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Payments for environmental services: Some nuts and bolts

Sven Wunder

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Acronyms and Abbreviations

CDM	Clean Development Mechanism (under the Kyoto Protocol)
CIFOR	Center for International Forestry Research (Indonesia)
ES	Environmental service
ICDP	Integrated conservation and development project
IPCC	United Nations Intergovernmental Panel on Climate Change
NGO	Non-government Organization
NTFP	Non-timber forest product
PES	Payments for environmental services
PROFAFOR	Programa FACE de Forestación para el Ecuador (FACE - Forest-absorbing carbon-dioxide emission forestation program in Ecuador)
RISEMP	Regional Integrated Silvopastoral Ecosystem Management Project (in Colombia, Costa Rica, and Nicaragua)
RUPES	Rewarding the Upland Poor for Environmental Services (a program to promote PES in Asia)
SDC	Swiss Agency for Development and Cooperation
VAT	Value added tax

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Conditionality – the ‘business-like principle’ only to pay if the service is actually delivered – is the most innovative feature of PES vis-à-vis traditional conservation tools (photos by Brian Belcher, Christian Cossalter and Sven Wunder).

Abstract

Payments for environmental services (PES) are part of a new and more direct conservation paradigm, explicitly recognizing the need to bridge the interests of landowners and outsiders. Eloquent theoretical assessments have praised the absolute advantages of PES over traditional conservation approaches. Some pilot PES exist in the tropics, but many field practitioners and prospective service buyers and sellers remain skeptical about the concept. This paper aims to help demystify PES for non-economists, starting with a simple and coherent definition of the term. It then provides practical 'how-to' hints for PES design. It considers the likely niche for PES in the portfolio of conservation approaches. This assessment is based on a literature review, combined with field observations from research in Latin America and Asia. It concludes that service users will continue to drive PES, but their willingness to pay will only rise if schemes can demonstrate clear additionality vis-à-vis carefully established baselines, if trust-building processes with service providers are sustained, and PES recipients' livelihood dynamics is better understood. PES best suits intermediate and/or projected threat scenarios, often in marginal lands with moderate conservation opportunity costs. People facing credible but medium-sized environmental degradation are more likely to become PES recipients than those living in relative harmony with Nature. The choice between PES cash and in-kind payments is highly context-dependent. Poor PES recipients are likely to gain from participation, though their access might be constrained and non-participating landless poor could lose out. PES is a highly promising conservation approach that can benefit buyers, sellers and improve the resource base, but it is unlikely to completely outstrip other conservation instruments.

Keywords: *Environmental services, rural livelihoods, conservation, economic incentives, stewardship, ICDPs, Bolivia, Brazil, Indonesia.*

1. Introduction

Following the Brundtland Report (Brundtland 1987) and the Rio 1992 conference, tropical conservation gradually headed in a more people-oriented direction. The trend reflected the conventional wisdom that alleviating poverty was the only way to conserve and protect the environment. Integrated conservation and development projects (ICDPs), and sustainable forest management were two major instruments intended to simultaneously increase incomes and conserve the environment (Salafsky and Wollenberg 2000; Pearce, Putz, and Vanclay 2003). Yet despite scattered successes, neither approach has so far achieved major shifts in tropical land-use trends (Brandon, Redford, and Sanderson 1998; Sayer 1995) or silvicultural practices (Poore 2003; Rice 1997). Moreover, there are fundamental doubts about the extent to which it makes sense to forcibly link the conservation and poverty-alleviation agendas when the trade-offs outweigh the synergies (Adams et al. 2004; Wunder 2001).

Based on these insights, much debate has emerged around the need for new conservation paradigms. The concept of payments for environmental services (PES) is at the centre of calls for more direct conservation approaches

(Hardner and Rice 2002; Niesten and Rice 2004; Scherr, White, and Khare 2004; Ferraro and Kiss 2002). As wilderness and natural habitats shrink, environmental services (ES) previously provided free by Mother Nature are becoming increasingly threatened. This emerging scarcity makes them potentially subject to trade. The core idea of PES is that external ES beneficiaries make direct, contractual and conditional payments to local landholders and users in return for adopting practices that secure ecosystem conservation and restoration.

This contingent method differs fundamentally from other conservation approaches. Instead of presupposing win-win solutions, this approach explicitly recognizes hard trade-offs in landscapes with mounting land-use pressures, and seeks to reconcile conflicting interests through compensation. Compelling conceptual arguments have been made that PES schemes are more cost-effective than ICDPs (Ferraro and Simpson 2002; Simpson and Sedjo 1996). While PES schemes exist in some developed economies, they remain poorly tested in developing countries. There are many incipient PES initiatives (Landell-Mills and Porrás 2002; Pagiola, Bishop, and Landell-Mills 2002), but for implemented PES schemes with money really changing hands in a conditional way,

one is typically referred only to Costa Rica and a dozen other pioneer experiences, mostly in Latin America.

Four ES types currently stand out:

1. Carbon sequestration and storage (e.g. a Northern electricity company paying farmers in the tropics for planting and maintaining additional trees);
2. Biodiversity protection (e.g. conservation donors paying local people for setting aside or naturally restoring areas to create a biological corridor);
3. Watershed protection (e.g. downstream water users paying upstream farmers for adopting land uses that limit deforestation, soil erosion, flooding risks, etc.);
4. Landscape beauty (e.g. a tourism operator paying a local community not to hunt in a forest being used for tourists' wildlife viewing).

Sometimes several services can be provided in a synergetic way – and a 'bundled' payment scheme can enable several service users to package their payments to service providers. But not all services are truly threatened and scarce, and not all users are willing to pay. Partial trade-offs between services are also likely: for example, a fast-growing plantation that maximizes carbon sequestration is perhaps not particularly biodiversity-rich, water-enhancing or attractive for tourists. Environmental services other than those listed above could potentially be traded (e.g. wilderness areas providing pollination services to agriculture), but so far only the four identified above exhibit significant commercial scale.

How have conservation and rural development circles received this emerging paradigm? It is fair to say reactions have been mixed. PES advocates stress that innovation is urgently needed because current approaches provide too little value for declining funding; that PES can provide new (especially private-sector) funding; and that poor communities selling these services can improve their livelihoods. Skeptics, however, fear that PES will 'bring back the fences' by decoupling conservation from development; that asymmetric power distribution means powerful conservation consortia may deprive communities of their legitimate land-development aspirations; and that commercial conservation may erode culturally rooted, not-for-profit conservation values (Romero and Andrade 2004; Karsenty and Nasi 2004; Karsenty 2004; Vogel 2002).

In addition, some PES opponents have vested interests. For a donor, money changing hands from a service buyer to a seller obviously provides fewer photo opportunities than a multifaceted rural development project – and is thus a harder sell to a home constituency that wants to believe in the power of point-wise, system-changing interventions for the common good, rather than in the existence of infinite externalities making necessary infinite payments. Integrated development NGOs and consultants risk losing their *raison d'être* with the prospect of PES replacing ICDPs; a whole different skill set would be required, such as land-use and service monitoring, facilitating negotiation, and financial intermediation. For land-use planners, PES implies recognition of recipients' right to freely determine land use, in spite of conflicts with land-use plans that may exist. Not surprisingly, many see PES as a threat rather than an opportunity, regardless of its potential virtues.

At this embryonic stage, mainstreaming PES in the tropics probably faces two key obstacles and a communication barrier. The first obstacle is limited demand: too few service users are so confident about the mechanism that they are willing to pay – in some cases, because the link between land use and ES provision is insufficiently understood or ambiguous (see below). The second obstacle is poor knowledge about the dynamics of ES supply. Where there is ES demand and willingness to pay, what are the institutional preconditions required for suppliers to negotiate a PES deal? If a PES takes off, how will direct, contingent benefit transfers work in often remote, cash-poor communities – both as resource-use incentives and in terms of local livelihood dynamics? Too little is known, and more hands-on experiments are needed. Finally, communicating the PES concept is a problem. Proponents often use an economic rationale, while skeptics draw on other social sciences (anthropology, sociology, psychology, political science). Obviously, there is scope to mediate between the two.

This paper does not address the first obstacle, 'unwillingness to pay', which is dealt with elsewhere (Balmford et al. 2002; Balmford and Whitten 2003; James, Gaston, and Balmford 2001; Wunder et al. 2004; Gutman 2003). Instead, it focuses on the second obstacle: the incentive and livelihood mechanics which so far have received comparatively less attention. Hopefully the paper can also better clarify the PES concept among conservation stakeholders, including its potentials and pitfalls, and lead

to a better understanding of which niche PES is likely to occupy in the conservation toolbox. Arguably, PES is the most promising innovation in conservation since Rio 1992, but it needs to be tried out on a much larger scale with more variety in applications to learn what works and what does not.

The PES ‘nuts and bolts’ in this paper will take the reader to the intermediate level of what questions need to be asked before designing a PES; it will not provide a step-by-step field manual of how to implement a PES scheme. This exercise will mostly use forest-based examples, drawing on detailed field assessments carried out in Bolivia and Vietnam, supplemented by selective experiences from Ecuador, Indonesia, Costa Rica and Brazil.

