicators that measure successes in erosion control from slope stability measures) is important to properly evaluate the successes of program action. The success of any restoration effort must be ultimately judged against the improved production of ecosystem services, no matter how impressive the short-term efforts and outcomes are.

Project site prioritization: Establishing a ranking for ES using an overall environmental benefit index, or EBI, can help in selecting sites for restoration and evaluating the performance of restoration activities. This is because with significant diversity of natural conditions and farming practices there is a lot of variability in the opportunity costs of retiring cropland and the operational costs of restoring it. Further this should have an impact on the amount of subsidy a project gets in some locations. A differentiated approach of subsidy is more effective and efficient. But all of the above must be crafted with sufficient knowledge of the ecological potentials, which implies that constant learning and adaptive management is essential to refine PES program activities over time and ensure efficient use of land and targeted funding. In summary, more attention should be directed to assessing the program spatial configuration and environmental effects at the landscape level, rather than random, opportunistic application of the PES program.

Provide training and a level of autonomy in program: For achieving long-term community support, provide better training in land management in general and forestry in particular to local households, and provide a level of autonomy in managing restored ecosystems.

Help disadvantaged and avoid reconversion of reforested/vegetated land back to cropland: Especially in the case of the rural poor, it is easy once the program expires (or before) for them to require re-conversion back to farmland. A PES program should pay special attention to this group and target livelihood improvements in these locations as a part of a PES program installation.

Important to monitor perverse incentives and conflicting policies that can undermine PES program: Governmental policies meant to stimulate grain production (etc) in rural China have caused cropland retirement (restoration) programs to unravel. It's important that any PES program manager keep watch on new policies that will undermine program efficiency and change opportunity costs in favor of land conversion back to crops and other intensive uses, thereby undermining PES program advances.

Uniform subsidies without flexibility or regard to site specific conditions leads to uneven benefits: Efficiency and equity of a PES program can be called into question and possibly undermine PES program objectives when places lower opportunity costs and or/lower value land get the same benefits as those places with higher opportunity costs and/or higher quality land, or cases where the latter suffers a net loss. To enhance efficiency, the current system (in China in this case) should be replaced by payments made according to the potential environmental benefits and the opportunity costs of local farming systems. Studies suggest that flexible payment mechanisms and competitive selection processes (e.g., auction) would improve the effectiveness of the program. A reverse auction for PES contracts (where landowners disclose how much compensation they would require to undertake land management action/PES program) can induce the cost-effective allocation of service generation, and greater variability of production costs will lead to higher savings compared with a command-and-control approach that does not allow flexibility.

Warning against top-down inflexible programs that don't allow local ownership of program: Encourage greater participation in environmental affairs by the lower-level administrations as well as the local farmers and other stakeholders, and tailor restoration arrangements to time- and place-specificities of particular ecosystems.

If institutional application is solely top-down, with little input from NGOs and local level, program is unsustainable in long-term: NGOs have an opportunity to play a valuable and important role of PES program mediation, management, and in conceiving and carrying out a PES program activities based on local knowledge. With strict top-down operating procedures, there is little room for communities and individuals to modify, and more chance of a higher program drop-out rate or no participation at all as well as inefficiency in PES program application. Local knowledge, experience, and initiatives are vitally important in making the program work. Participants need the ability to make and change rules, and engage in collective action on some level during development and subsequent implementation of PES program.

Short-term PES payment scheme is not in line with long-term nature of environmental services: Policymakers need to recognize that the long-term nature of the environmental services targeted by the program require significant extension of the subsidy lengths, which at present are at most 8 years.

A word about monitoring: A sound internal monitoring and evaluating system must be built into the PES program; and enabling local users to monitor and communicate outcomes will tap into local knowledge and reduce the need for and cost of external monitoring.

## BRAZIL/ACRE CASE STUDY

### **Payments for ecosystem services in Amazonia. REDD in agricultural frontiers near Cruzeiro do Sul (Acre, Brazil).**

*Reference: Eloy et al. 2012. Journal of Environmental Planning and Management, 55:6, pp. 685-703*

**Background:** Farmers in remote areas of the Amazon, Brazil, with low access to capital, relatively small lots and lower profits relative to large ranchers have been faced with pressure to deforest in order to subsist by mostly practicing swidden agriculture. At the same time they have received national sanctions for deforesting more than the Brazilian Forest Code (1965) allows. Many of these offenders have been unable to pay their debts to the government.