The following specific questions are addressed. How is a PES scheme defined, and how does it differ from other conservation approaches (Section 2)? How can one evaluate to what extent an ES has been delivered or not (Section 3)? Is PES likely to suit some land-use scenarios better than others (Section 4)? Is there a trade-off between efficiency and fairness (Section 5)? Who exactly should be paid (Section 6)? Should payments be in cash or in kind (Section 7)? Is PES useful for poverty alleviation (Section 8)? The paper concludes with a summary and discussion (Section 9).

2. Definition, terms and key features

2.1 Definition

To my knowledge, the literature so far does not formally define PES, which contributes to some conceptual confusion. For our field work in Bolivia and Vietnam, we used five relatively simple criteria to describe the PES principle. A PES is:

1. a *voluntary* transaction where
2. a *well-defined* ES (or a land-use likely to secure that service)
3. is being ‘bought’ by a (minimum one) ES *buyer*
4. from a (minimum one) ES *provider*
5. if and only if the ES provider secures ES provision (*conditionality*).

First, PES is a voluntary, negotiated framework, which distinguishes it from command-and-control measures. This presupposes that

potential ES providers have real land-use choices, something which in Vietnam, for instance, typically was not the case: payments here were more to be seen as an integral part of the predominating command-and-control system (Wunder, The, and Ibarra 2005).

Secondly, what is bought needs to be well-defined – it can be a directly measurable service (e.g. additional tons of carbon stored) or land-use caps that are likely to help providing that service (e.g. “forest conservation provides clean water”). In fact, here the word “likely” hides important scientific insecurities and popular perceptions. Especially hydrological services are often based on beliefs rather than scientific proof (e.g. “forest cover always increases water availability”) (Kaimowitz 2004). Also, external factors can interfere; Nature is not always ‘well-behaved’. For instance, even if forest conservation indeed increases the likelihood of clean local water provision, this increase may be subordinate if the general frequency of tropical storms and flooding is high, thus dominating water-quality outcomes. Payments that build on scientifically unlikely relationships, on likely relationship being unlikely to affect significantly the desired outcome, or on what has outright been proven to be a myth, might persist over a long time. In many cases, we lack the knowledge base to classify objectively which ES provision cases are real and which ones are ‘imaginary’. However, we assume that a poor underpinning of ES will tend to decrease PES robustness and sustainability: the less realistic the scientific basis of a PES scheme, the more exposed it is to the risk of buyers questioning its rationale and abandoning payments.

In any PES, there should be resources going from at least one ES buyer (criterion 3) to at least one provider (criterion 4), though the transfer often occurs through an intermediary. Last but not least, in a PES scheme user payments need to be truly contingent upon the service being continuously provided (criterion 5). ES buyers thus normally monitor compliance, e.g. has hunting, deforestation or slash-and-burn agriculture really been contained in the manner stipulated in a given contract? In developed countries, supporting legal and enforcement apparatus can create the conditions for on-off payments to provide future ES flows, for instance in permanent easements (e.g. Bayon 2004; Sokolow and Zurbrugg 2003). But in developing countries, this option is usually lacking – more so in agricultural frontier areas with weak governance. This feature implies

that in the tropics PES normally need to be *periodic* (often with an infinite horizon) and tied to *monitored compliance*. Service buyers thus need to be able to withdraw from a PES contract if they do not get what they paid for. Conversely, service providers may also have an interest in flexible contracts, so they can pull out (or alter the terms) of a PES scheme if changing context conditions induce them to do so.

How many PES schemes with these five basic principles can one find in the tropics? In our assessment of two countries, Bolivia and Vietnam, no single scheme satisfied all five criteria, although several satisfied more than one (Robertson and Wunder 2005; Wunder, The, and Ibarra 2005). For instance, watershed payments were being made, but there was no free land-use choice (criterion 1). The more precise nature of the service provided often remained fuzzy (criterion 2). The money often came from donors rather than from service users (criterion 3). Conversely, sometimes users were charged, but the money had not been spent so far to pay potential ES suppliers (criterion 4).

However, clearly the hardest criterion to meet is conditionality (criterion 5): many initiatives are loosely monitored or not at all, payments are up front instead of periodic, and they are made in good faith rather than being truly contingent on monitored service provision. The business-like feature of contingent conservation payments raised some resistance in all study countries. In sum, while the number of tropical *PES-like initiatives* is thus considerable — (Landell-Mills and Porras 2002) reviewed 287 such schemes — there are probably very few ‘true PES’ conforming to the theoretical concept developed in the literature and described in the simple definition above.

If our field search thus produced barely any ‘true PES’ hits, is it perhaps because the above PES definition was simply too narrow? Historically, many schemes of reforestation and soil-conservation subsidies were clearly justified in part by environmental services, even though the provision of the latter typically was assumed rather than monitored. Alternatively, one could choose to define PES by the additive meaning of the terms it contains: any “payment” somehow intended to promote “environmental services” could be PES. In addition to reforestation and soil-conservation subsidies, things like salaries for local protected-area guards, wages for people working in conservation projects,

and certainly all ICDPs would qualify. If, nevertheless, I prefer to maintain the above ‘pure PES’ definition, it is out of a belief that these five principles represent something new — a more direct approach that deserves to be tested on its own terms, before being added to the big pool of well-tested environmental spending types. Evaluating the different degrees of compliance with these five criteria of specific cases — though sometimes a task with subtle distinctions — can serve as an indicator to what extent these cases truly represent the underlying PES principle.

2.2. Terminology

What terms have been used to describe this type of innovative mechanism? Box 1 summarizes four terms describing the remuneration mechanism (the “P” in PES): “payments”, “markets”, “rewards” and “compensations”. As discussed in detail in Box 1, the choice of term implies what one should expect the mechanism to achieve: Is it the competitive interaction between multiple agents (“markets”), the just and equitable prize for services rendered (“reward”), or the recompense for a cost the service supplier has suffered (“compensation”)? This is clearly linked to substantive questions about what situations merit remuneration, to whom, in what ‘currency’, and how much — questions that will be dealt with in the remainder of this paper. The terms used can also trigger different political and ideological associations, which in turn can influence whether the mechanism is implemented or not (Wunder and Vargas 2005). In the following, we adopt “payment” as arguably the most generic and less ideologically colored term, but the most appropriate choice of label will be case-specific.

The “E” in PES has also been subject to discussion: does it stand for “environmental” or “ecosystem” services? We use the former, assuming a separable nature of different services. The latter probably has a more integral interpretation, implying that multiples services cannot always be broken up into additive components (Scherr, Khare, and White 2004). However, the substantive difference for our purposes is minimal.

Finally, the “S” is probably the least controversial part, given the consensus that we are discussing “services” in the sense of non-material, non-extractive benefits from Nature. One factor of doubt can be how to account for certified ‘green’ products that are being produced jointly with an environmental service. In some

Box 1. Terms used for the remuneration of environmental services

1. *'Payments for ES'* – chosen here as the most generic term. However, it has a clear monetary association, which can raise ideological resistance (Wunder and Vargas 2005) and can be locally seen as conflicting with the option of in-kind payments (Section 7).

2. *'Markets for ES'* – another widely used term, e.g. by the Katoomba Group and IIED. The notion is not only of a prime role for economic incentives, but also multiple actors, choices, and competition to some degree. Such markets do exist in some developed countries, but in developing countries they seem remote. Market mechanisms face general restrictions in developing countries, but in addition, the localized nature of eco-services often limits competition on the supply side, sometimes creating *de facto* monopolies. For instance, urban water users cannot just choose different upstream neighbors, or a private nature reserve protecting a targeted endemic species cannot be simply substituted by another area. Single-buyer, or 'monopsonic' schemes are also quite common, such as water companies, breweries, electricity firms, or tourism operators. Many schemes are thus bilateral agreements between one buyer and one seller – but not 'markets'. Markets have some desirable features in terms of society's resource allocation, so they are desirable long-term goals in some cases. But when the transaction costs of schemes are high, as with watershed protection, striving for multiple buyers and sellers might not be attractive. Our research in Bolivia, Vietnam and elsewhere showed that markets can come to be ideologically equated with neoliberalism, creating a political alienation detrimental to promoting PES (Wunder and Vargas 2005).

3. *'Rewards for ES'* – a terminology with an overtone of entitlement and justice for service providers being secured through a transaction: everybody who delivers a benefit should also be 'rewarded'. This label has, for instance, been used by the RUPES program in Asia ("Rewarding the Upland Poor for Environmental Services") (van Noordwijk, Chandler, and Tomich 2004). However, this general connotation runs the danger of raising excessive expectations, since services that are neither highly valuable and/or not threatened are unlikely to find buyers (Section 5).

4. *'Compensations for ES'* – has been used in a comparative framework (Rosa, Kandel, and Dimas 2003). It refers appropriately to a direct or opportunity cost on behalf of the service supplier, which creates a moral justification and a societal rationality for paying. However, where 'reward' implies that everybody who delivers should be paid, 'compensation' restricts the scope to those who bear some costs – those who bear no costs do not need to be 'compensated'. The term could be misleading when providers who suffer costs look not only for recompense, but also for a 'providers surplus' – gains from the transaction that exceed their costs and thus make them better off. In a strict sense, cost compensation alone would barely have any poverty-alleviation impact on PES recipients.