With a lack economic incentives to help change their land use patterns and in the face of disagreement with the increasing amount of fines coming from national authorities, recent PES schemes have targeted the colonization zones of Amazonia in order to induce farmers to maintain or restore their remaining forest without compromising their welfare. In a move to decentralize deforestation control policies, REDD-related PES programs have unfolded at the, mostly, state-level rather than the federal levels (e.g., in Acre and Amazonas). Funding to support PES in these remote yet imperiled stretches of the Amazon has manifested based on funds from state governments as well as from foundations and international companies positioned in carbon markets.

The state-based PES program was launched in 2008 by the government of the Brazilian state of Acre, and the state government is now considered one of global leaders in sub-national PES negotiations. The government of Acre implemented the Program to Promote Reforestation. To avoid deforestation, the PES program aims at containing agriculture and cattle breeding within deforested areas, in order to reduce cultivation within natural forests; this is also called land sparing. Led by the public extension system, alternative land use entails three types of fire-free farming systems: permanent crop cultivation using rotation with leguminous fertilizers, agroforestry systems and silvopastoral systems. The fire-free crop cultivation model requires inputs of lime and seeds, and often requires pesticides and mechanical soil ploughing to remove weeds. Moreover, agroforestry systems based on perennials are labor intensive relative to swidden cultivation. Silvopastoral systems require higher investment per hectare (tree planting, cut and carry system, fencing) than extensive cattle-based systems the PES program was mainly directed to long-established settlements.

The strategy of the government has been to focus on rural settlements near roads, where the rates of deforestation are the highest. The program has been financed by public funds, with approximately R\$180 million per year dedicated in 2008/2009 alone. Since 2010, the state government has been negotiating for private and international funds via REDD opportunities. In exchange for an annual payment (R\$500 a year for three years, then R\$600 a year for six years), farmers commit themselves to stopping swidden cultivation in natural forest, and restoring or protecting their legal reserve by the end of the contract, with priority given to permanent protection areas.

**Experiences:** Program administration in this case study example is shorter lived than in the other examples. However, the importance of lessons learned from PES program set up is still of value to review here. By November 2010, 2100 families had joined the certification program.

**Outcomes and Lessons Learned from Administration:** PES funding not sufficient to cover opportunity costs of bigger producing landowners: Based on the analysis, the small payment level offered by the scheme that is available for each farmer was not been attractive for many large-landholders, who have large scale cattle-based systems and can avoid penalties relatively easily.

Lack of spatial targeting can miss the mark on PES: Forest policies, especially market-based incentives, often fail to take into account the spatial heterogeneity of resource management. Spatial targeting of conservation priority areas (and related environmental services) is largely absent in PES schemes, therefore leading to resource limitations for PES program implementation as well as broader participation in the scheme. Further this means that areas of higher ecological importance

(for carbon sequestration, biodiversity, etc) may also be overlooked in favor of potentially less ecologically valuable lands.

More accessible and well-to-do farmers may receive preference and therefore assistance of PES program over more distantly located and poorer farmers: PES scheme tends to target farmers living near the main roads, who have more capital and are connected with urban markets and technical assistance, and whose properties are mainly covered by pasture. Fire-free crop cultivation systems are promising for capitalized landholders, who are compelled to comply with environmental legislation. These alternative land uses may be adapted to foster reforestation in pasture land. Because of problems with program implementation favoring settlements closer to principal roadways, to curb deforestation and alleviate poverty in the long term, a specific policy should target remote areas. In these remote areas farmers are often not even aware a PES program is available, despite the fact that they are located in the prime areas where the initial stages of deforestation usually take place, where agroecosystem fertility and agrobiodiversity are still high, and where farmers are vulnerable to deforest.

Strategies of agricultural intensification- land sparing- are missing farmers off the main grid: As a follow up to the last point, farmers who are more distant to the main road network but typically more prone to the initial stages of deforestation are missing out on technical assistance, tractors, chemical inputs, hired labour and access to outlet markets which would help them achieve land sparing goals. As a result, agricultural intensification is mainly directed to farmers who have more capital and are connected with urban markets and technical assistance.