Local inhabitant from Zancudo working as a boatman in a tourism operation. The Zancudo community received an in-kind compensation from the Transturi company for not hunting in a prime tourism visitation zone in the Imuya area, Cuyabeno Wildlife Reserve, Northern Amazon region of Ecuador (photo by Sven Wunder).

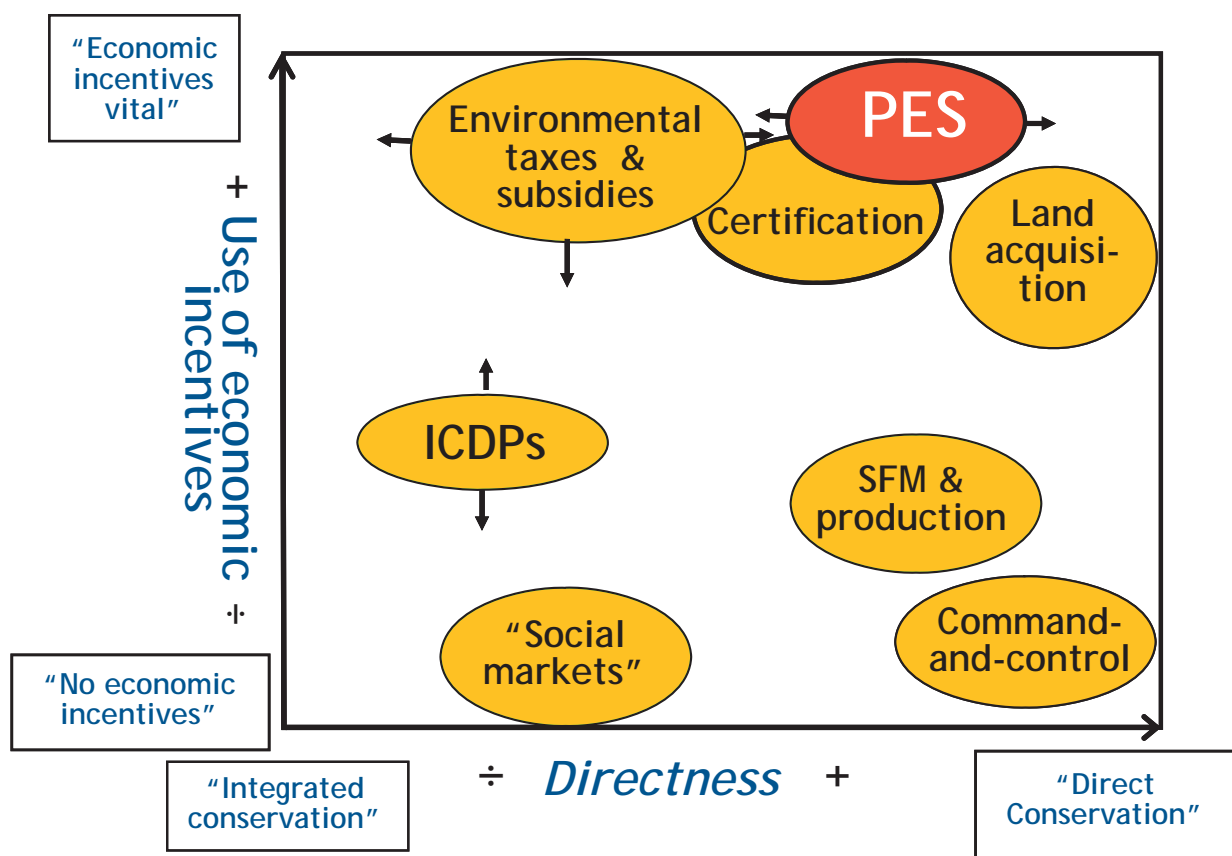


Figure 1. Comparing PES to other conservation approaches

global assessments of the total value of ES transactions, the value of these products is fully included (Scherr, Khare, and White 2004). It might be more appropriate here to count exclusively the value of the green premium, i.e. only the value difference between the ecologically and the conventionally produced good can genuinely be attributed to the ES.

2.3. Key features

What features distinguish PES from other conservation approaches? PES has already been compared with ICDPs in the literature, but a broader evaluation is desirable, including a comparison with other conservation instruments. Figure 1 ranks a set of conservation approaches according to two criteria: first, the degree to which they rely on economic incentives; second, the extent to which conservation is targeted directly rather than integrated into other development approaches. Note that the approaches as described are not mutually exclusive; they could be combined in different conservation strategies.

Command-and-control regulations (including the creation of strictly protected areas) aim

rather directly at protecting the resource, without using economic incentives – unless corruption turns regulations into *de facto* unofficial 'taxes'. They are thus located in the extreme South-Eastern corner of the diagram and stand in stark contrast with the voluntary, flexible character of PES. However, PES can coexist with or even enhance command-and-control measures, as in the case of the Kyoto Protocol preconditioning carbon mitigation markets. *Sustainable forest management (SFM)* and similar resource-use improvements also directly pursue conservation by influencing production and extraction processes. Technical modifications are the main instrument, although economic incentives and development mechanisms also can play a role.

In the South-Western cluster, *ICDPs* are by their very nature the opposite of direct. They are non-contingent and explicitly integrate conservation and development concerns, looking for 'conservation by distraction' and 'less poverty – less degradation' effects. Their holistic efforts include building local institutional capacity, generating benefits to 'buy' local goodwill towards conservation and influencing

government policies. Economic incentives in ICDPs play a variable role. Unlike PES, ICDPs require investments in alternative production forms. They are 'projects' or 'programs', often surrounded by mutual expectations of holistic (sometimes: paternalistic) interventions. In contrast, PES are designed as 'transactions' that may be sensitive towards local development dynamics, but without pretending to hold community hands — it is all about selling and buying a service to achieve a more rational land use. Yet, one could also imagine some hybrid forms, such as integrated projects that are financed in a contingent way (Section 9).

In a cluster adjacent to ICDPs, we have "*social markets*" (Heyman and Ariely 2004). These comprise systems of reciprocity and exchanging favors at different social scales. By definition, these systems are non-monetary — and critics argue that introducing PES project tends to jeopardize them (Section 6). Social markets are often traditional systems that have evolved locally over time. Points of leverage for conservation include moral persuasion, social pressure, or promised favors — all factors closely linked to integrated social systems and development processes, rather than to direct conservation.

Obviously, PES belong to the family of approaches making pronounced use of economic incentives (Northern cluster) — in fact, incentives are at the very core of PES. In that respect, PES resemble *environmentally motivated taxes and subsidies*. But the PES approach of 'purchasing conservation' in a contingent way is more direct than most taxes and subsidies which aim more at changes in broader production and resource-use patterns. Ecological price premiums linked to *product certification* can be seen as overlapping with PES (see below, this section). The 'ecological VAT' program practiced in several Brazilian federal states is another border case between PES and fiscal environmental instruments: tax transfers being made from federal states to municipalities, which are rewarded for the size and quality of conservation areas (May et al. 2002; Grieg-Gran 2000).

Land acquisitions for conservation and similar measures such as buying out logging concessionaires are one-off solutions aimed at eliminating environmentally problematic actors. PES instead try to make deals to work with these actors. PES normally do not involve changes in land tenure. PES might thus be cheaper and more adaptive, local people need

not be expelled, and the conservation buyer does not need to worry about enforcing land tenure. Conversely, setting up and running a PES scheme could over time require higher transaction costs (negotiation, monitoring, etc.) than once-and-for-all land purchases, and there is always a risk that the landowner cancels or violates the PES deal. Notably, land purchases are fully direct; they have no posterior integrated conservation-development dimension. In turn, to the extent that receipts from PES change local livelihood dynamics through income, consumption, labor and land markets, this can either strengthen or weaken conservation — be it by affecting the sustainability of the PES deal itself or through unexpected environmental side effects. These indirect feedback loops triggered by the development dynamics of PES are sometimes forgotten by those who see the PES approach purely as 'direct conservation'.

2.4 Different PES types

PES schemes thus clearly distinguish themselves from other conservation tools, but internally they are also a quite diverse family. In the following, three distinctions will be made: area- vs. product-based schemes, public vs. private schemes, and use-restricting vs. asset-building schemes.

First, PES schemes differ in the vehicles used to achieve conservation or restoration effects. The most common type is *area-based schemes*, where contracts stipulate land- and/or resource-use caps for a pre-agreed number of land units. Examples are conservation concessions (Niesten, Ratay, and Rice 2004; Hardner and Rice 2002), easements, protected catchments, or forest-carbon plantations (Smith and Scherr 2002). Second most common are *product-based schemes*, where consumers pay a 'green premium' on top of the market price for a production scheme that is certified to be environmentally friendly, especially vis-à-vis biodiversity (Pagiola and Ruthenberg 2002). The premium could be for a product meticulously linked to the use or non-use values of pristine habitat (e.g. ecotourism, extractive jungle rubber), for agro-ecological production modes preserving relatively high ES levels (e.g. shade-grown coffee, organic farming) or for ES conflictive production methods using best practice to minimize negative environmental impacts (e.g. certified timber, proposed certification of soy and cattle producers in Brazil).



Cloud forest being protected by the watershed PES scheme in Pimampiro, Northern Ecuador (photo by Sven Wunder).

Second, PES also differ according to who the buyers are. On the one hand, in *public schemes* (e.g. in Costa Rica, Mexico, China), the state acts on behalf of ES buyers by collecting taxes and grants and paying alleged ES providers. On the other hand, *private schemes* are more locally focused (e.g. watershed schemes in Pimampiro-Ecuador, Valle del Cauca-Colombia, Santa Rosa-Bolivia, and basically all carbon schemes), and buyers pay directly. Public schemes are generally larger in scope and have the state providing legitimacy, which many private schemes struggle hard for. On the downside, public schemes can become overloaded with side objectives catering to voters rather than supplying ecological services proper, they are less flexible vis-à-vis targeting of strategic ES sellers, and they tend to be less efficient in securing additional ES provision (Section 3).

Finally, “use-restricting” PES schemes reward providers for *conservation* (including natural regeneration) for capping resource extraction and land development; or for fully setting aside areas, such as for protected habitat. Here, landowners are paid for their conservation-opportunity costs, plus possibly for active protection efforts against external threats (Hardner and Rice 2002). In contrast, in “asset-building” schemes PES aim to restore an area’s ES, for example (re)planting trees in a treeless, degraded landscape. Conservation-opportunity and protection costs aside, PES may here also

compensate the direct costs of establishing ES, often through investments within agricultural systems (Pagiola et al. 2004). Whether PES is an economic rent for basically “doing nothing”, or at least in part a reward for actively improving ES, has some implications for rural employment (Section 8).

3. How to evaluate PES efficiency?

If you go to the market and buy a fish to cook for lunch, it may eventually taste better or worse than expected – but basically you know in advance what you buy. If you buy an ES, whether you get what you paid for is much less self-evident. Since the ES is provided over time, you always need to consider what would hypothetically happen without your PES scheme, i.e. you need to construct some *counterfactual ES baselines*. The first and prime question to ask is whether the PES scheme has a sufficiently large, additional effect vis-à-vis that baseline: Does it really make a difference? The *additionality* question has been much debated for forestry’s status in the Kyoto Protocol’s Clean Development Mechanism (CDM). Only reforestation and afforestation are currently accepted as truly additional and thus eligible for carbon credits, while protecting forests that would disappear in a no-PES baseline is not. Figure 2 illustrates three fundamental baseline scenarios.

Current CDM rules are an example of a static baseline where (a): forest carbon stocks are assumed to remain constant vis-à-vis a *laissez-faire* historical scenario. The difference is then attributed to specific interventions that qualify for carbon credits. Critics argue that in many tropical countries deforestation is an integral part of development, implicitly adopting a dynamic, declining baseline (b). A halt or even slow-down in deforestation (‘avoided deforestation’) would then qualify for additionality and carbon credits. However, regions or countries in advanced stages of their ‘forest transition’ process also regain forest cover as a result of land-saving and forest-valuing development features, even without specific interventions. An example of this improving baseline (c) is Costa Rica, where a historical turnaround of deforestation started in the early 1990s (between the 1987 and 1996/97 forest assessments), i.e. *before* the PES system was implemented from 1996 onwards.

This shows that the choice of baseline is tremendously important for PES efficiency. For instance, the Costa Rican PES system builds on static baselines, but if in reality forest cover would increase even without PES, it means the system is likely to pay for reforestation or conservation that would have happened anyhow – a suspicion that seems substantiated by case studies of PES-receiving forest owners with holiday cottages who would be unlikely to clear or degrade their forest (Miranda, Porrás, and Moreno 2003). Conversely, current CDM rules bypass important opportunities to slow down forest loss through economic incentives, due to the use of a rigid static baseline. Adopting the wrong baseline can thus lower PES efficiency, or, in the worst case, waste all the money spent: if no *de facto* change in behavior is achieved, no additional environmental services will be produced.

Two other PES efficiency concepts are relevant whenever the intrinsic scope of the ES exceeds in time or space the scope of the specific PES intervention. This is highly relevant for carbon sequestration, which is a global, long-term service enhanced through a series of interventions specific in time and space. If a carbon PES scheme finances reforestation in a certain area, but this directly causes deforestation pressures in a neighboring area, then the PES scheme had a high *leakage*: it achieved high additionality only for the project area, but not for the broader, global goal. If after the scheme's termination all the reforested trees are cut down immediately for firewood, the scheme's *permanence* would be lower than if the trees were left standing. Leakage and permanence are also relevant concepts for watershed, landscape aesthetics, and biodiversity goals, depending on how focused these goals are in time and space, compared with the scope of the specific PES interventions.

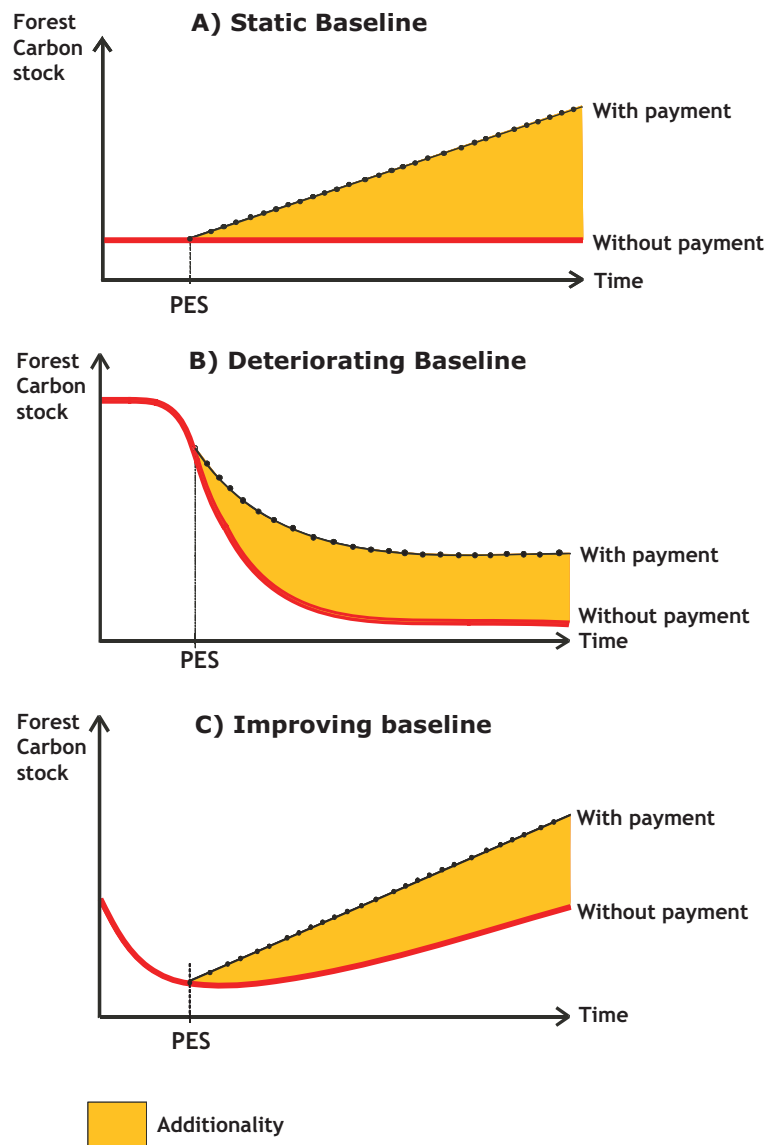


Figure 2. Three different PES baselines



Pine plantations on community lands planted through the PROFAFOR carbon sequestration program (Forest-absorbing carbon-dioxide emission forestation program in Ecuador). High Andes near Guamate, Southern Ecuador (photo by Sven Wunder).