Promoting only land sparing in this type of system may cause the PES program to lose sight of its socio-economic and environmental objectives due to limited spatial targeting. The PES scheme should go beyond the land-sparing model and promote a wildlife-friendly agriculture strategy, based on low-input management. Poor smallholders may be able to change their land use in order to slow deforestation by enhancing the interrelations between the components of their agroecosystem, rather than by use restrictions and technology-dependencies.

PES must also work to incorporate investment in rural development, not just capture opportunity costs: PES costs go beyond opportunity costs, as to be effective they must be associated with investments in rural development (education, infrastructure, land rights enforcement etc.).

## Comparative Analysis of PES Programs

*Reference: Wunder et al. 2008. Taking stock: A comparative analysis of payments for environmental services programs in developed and developing countries Ecological Economics. 65: pp. 834-852.*

**Background:** This review provides a CIFOR analysis of key lessons learned associated with an international assortment of PES programs (large and small, national and subnational). There have been few efforts to systematically document the characteristics and effectiveness of different PES programs, and even fewer efforts that have compared them. For further, in-depth reading refer to the document cited directly above (see [http://www.cifor.org/pes/ref/publications/all\\_publications.htm](http://www.cifor.org/pes/ref/publications/all_publications.htm)). A synthesis has been carried out that evaluates each case study with respect to design, costs, environmental effectiveness and the like.

**Outcomes and Lessons Learned from Administration:** User-financed PES versus government finance: Significant differences were found between user-financed PES programs, in which funding comes from the users of the ES being provided, and government-financed programs, in which funding comes from a third party. The user-financed programs analyzed were better targeted, more closely tailored to local conditions and needs, had better monitoring and a greater willingness to enforce conditionality, and had far fewer confounding side objectives than government financed programs.

Are the right potential providers participating? Enrollment: Most PES case studies analyzed showed little problem attracting potential ES providers. In most cases applications far exceeded the available funding (e.g., Costa Rica, Mexico cases). Further, even where participation is high overall, it may not be high in the most important areas (e.g. high-value environmental service yields). The most likely reason for gaps in participation of high value ES land is that opportunity costs in these areas apparently exceeded the uniform prices that the programs offered, which tend to be lower than the opportunity or socio-economic costs. A critical component of successful PES implementation is whether the right potential providers are participating.

Payments rarely tied to direct measures of ES units: In the study, payments were rarely tied directly to measured ES units. Rather, were payments are tied to proxies such as approved land uses, though some programs use mixed standards, such as area reforested combined with a minimum tree-survival rate (however this is often difficult to measure in practice. Although basing payments on actual ES delivery is ideal to PES payment structuring and management, payments cannot be based on variables that ES providers cannot observe. Farmers, for example, have no way of observing how their land-use practices affect water ES delivery far downstream. Where ES delivery is closely monitored is in cases of carbon sequestration, which has become a successful approach to estimating PES delivery.

Monitoring and sanctions for non-compliance: Monitoring across case studies was variable and even within one program monitoring history fluctuated and was variable and often inconsistent. Further regarding incidences of non-compliance, in most case studies, the primary sanction for non-compliance was the loss of future payments, either temporarily or permanently. In some cases, previous payments had to be repaid. Developed-country government-financed PES programs also typically include cross-compliance provision that ties eligibility for other subsidy programs to compliance. More severe sanctions could reduce monitoring costs by raising the expected losses from non-compliance, but such sanctions may be both politically and practically difficult to enforce, and in some programs even simple sanctions like withholding future payments are avoided. There is thus far no systematic study of the degree to which different types of sanctions have proved effective at inducing compliance.

Demonstrating additionality, where it seems to work best: In most programs demonstration of additionality (PES interventions that go beyond business-as-usual) has been difficult to require of enrollees and demonstrate. Many user-financed programs seem to have high additionality, as in cases where deforestation trends were reversed in the program area, but continued at high rates in surrounding areas. Cases in the field where reforestation projects have been implemented more readily display incidents of additionality.