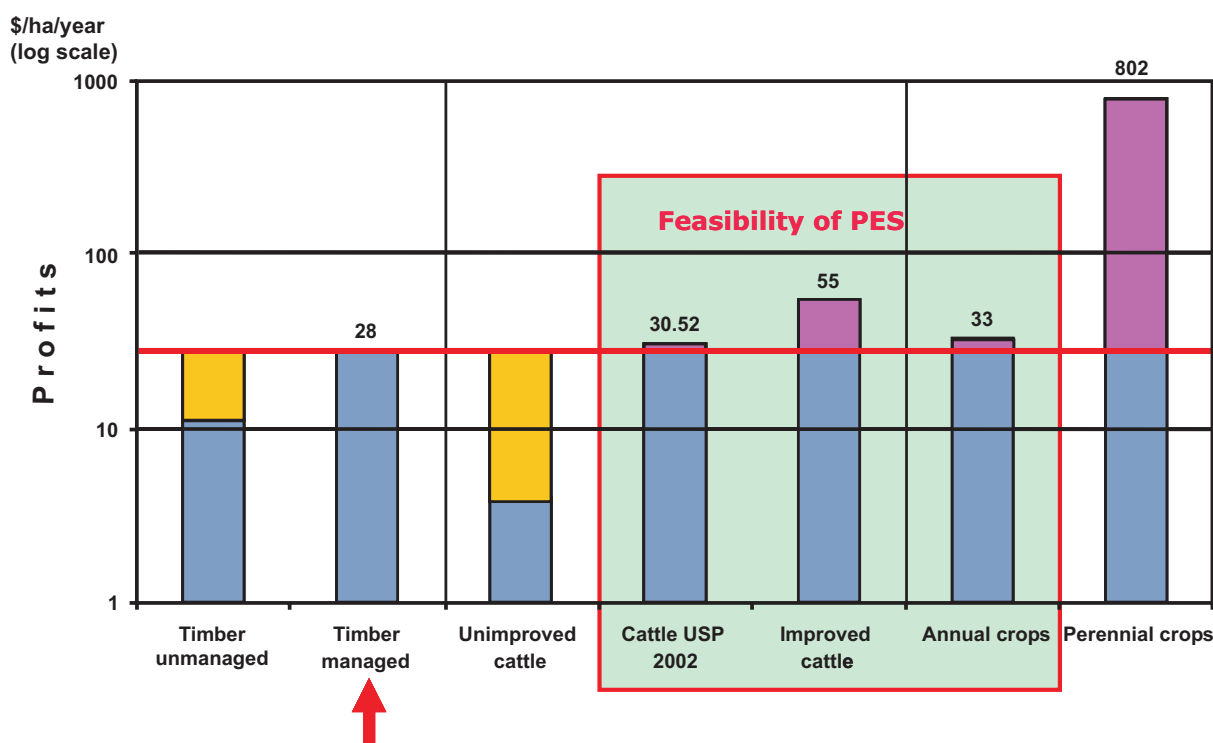


Figure 3. Profitability of land uses compared. Paragominas county (Brazil)

Source: Almeida and Uhl (1995); Margulis (2003)

Many practical issues must be considered when deciding how to fix a baseline and evaluate additionality. Combining implementation with research and systematic data collection would be particularly suitable in this case, as happened with the RISEMP project in Colombia, Costa Rica and Nicaragua (Pagiola et al. 2004). If one just observes outcomes in areas with performance payments, one cannot discern the PES impact separate from omitted variables such as recipient’s location, schooling, conservation attitudes, etc. Randomizing the payment could help control for this bias, for example randomly selecting from a pool of households potentially eligible for PES (R.Godoy, pers. e-comm., 7 April 2005). In the RISEMP project, groups were designed to control not only for whether PES payments were made, but also whether technical assistance accompanied the payment (J.Gobbi, pers.comm., Turrialba, 9 February 2005).

4. Using PES for which land-use scenarios?

In interpreting the emerging theoretical literature advocating PES schemes (Ferraro and Kiss 2002; Ferraro and Simpson 2002; Ferraro 2001), one might be tempted to believe PES has an *absolute advantage* over other approaches, specifically ICDPs. But as mentioned above, third

instruments may also be available, and their conservation-efficiency ranking may be highly context-specific. Conservation’s opportunity cost, i.e. the returns to alternative land uses, are one discriminating factor determining where PES is applicable. Figure 3 provides a numerical example of land-use profitability from Paragominas County in the Brazilian Amazon, which we can use for discussion.

Let us for the sake of simplicity assume different ES buyers had jointly determined that managed timber production would be the most desirable land-use option in Paragominas, maximizing different ES while providing a minimum productive income to land users. They are now pooling resources for a bundled PES scheme offering land-use incentives to shift to managed timber production. Compared to the net land-use profits of US\$28/ha/yr from managed timber (horizontal line in Figure 3), some activities have higher, others lower economic returns. For which ones would a PES-led substitution strategy likely work?

For activities with lower returns already (unmanaged timber, unimproved cattle ranching), a PES subsidy for managed timber production is unlikely to matter. Land users already would have changed to this higher-yield activity without PES, but are probably constrained by other factors (access to credits,

technology, infrastructure, know-how, etc.) which are not directly related to recurrent land-use profitability.

At the other end of the spectrum, perennial crop cultivators receive US\$402/ha/yr - a per-hectare economic return no less than 28 times higher than managed timber. Shifting them from perennials to timber production would require an astronomical subsidy, likely to by far exceed potential conservation funding and the economic value of the incremental ES gained. However, for activities *marginally more profitable* than the desired land use (i.e. improved ranching and annual crops in the 'feasibility rectangle' in Figure 3), a PES subsidy could effectively alter breakeven points and induce the desired shift towards sustainable forestry.

By implication, a PES system is likely to be most cost-effective in the middle range of activities marginally more profitable than the desired land use. For less profitable activities, PES is likely to be irrelevant; for substantially more profitable activities, finite funding tends to fall short of the compensation needed.

Obviously, there are some caveats in using this example to represent the complex real world. Producers might not only look at average annual profits, but also at other factors such as risk, price fluctuations, expected future returns, legality of use, and security of land tenure. Where land is plentiful, like in the Amazon, they may also look more to returns per labor input or per capital unit invested, rather than per land unit. ES buyers aiming to protect existing, threatened services in use-restricting schemes (e.g. biodiversity set-asides) may need to anticipate emerging threats and future rises in opportunity costs - if they react only to changes that have already occurred, the service may already have been irreversibly lost (see next section).

On the other hand, this simple example also has some robust practical lessons. For instance, in the nascent Brazilian PES program "Proambiente", perennial crops are planned to be promoted, among other things by providing PES-subsidized credits. But as Figure 3 showed, in terms of average returns perennials are already extremely profitable, so PES-reduced recurrent capital costs and marginally higher returns are unlikely to make much difference for most land-use choices. Perennials may be more effectively promoted by reducing disease risks, price fluctuations, credit constraints and

other barriers to entry. It may well be that traditional integrated project approaches, targeted at the multiple non-income constraints to adopting perennials, are more suited for this specific task than PES.

Contrary to common belief, it is often not necessary before PES establishment to do a full economic valuation of ecosystem services on the buyer side, and an economic study of farming system returns on the provider side. In principle, any price the two parties jointly negotiate can be 'the right price' - just as right as the price I negotiated for the fish in the market. For carbon sequestration, a referential market price already exists. However, some back-of-the-envelope calculations can certainly help each side to strengthen their negotiating positions, or even to pre-determine whether a PES scheme is a realistic option or not.

An example can illustrate this. In a watershed PES pilot scheme in Santa Rosa, in the buffer zone of Amboró National Park in Bolivia, a relatively low annual PES (in-kind value of about US\$7/ha/yr) was offered to landowners to set aside forests for conservation. Opportunity costs varied according to slope, soil fertility and access, but would be up to an order of magnitude higher. When PES rates were so uncompetitive, surely nobody would join the conservation scheme? But some farmers did, mainly to cash in a rent for forests that they would have conserved anyway. While the scheme made important headway in locally piloting the basic PES principle, it probably gave little ES additionality, so far at least (Robertson and Wunder 2005).

In this type of situation, a basic assessment of opportunity costs can help set PES rates competitively, and possibly target limited PES resources to those areas where they can really make a difference. As ongoing research with our partners in Costa Rica tentatively indicates, significant efficiency benefits may be gained by changing from the current flat PES per-area payments to rates differentiated in space and tailored to the variable ES provision potentials and opportunity costs of different forest landscapes (T.Wünscher, pers.comm., Turrialba 10 February 2005) - although eventually there may be major political-economy obstacles to implementing differentiated payments in a public scheme.

5. Efficiency or fairness?

In conservation and rural development circles, many look to PES as a source of just reward for poor rural dwellers who take care of the environment and continuously 'produce' ES — until now, for free (Shilling and Osha 2003; Rosa, Kandel, and Dimas 2003; van Noordwijk, Chandler, and Tomich 2004). However, from an efficiency point of view, only those who constitute a credible threat to ES provision should be paid. Let us return to the Brazilian Amazon for an example.

First, the remote federal states of Amazonas and Amapá have recently declared large areas to be protected, and federal government representatives have also expressed hope that their pro-conservation policies will be rewarded with international PES resources. Yet, deforestation rates in most of these remote areas remain very low, indicating that the development frontier has still not reached them. Why would ES buyers want to pay for conserving forest that is not currently threatened, and thus would be conserved anyway (negligible additionality)? If land-use pressures are distant, how far-sighted should a PES initiative be?

Second, a state like Mato Grosso is at the other end of the spectrum, aggressively promoting the expansion of ranching and soy. High deforestation rates reflect land-use threats and high conservation opportunity costs, especially in terms of soy beans' high profitability. The economic, biophysical and political context induces rapid forest conversion. There are thus many good reasons to intervene, but would even large-scale PES be sufficient to change the process? Or is the system with its economic forces too much pre-gearred to a scenario where forests will rapidly decline no matter what, constrained only by capital shortages, road infrastructure, time, and possibly legal constraints? Is there hence eventually greater hope for conservationists in pursuing command-and-control measures here, such as enforcing the Brazilian legal restrictions mandating a minimum percentage of forest retained on farms?

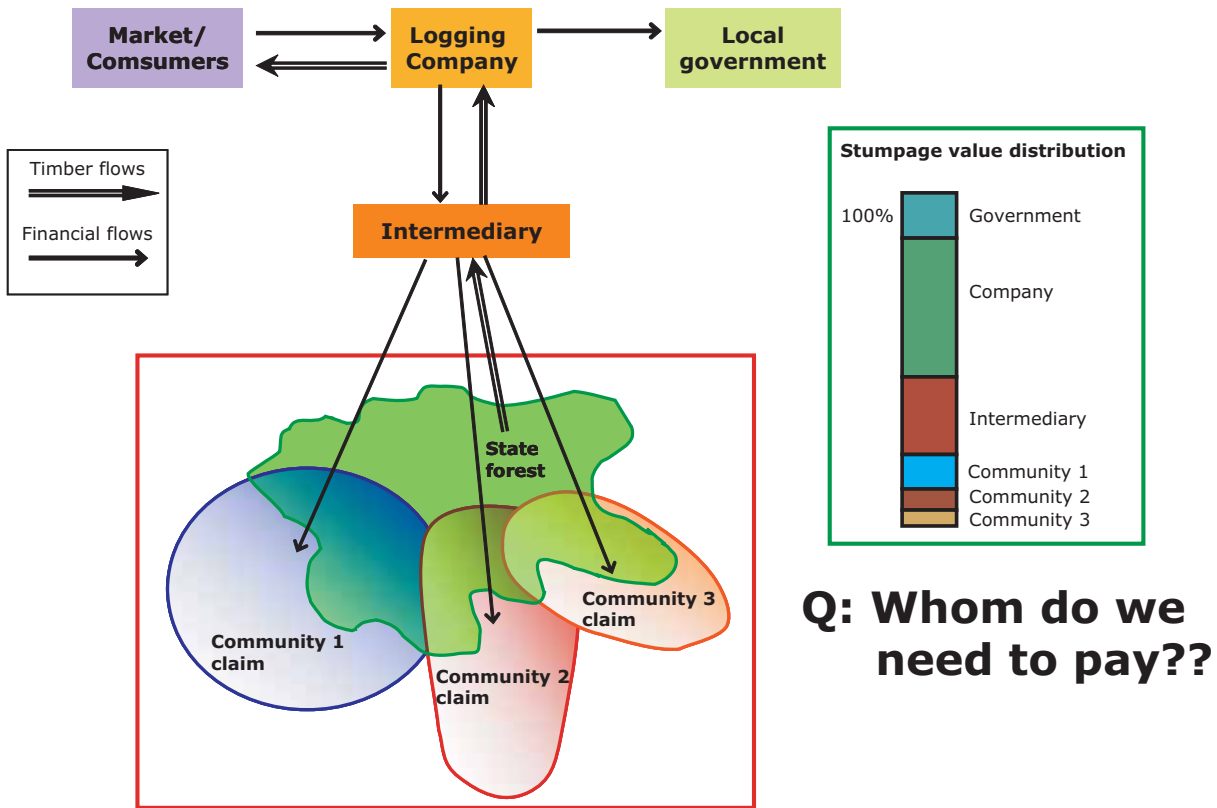
Third, a federal state like remote, forest-rich Acre constitutes an intermediate example. Its self-declared *Governo da Floresta* (Forest Government) has been innovative in socio-environmental legislation and implementation, with a pro-active grassroots movement; the mix has much appealed to foreign donors. At the same time, emerging economic factors like road projects linking Acre to neighboring

Bolivia and Peru and expanding timber and beef demand, are all increasing pressures on forests and accelerating clearance rates. Is this intermediate setting, with foreseeable major threats and rising opportunity costs, perhaps the most favorable scenario for PES application?

Obviously, there are no easy answers — not least because the three states internally include a high variety of sub-scenarios. Biodiversity buyers might best keep a diversified portfolio, acting on both current and projected threats. PES schemes need to strike some balance between short-run efficiency and fairness, the latter influencing long-run viability. However, what seems certain is that neither the 'ecologically noble savage' who fully safeguards his or her environment, nor the impoverished farmer too poor to do significant ecological damage, will emerge on the scene as major ES sellers. They simply do not constitute a credible threat, so paying them creates zero additionality — it makes no difference. Is that unfair? Perhaps not, since they also do not suffer conservation opportunity costs from forgone development. The ideal ES seller is, if not outright environmentally nasty, then at least potentially about to become so.

On the other hand, current threats are not the only relevant indicator — and sometimes threats are only unambiguously revealed when it is too late. Applying PES to target agents and areas where threat is *projected* to emerge could be an effective insurance against future degradation. CIFOR has adopted this logic trying to develop a community conservation concession scheme in Setulang village, East Kalimantan, Indonesia (Wunder et al. 2004). While most neighboring villages have sold out their forest to timber companies, Setulang has preserved five thousand hectares of primary lowland forest, mainly to protect local water supply.

However, the bids from logging companies are rising, and the internal village conservation consensus is endangered. In this situation, an external biodiversity payment to local people for not selling logging rights could help sustain the village consensus. It can also help them cover the costs of more effectively protecting the forest against logging companies' external threat. PES probably has a high potential for achieving real and additional conservation gains in situations where decisions are still 'on the edge', especially when it is in a use-restricting scheme with ES being threatened by irreversible loss (e.g. biodiversity). Once the balance has tipped and the community has sold off logging rights, it is obviously too late for PES to have any impact.



Q: Whom do we need to pay??

Figure 4. Buying out logging rights for conservation in Indonesia

CIFOR is supporting the village of Setulang, East Kalimantan, Indonesia, setting up a PES scheme to avoid logging of the village's lowland forest and find financial support to set it aside for conservation (photo by Yani Salah).



6. Whom to pay?

This section will deal with three concerns in selecting possible PES recipients: the value-added chain, insecure land tenure, and illegal resource use. The first issue relates to the vertical distribution of opportunity costs. Consider the Setulang case (Wunder et al. 2004). For a biodiversity PES to be politically acceptable, one needs to compensate a critical mass of decision makers that would otherwise benefit from the biodiversity-threatening activity, logging. Figure 4 shows the approximate distribution of timber-extraction benefits, combined with the financial and commodity flows. Logs are being extracted from *de jure* state forests, the use rights of which are *de facto* claimed by different local communities through traditional land rights (*adat*) that in turn are generally recognized by the post-Suharto Indonesian state.

However, claims are overlapping between communities, and their negotiation power varies – causing their shares in total timber rents to diverge (right-hand bar). Yet, other agents such as intermediaries (fees), timber companies (sales value), local government (taxes, bribes) and probably timber consumers (consumer surplus) are currently getting the lion's share of net profits, and would thus

have the most to lose from conserving forests. Should all these actors be compensated in a PES scheme?

From an efficiency point of view, one would want to compensate enough (not necessarily all) actors to form a resilient conservation alliance, but selecting only among those who have credible site-specific claims. Generally, consumers, intermediaries and timber companies need not be compensated, as long as their interests remain 'mobile'. Unless they buy, rent or forcibly occupy an area, they cannot make site-specific claims. On the other hand, communities acting as direct local guardians have a vital stake, and do need to be compensated. Yet, if the community is too weak to protect its land from loggers, then a PES scheme has no foundation. Local government, recently strengthened by decentralization, can be a catalytic actor that may need to be rewarded, although there are pros and cons.

Note that for a PES to be 'fair', one might want to compensate all losers, but in this specific case across-the-board compensation would be prohibitively expensive. Note also that buying conservation for a relatively low price, aligned only with local people's opportunity costs, could eventually trigger losses in national income by forgoing large timber rents paid to non-local actors (Section 8). Whom exactly to pay is a question of negotiation, political feasibility (which includes perception of fairness), legality (particularly vis-à-vis land tenure) — and possibly also of ethics, since some actors may lose illegal revenues, corrupt payoffs, and iniquitous profits.

Second, many land users in the tropics do not have formal land titles, especially in agricultural frontier areas. Can and should these people receive PES? The main preoccupation for private ES buyers should not be the *de jure* land rights, but *de facto* land- and resource-use control capacities. Informal landowners whose land claims are widely recognized and respected can be efficient ES provider since they can control access; someone whose tenure is perceived as insecure and weak cannot, since external agents can occupy the land or harvest the resources. In disaggregating the complex concept of tenure rights, the 'right to exclude' layer is particularly decisive for ES providers' efficiency. The more open the access, the less adequate the scenario is for PES.

Third, land tenure issues aside, does the legal status of resource uses matter for selecting

PES recipients? Many legal caps on tropical land uses are weak (e.g. declared but not enforced 'protection forests'), and some forest products (e.g. wild animals, logs, charcoal) are globally to a large extent illegally harvested. Should these resource users receive PES to defer their threats of illegal extraction? If so, would legal actors be perversely encouraged to drift into illegal activities, too, in order to qualify for PES — or just to protest against an unfair system? Could PES eventually come to endorse crime (Vogel 2002)? There is certainly a game-theoretical foundation for environmental blackmail (Mohr 1990), and perverse incentives have been a real concern for some PES schemes (Pagiola et al. 2004).

Again, there is no one-size-fit-all answer, and a pragmatic approach is recommended. In many cases, a carrot-and-stick approach is rational, i.e. to supplement weakly enforced laws with PES compensations partially covering compliance opportunity costs — especially when recent top-down protection declarations can be said to have been unfair vis-à-vis existing local land claims. Even in the well-established Costa Rican PES system, farmers are paid *inter alia* for not deforesting, although deforestation actually is illegal.