Link between land use and ES: It is important to determine whether the right land use changes are being undertaken in a PES program, and many programs assume that forests, in particular, provide all desired ecosystem services- which they may not. This has made PES programs and related payments subject to controversy.

User financed PES is easier to track delivery of PES: Many PES programs are based on a limited scientific foundation including lack of monitoring of ES generation. This makes it difficult to detect problems and react to them. Evidence shows that user-financed programs fare better in this regard, over the long term, as users have their own money on the line, and thus have incentives to ensure it is spent effectively. Also the much smaller scale and narrow ES focus of user-financed programs makes it easier to observe whether the desired ES are being generated or not.

Perverse incentives run risk of augmenting deforestation threats: PES programs need to be careful not to create perverse incentives, for example, by stressing additionality to an unreasonable degree that people feel pressure to deforest to create a case of additionality. With careful crafting of contracts, this threat can be minimized. For example, to avoid inducing deforestation, the Clean Development Mechanism has specified that only areas deforested prior to 1990 are eligible to sell carbon credits from reforestation.

On the other hand, PES can create positive incentives to not deforest, as has been the case in Costa Rica where it was noted that people feared losing future PES allocations if they cleared all of their forest, and so people have been observed to opt in to forest conservation without being enrolled in the program.

Regarding administration and transaction costs of PES program functioning: Transaction cost data must be interpreted very carefully in part because apparently low transaction costs may result from under-spending for program monitoring, enforcement or other important activities. A cheap program might also be an ineffective one, but the shortcomings may not be visible until later. At the same time, high costs of program administration are not proof of effectiveness, as money can be spent inefficiently.

As a follow up point to this, improved targeting of PES program enrollment, combined with differentiated payments based upon land quality and contribution to the service being provided, could significantly raise cost efficiency. Specifically, ES delivery could be nearly doubled if applications were selected according to ES provision levels, risk of ES loss in the absence of PES, and landowners' costs of ES provision. Currently, few PES programs take all of these criteria into account, although some take various of them into account. The U.S. Conservation Reserve Program bases

enrollment decisions on the ratio between the expected benefits of a given plot (computed using the Environmental Benefits Index) and the cost of provision (as reflected in the applicant's bid for that plot).

Conservation per se is costly, not necessarily due to PES: Opportunity costs do not diminish if a different (non-PES) approach is adopted. Ultimately, if an environmentally-preferred land use is less profitable to land users than another, environmentally-harmful one, there are only two choices: land users must either be compensated, somehow, for the difference, or they must be forced to absorb it themselves. This is a political question to resolve. In practical terms, conservation is costly, no matter what alternative is chosen.

Poverty alleviation and PES- findings indicate explicit pro-poor target campaigns may not be needed: In the case of user-financed programs as well as government-led programs, even though the poor were not explicitly targeted by the program, it is notable that in all cases poor PES providers were able to access the program and become ES sellers, and in all cases they also experienced some welfare gains from their participation. This indicates that targeting the poor explicitly is not a necessary condition for PES to benefit the poor.

Does PES deliver strong welfare improvements? While data is weak on which and by how much participants benefited positively from their respective PES program, it is clear that no substantial welfare improvements were gained. However, PES is seen to deliver small gains over and above opportunity costs in most instances (and this can be especially important in areas with few cash resources). Also in areas where tenure security is weak, PES program activities have helped clarify land tenure (forced the issue with local authorities). Secure land tenure can therefore help augment the value of natural resources for local people.

Environmental effectiveness of PES programs can be undermined by ulterior motives: When the criteria for spatial targeting or for enrolling applicants is something other than capacity to deliver ES, the program's effectiveness is likely to decline. Following up on the above, pro-poor targeting point, it's important to note that there are instances where it is not appropriate to have a blanket-ed campaign of poverty alleviation using PES, and thereby potentially target large areas of marginal land for delivering ES as this: 1) threatens program effectiveness (e.g., high value lands are overlooked in favor of lower quality ES delivery); 2) limits technical and financial resources of program; and 3) limits welfare benefits of those who have strong ES to provide the program (e.g., paying providers just barely over their cost of provision – there will be little or no net benefit to providers).