However, since PES presuppose *de facto* free land-use choices (Section 2), they are normally not an adequate tool to strengthen existing protected areas, although there can be exceptions. To the degree that protected areas have been relatively efficient in halting deforestation (Bruner et al. 2001), squatters should not be paid to stop expanding further into national parks — unless it is bound to be a 'paper park' without any command-and-control potential. Paying squatters could backfire by 'giving away hostages' in the struggle over protected land, e.g. by attracting new squatters looking for their 'just reward'. Ultimately, the decision whether to offer carrots depends on a realistic assessment of how far the stick alone will take you.

More broadly, PES implementation should be preceded by an efficiency analysis of existing approaches and motivations for ES provision, and how a PES scheme would likely affect them. Will payments always increase recipients' effort? At least part of the psychological literature claims that extrinsic rewards can undermine intrinsic motivation (Deci, Koestner, and Ryan 1999), such as a community's self-interest and pride in forest conservation. Monetary rewards could also debilitate pre-existing social markets (Section 2),

i.e. societal ties and reciprocity arrangements. Apparently this is especially a danger as long as payments remain small (Heyman and Ariely 2004). At worst, conservation effort in exchange for a low monetary PES could be lower than for ‘no payment’. This is noteworthy, since in most cases PES amounts paid have actually remained low.

7. How to pay?

Payment methods also matter for PES efficiency. A cynical ES buyer might be indifferent about the mode of payment, as long as the provider signs the contract. But the contract’s sustainability may eventually depend on the unforeseen development effect of payments on household incomes, changes in consumption, and demand for land and labor. Also, these changes may have environmental side-effects on conservation, beyond what is stipulated in the contract. So it is advisable to *ex ante* think about (and even experiment with) different payment modes, including the cash vs. non-cash selection and the periodicity of payment.

Economists often think of cash payments as the most flexible and thus preferable mode. Cash will be most appropriate when ES suppliers forgo cash income to comply with a PES contract, e.g. reducing a planned expansion in cash crops to conserve a forest area vital for watershed protection. Indeed, in this situation ES suppliers could hardly be expected to accept non-cash PES benefits exclusively, since cash is exactly what they lose from conservation.

Many development practitioners are generally hesitant to advocate cash transfers to rural communities, since they doubt the ability of cash to create sustained local welfare. Cash may increase myopic spending (alcohol, luxury goods, etc.) and cause social distress. At the other end of the spectrum, some argue that regular cash transfers are more effective in alleviating poverty than in-kind contributions or development projects. For instance, in two recent Mozambican cash-transfer programs, flood victims and demobilized soldiers have used their money wisely, administrative costs were very low at 5-10%, and the poverty-alleviation impact was impressive (Hanlon 2004).

A PES field example can illustrate the viewpoints ranging between these two extremes. Table 1 sums up different attitudes from interviews in the Santa Rosa watershed (Bolivia) vis-à-vis the pros and cons of receiving PES in the form of beehives (the current in-kind mode) versus cash (as hypothetical alternative) (Robertson and Wunder 2005). The recipients originally negotiated a contingent transfer of beehives, combined with technical assistance for beekeeping. As one PES-enrolled farmer explained, “If I receive cash, I know I will spend it right away. Instead, I want these payments to create something that lasts.” This statement indicates not only reluctance to receive cash, but also recipients’ expectations of ‘integrated’ (often, paternalistic) interventions: the mediating NGO is assumed to deliver a readymade, complete ‘package’ of benefits. This may well be a rational preference if

Table 1. Perceived advantages and disadvantages of two PES payment modes in Santa Rosa (Santa Cruz, Bolivia), Fundación Natura. Cash and in-kind transfers compared.

Beehive pros/Cash cons	Cash pros/In-kind cons
- Some recipients reject money – it would be spent rapidly and leave no long-run benefits	- Some recipient little skilled and interested in beekeeping, thus losing benefits
- Paying cash “smells” more like losing property rights – whether that fear is rational or not	- Beehives are inflexible assets to sell, compared to animals or equipment
- Honey is a useful subsistence product	- Beehives are inflexible assets to subdivide, compared to cash
- Beekeeping includes an incentive to protect forest as bee habitat	- Extra training costs for implementing NGO
- Demonstration effect of bees and the sweet taste of honey give PES implementers more goodwill than a corresponding cash transfer	- Extra costs for recipients to benefit – beekeeping demands labor inputs

local capacities for saving, investment and entrepreneurship are limited. Other recipients said honey was a useful subsistence product, and receiving beehives caused less fear over land expropriation than cash transfers, whether such fears were rational or not.

For the NGO, the need for bee habitat provided an additional local incentive for conserving the forest. Also, the beehive 'demonstration effect' was claimed to bring more mileage than tiny corresponding cash payments would do. This is supported by psychological science claiming that low-value, in-kind payments can be more effective than low-value cash payments in stimulating effort, since recipients are more likely to view in-kind transfers as compatible with reciprocal exchange and "social markets" (Heyman and Ariely 2004).

However, local opponents wanting cash instead stressed the beehives' inflexibility as an asset, as well as the labor and skill requirements, implying that less-dedicated beekeepers would receive low or zero returns. The NGO training in beekeeping also constitutes an extra cost. Some recipients foreshadowed they would *sell* the next hives to those specializing in bees – thus creating an 'intra-village secondary market' exchanging bees for cash. Others said they would prefer in-kind alternatives, e.g. barbed wire to fence off their land and strengthen tenure. Unless it poses high incremental administrative costs, one could offer a menu of payment modes, even in the same village.

This small example shows that one is well-advised to investigate in advance what mode local people favor. Their preferences might vary across villages, families and even individuals within families, so that a customized approach is desirable. Recipient gender aspects should also be monitored, and in some cases collective rather than individual contract may be preferable (Section 8). In terms of periodicity, it is often desirable to mimic other regular income flows with small, frequent payments – even if compliance monitoring is done only once a year. This may be particularly relevant if cash payments are applied, and temptations for rapid spending are substantial. But one has to find out case by case what is most likely to increase welfare. Some recipients will prefer in-kind options, but cash-poor communities may clearly prefer cash. PES implementers should overcome the paternalistic prejudice that local people are generally unable to administer money going into their pockets.

Finally, it has been suggested that PES agreements could include contingent transfers of infrastructure, such as building a school or a road, or giving basic resource rights to local people, such as formal land tenure (Rosa, Kandel, and Dimas 2003; van Noordwijk, Chandler, and Tomich 2004). The problem here is that large or irreversible up-front benefits are dubious incentives for a continuous supply of contracted services over time. How can one credibly sanction non-compliance – a crucial concern for any contingent agreement? Possibly one could tie compliance to the running *maintenance* cost of infrastructure, e.g. to the costs of keeping a school or a road open. But even so that road maintenance might be taken over by a logging company or an agricultural investor promoting the exact opposite of the land use ES buyers had looked for. These types of incentives are thus generally more apt for ICDPs than for PES schemes. It makes extremely bad headlines for a conservation organization to come and destroy the locally built school or road, or to deprive people of their newly won land rights, just because they happened not to honor their side of the PES bargain.

8. Pro-poor PES?

At a time when overseas development assistance is increasingly focusing on poverty alleviation, it is no surprise that fads like PES are scrutinized for their potential to achieve this goal. Much hope exists that poor ES providers (e.g. remote upland farmers) can raise their incomes by receiving PES from the allegedly richer ES buyers (e.g. urban water users); indeed some donors are only interested in PES for their hoped-for, pro-poor effects.

Conceptually, it is convenient to look at three poverty-related sub-question (Grieg-Gran et al 2005):

- 1) *Participation*: what access to and 'market share' in PES schemes can poor potential ES providers compete for?
- 2) *Effects on ES sellers*: To the extent poor providers do get access, how does PES participation affect their livelihood?
- 3) *Effects on non-sellers*: How does PES affect poor people not selling ES (non-participating farmers, poor ES users, product consumers, landless laborers, etc.)?

8.1 Access to PES participation

Poor farmers seeking to become service sellers face both explicit PES access rules and underlying structural constraints. Explicit PES access rules can favor or disfavor smallholders. Examining six carbon and two watershed projects in Latin America, Grieg-Gran et al. (2005) found a mixed picture. Some rules discriminated against smallholders, such as formal-tenure requirements and the exclusion of agroforestry and silvopasture; others, such as maximum farm-size and targeting of underdeveloped regions, were pro-poor.

There are two major underlying structural constraints. First the 'poorest of the poor' often do not own or control any land, thus directly ruling them out as PES service providers – at least as long as the PES scheme is 'area-based'. PES is thus by its very nature more relevant to 'moderately poor' smallholders. Even those poor who control land often do not have formalized or fully secure tenure. As argued in Section 6, a pro-poor PES scheme could, in most cases, work its way around tenure informality, but effective land-use control is more difficult to enhance by external intervention.

A second structural constraint is the high transaction costs of dealing with many smallholders (or land owned collectively by internally conflictive communities), compared to only a few big landowners (Smith and Scherr 2002). This is exacerbated if there are economies of scale in service provision, e.g. when carbon sequestration requires a process of Kyoto certification with elevated fixed costs. Again, creative scheme design to 'bundle' smallholders, as currently experimented with in Costa Rica's national PES scheme, might alleviate that constraint. 'Bubble projects' for carbon sequestration are a similar cost-saving attempt to make ES commitments for an entire county or region, rather than individual landholders (ibid: 34-5). Obviously, this will move at least part of the transaction costs from the buyer to those seller institutions that have to make sure collective commitment is converted into a sufficient degree of individual compliance. All these measures can thus probably reduce transaction costs, but hardly eliminate the structural constraint proper. Working with three ES providers will almost always be easier than working with three hundred.