**Summary Points of Lessons Learned**

<b>Ecological Considerations</b>	<b>Ensure environmental service provisions are actually being provided as stated:</b> Tracking and accounting of performance measures on lands enrolled in a PES program is needed to ensure proper application of expressed environmental service provision. Initial assessments of the land use–ES link should guide eligibility criteria for program enrollment. If this does not happen, the program is likely to be inefficient and ineffective. An example of failure to deliver on PES is the Mexico program which was supposed to be working in highly impacted/overexploited aquifers to ensure conservation action within aquifer would protect threatened water supply- but most land enrolled has not been located in threatened aquifers. The land use-ES link is broken, yet payments are still being made.
	<b>Targeted PES enrollment will make program more effective:</b> Spatial targeting of conservation priority areas (and related environmental services) is largely absent in PES schemes, therefore leading to resource limitations for PES program implementation as well as broader participation in the scheme. Increased attention should be directed to assessing PES program spatial configuration and environmental effects at the landscape level, rather than random, opportunistic application of the PES program. Spatial targeting can be done by directing payments towards areas more likely to generate ecosystem services. Better targeting of PES program activity areas (based on forest type, biodiversity, additionality case) can help ensure site selection involves high quality lands, improves cost-effectiveness and reduces the budget required to meet the program objectives.

	<p><b>PES programs have been shown to elevate forest conservation and compliance on-the-ground:</b> Activities implemented as a result of PES programs have led to an increase in the surveillance of forestlands and revision of rules regarding the extraction of forest resources, where such oversight was not in place before. In addition, it has been shown in some cases that non-ES program participants have been “participating” by not deforesting with the idea that in the future they may be interested to enroll in the PES program.</p> <p><b>Leakage threat:</b> Measures must be taken to address leakage in the PES program to help minimize the occurrence of PES participants relocating their project activities (deforestation/degradation activities) to other forested locations and thereby undermining the program.</p>
<p><b>Socioeconomic Considerations</b></p>	<p><b>Livelihood improvements- help disadvantaged and avoid reversion or reversals associated with reforested/ conserved land:</b> A PES program should pay special attention to the economically vulnerable rural poor and target livelihood improvements in these locations as a part of a PES program installation and sustainability.</p>
	<p><b>Land with high opportunity costs need to receive sufficient payments from PES to participate:</b> Due to variability in the opportunity costs of different land under a PES scheme and the operational costs of restoring or conserving this land, a differentiated approach of PES payments may be more effective and efficient to ensure lands with higher opportunity costs (and often higher risk of deforestation or forest degradation) can competitively participate in Program. Based on analysis contained herein, the small payment level offered by many PES schemes has not been attractive for many large-landholders, who have large scale cattle-based systems and can avoid penalties relatively easily. Financial planning must take this into consideration- crucial.</p>
	<p><b>Invest in rural development, not just capture opportunity costs:</b> PES costs must go beyond the opportunity costs. They must be associated with investments in rural development (education, infrastructure, land rights enforcement etc.)</p>
	<p><b>Co-funding has been an important instrument to promote participation and benefits for small-scale landowners:</b> The money obtained through the PES is regarded as a crucial co-investment for activities like reforestation, forest management and agroforestry, and promotes the economic attraction of forest activities.</p>
	<p><b>Warning against top-down inflexible programs that don't allow local ownership of program:</b> Encourage greater participation in environmental affairs by the lower-level administrators as well as the local farmers and other stakeholders, and tailor restoration/conservation arrangements to time- and place-specificities of particular ecosystems. Adaptive management and local appropriateness critical in program acceptance and success.</p>
	<p><b>More accessible and well-to-do farmers may receive preference and therefore assistance of PES program over more distantly located and poorer farmers:</b> PES scheme tends to target farmers living near the main roads, who have relatively more capital than more distant landowners, as they are connected with urban markets and technical assistance. To help curb deforestation and alleviate poverty in the long term, a specific policy should target remote areas. In these remote areas farmers are often not even aware a PES program is available, despite the fact that they are located in the prime areas where the initial stages of deforestation usually take place, where agroecosystem fertility and agrobiodiversity are still high, and where farmers are most vulnerable to launch new deforestation activities.</p>
	<p><b>Manage expectations of PES payments:</b> Analysis has shown that PES is not making households worse off, which is a major concern in REDD+ negotiations. At the same time, it does not appear to be conferring large surpluses to individual landowners.</p>

<b>Institutional Considerations</b>	<b>Payment should match level of service:</b> Differentiate the level of payment based on the actual amount of environmental services provided and opportunity costs to improve the program's efficiency. If this is not carried out, good candidate sites for PES program action may not be affordable if money is spent elsewhere on less valuable lands for PES.
	<b>Spatial differentiation needed to target prime areas for PES provisions:</b> Forest policies, especially market-based incentives, often fail to take into account the spatial heterogeneity of resource management. Spatial targeting of conservation priority areas (and related environmental services) is largely absent in PES schemes, therefore leading to resource limitations for PES program implementation as well as participation in the scheme. This said, often PES programs come couched with other often competing objectives (e.g., poverty alleviation), which makes strict management of this issue difficult.
	<b>Weak institutional arrangements at outset could jeopardize PES program legitimacy and efficacy:</b> If institutional arrangements and staff capacity/availability are weak at outset of program, PES program may suffer from unequal participation (limitation of participants only where data is readily available, government working with existing contacts only rather than carrying out program outreach) and mishandling of program implementation (staff overwhelmed and applying PES requirements incorrectly). Launching a scaled-up PES program without sufficient pilot time to test assumptions and methods and determine appropriate payment structure can cause a lot of confusion and waste. In some PES cases, planners did not know how much, how long, and in what way to subsidize farmers for participation before the program was initiated. This led to widespread overcompensation and oversimplification of different programmatic options.
	<b>Technical assistance needed to ensure proper program implementation and participant understanding of program objectives:</b> Communities that received no technical assistance in the design of their PES implementation schemes, and were in fact unaware of their contractual requirements or the point of the PES program in detail, are susceptible to establishing weak management plans and program implementation.
	<b>Sustained maintenance, management and monitoring to ensure delivery of PES:</b> Must be aware that restoration and forest management are complex and costly, and require sustained efforts (and budgets) for maintenance and management. Further, without active and commensurate monitoring and compliance in place, PES programs will be ineffective. Without this, a restored ecosystem can be easily degraded again by reconversion or other potential disturbances at any time.
	<b>Important to monitor perverse incentives and conflicting policies that can undermine PES program:</b> Governmental policies meant to stimulate production have caused restoration and land management programs to unravel. It's important that any PES program manager keep watch on new policies that will undermine program efficiency and change opportunity costs in favor of land conversion back to crops and other intensive uses, thereby undermining PES program advances.
	<b>PES operational costs are inherently high and need to be factored into financing programs:</b> Costs of program implementation are high (often greater than 20% of overall PES budget) and this affects the overall provision of payments to high value PES lands.

	<p><b>Environmental effectiveness of PES programs can be undermined by ulterior motives:</b> When the criteria for spatial targeting or for enrolling applicants is something other than capacity to deliver ES, the program's effectiveness is likely to decline. Following up on the above, pro-poor targeting point, it's important to note that there are instances where it is not appropriate to have a blanket campaign of poverty alleviation using PES, and thereby potentially target large areas of marginal land for delivering ES as this: 1) threatens program effectiveness (e.g., high value lands are overlooked in favor of lower quality ES delivery); 2) limits technical and financial resources of program; and 3) limits welfare benefits of those who have strong ES to provide the program (e.g., paying providers just barely over their cost of provision – there will be little or no net benefit to providers).</p>
	<p><b>The design and operation of government-financed programs was found to be hijacked for many alternative purposes:</b> Significant differences were found between user-financed PES programs, in which funding comes from the users of the ES being provided, and government-financed programs, in which funding comes from a third party. The user-financed programs analyzed were better targeted, more closely tailored to local conditions and needs, had better monitoring and a greater willingness to enforce conditionality, and had far fewer confounding side objectives than government financed programs. This said, in many instances, financing by a government body (or some other representative of society) is the only approach that is feasible/available and opportunities using lessons learned (above) can help reduce programmatic failures.</p>

Part II was compiled by Loretta Baker, WWF Germany, Department for Agriculture and Biomass, 2014