Naturally, these 'comparative disadvantages' of smallholders must be weighed against any corresponding advantages. In particular,



Two PES recipients from Nueva America, Pimampiro, Northern Ecuador. Payments are made by the town's water consumers to protect the forest in the headwater of the watershed (photo by Sven Wunder).

smallholders may have significantly lower opportunity costs of their labor and possibly of their (marginal) lands (Costa and Zeller 2003). As long as PES rates per land unit are low, wealthier actors with better capital and technology access and thus higher opportunity costs may not find it worthwhile to compete with poor ES suppliers. These potential advantages of poor ES suppliers may or may not make up for their higher transaction costs. Achieving high smallholder participation rates is also often simpler for highly spatially bound services (e.g. watershed protection) where buyers have to work with whomever occupies the targeted space, whereas the dilemma

of transaction costs becomes more apparent for homogenous services with a high degree of spatial mobility and competition (carbon sequestration, in particular).

8.2. Effect on ES sellers

Once poor service suppliers have made it through the eye of the selection needle or have obtained an ES market share, how are they likely to fare? As explained in Section 2, PES contracts are voluntary agreements, so individual service providers can only be made outright worse off if they are being cheated, *de facto* forced into participation, or just surprised by the *ex post* livelihood impacts (e.g. due to under-estimated opportunity costs) and local-economy derived effects (e.g. changing land or labor markets).

Of these possibilities, the latter is maybe the most likely (see discussion below) – though even here PES exit or renegotiation options may still exist. Cases where service sellers are being ‘PES trapped’ into a lasting negative livelihood outcome could potentially occur, e.g. with long-term land-use deals being signed under asymmetric access to information. But so far, convincing real-world examples of ‘PES trap’ cases seem to be lacking in the literature. Not only does PES offer an additional source of income in often cash-poor areas with low diversification, the cash flow is potentially also more stable than common alternative sources, such as cash crops with heavily fluctuating output prices. At least, this is the case if the PES program is well-administered and continuously funded, so that ES buyers fully meet their obligations (Pagiola, Arcenas, and Platais 2005).

Even if poor PES providers are likely to be better off, questions remain as to ‘how much’ and ‘in what way’ they will gain from participation. As in any commercial transaction, there is an inherent conflict over price between ES buyers maximizing consumer surplus (‘biggest conservation bang for the buck’) and ES providers boosting their producer surplus (PES payments net of opportunity costs). ES buyers will often, though not always, be in a better negotiating position on account of being fewer in number, more well-informed and initiative seeking than ES providers. For instance, more opportunity-cost studies have been done than willingness-to-pay studies; the buyers thus know more about the sellers than *vice versa*. Increasing organization and information levels among ES providers could sometimes improve their negotiating position.

Notwithstanding possible power asymmetries, in some cases PES come to constitute a noteworthy share of participants’ household income – at least as far as we can tell from all the preliminary studies that are available. In Costa Rica, PES payments accounted for more than 10% of family income in more than one quarter of participants (E.Ortiz, cited in Pagiola et al. (2005)); in Virilla PES payments averaged 16% of cash household incomes, but three-quarters of households there earned more than US\$820 monthly and were thus far from poor in the first place (Miranda et al. 2003). However, in poverty-struck zones the situation can be quite different. In Costa Rica’s Oca Peninsula, a small survey found that of PES recipients that were under the poverty line, the scheme lifted half above it and became the primary household cash income source in 44% of cases (Muñoz 2004). In Pimampiro (Ecuador), watershed-protection payments to poor upland *colonos* made up 30% of recipient households’ spending on food, medicine and schooling (Echavarría et al. 2004). PROFAFOR carbon projects in the low-income, high-altitude areas of Ecuador, and the Huetar Norte project in a disadvantaged region of Costa Rica both created some employment in the short run and an important plantation asset for future incomes (Miranda, Porrás, and Moreno 2004; Albán and Argüello 2004; Milne 2000). Obviously, all gains reported here are gross figures, since we do not know the size of opportunity costs (income forgone due to PES-induced land-use restrictions), which could be anything from zero to the size of the proper PES payment. Yet, at least for disadvantaged regions, the relative size of income PES contributions seems likely to have been quite significant.

Sometimes PES recipients gain more than just income from participation; non-monetary side benefits can be at least as important (Rosa, Kandel, and Dimas 2003). Three factors stand out here. First, PES participants perceive that PES contracts can help increase land-tenure security vis-à-vis neighbors or squatters by mapping and demarcating the land and by demonstrating an income-generating activity from it. This was found in various Latin American case studies by Rosa et al. (2003), but also in our Bolivia case (Santa Rosa) where forested land is highly threatened by landless migrants from the highlands. Second, PES participants tend to increase their ‘social capital’ by improving internal organization, e.g. when collective bargaining and action vis-à-vis the service buyers are needed (Rosa, Kandel, and Dimas 2003; Grieg-Gran, Porrás, and



Payments for environmental services are most effective in marginal lands where a modest payment can “tip the balance” in favor of conservation. Dry forest area in Costa Rica’s Guanacaste region, where pastures are abandoned and enrolled in the PES program (photo by Sven Wunder).

Wunder 2005). Some benefits accrue through PES ‘learning-by-doing’; others are provided in advance (e.g. formal training). This social-capital effect is generally to the advantage of local people in their other business dealings with the outside world. Some negative social effects (e.g. tensions between PES participants and non-participants) can also occur. Finally, the PES program works as a strategic ‘site propaganda’, increasing the visibility of the village or community vis-à-vis both donors and public entities. For instance, in Bolivia we found that some villages involved in landscape-beauty/ecotourism initiatives suddenly found it easier to attract a donor for a health clinic or get recognition from the municipality regarding their long-claimed land-tenure.

8.3. Effect on the non-ES selling poor

What happens to those impoverished people who are not participating in, but still are affected by PES? This is much harder to say, since this residual group is quite heterogeneous, and since impacts are dominated by complex secondary effects that occur in factor markets (land, labor) and in commodity markets (agricultural crops, forest products, etc.). It seems most relevant to look at three impoverished groups: service users, on-site landless people, and off-site actors in the value-added chain.

First, not all ES users are well-off agents. Poor tropical farmers are likely to suffer most from global warming since they lack the means to adapt their farming systems, and are thus particularly helped by mitigation efforts (IPCC 2001). Urban water users in shanty towns often receive their drinking water for free since their

taps are not metered; hence they free-ride on any PES-led improvement in water quality or availability. Free-riding ES consumers are thus made better off, yet their slightly more privileged counterparts in the next district who pay for water may well be made worse off, if water fees are rising to finance PES.

Second, in many cases the landless ‘poorest of the poor’ self-engage (or are being employed) in some of the most ES threatening activities, such as logging-company workers, firewood and charcoal makers, extractors over-harvesting NTFPs (non-timber forest products), or farm hands hired for clearing land and for cultivating converted soils. To the extent that the PES scheme is *use restricting* (Section 2), i.e. it caps planned forest-product extraction or agricultural conversion, groups involved in these activities will lose out in terms of employment or informal-sector income. For instance, PES restrictions were found to be likely to hurt traditional herder and NTFP harvester groups in India (Kerr 2002). In the Santa Rosa case, poor farmers enrolling in conservation PES want to protect themselves from the poorest-of-the-poor migrants coming to the village with the clear aim to occupy ‘idle’ land. This shows that subgroups of ‘the poor’ may have internally antagonistic interests vis-à-vis PES implementation. Conversely, if ES provision is *asset-building*, such as justifying planting trees in degraded landscapes with few productive alternatives, this can trigger a net expansion in rural jobs and benefit unskilled rural labor, thus alleviating poverty.

While effects thus can go both ways, in some cases their size can be significant. For instance, laid-off logging and sawmill workers were the main reason for compensatory ICDPs being implemented in the Noel Kempff Mercado Climate Action Project in Bolivia (Asquith, Vargas-Ríos, and Smith 2002). If PES is locally lucrative, it could increase competition for PES-eligible land, possibly to the detriment of the weakest actors’ access to that land (Rosa, Kandel, and Dimas 2003).

Finally, PES-induced rural changes can have off-site effects. For instance, the urban poor buying charcoal could be faced with higher prices if an important peri-urban, charcoal-production area is set aside for conservation. Conversely, these higher prices may benefit poor charcoal producers at other sites. If valuable timber rents end up mainly in the capital, then restricting timber harvests can indirectly affect poor people working in, say, the urban service sector stimulated by these rents. Cutting off raw-

material supply can have important downstream development impacts — which obviously should be compared to any ‘multiplier effects’ from PES financial injections. No empirical studies on these linkages exist; in most cases one would expect them to be smaller than on-site effects, but timber rents could be a prominent exception, as was shown in Section 6.

9. Conclusion and perspectives

9.1. When is PES the preferable conservation instrument?

“Give a man a fish and he’s set for supper. Teach him how to fish and he’s set up for life.”

This popular proverb expresses well the appeal of ICDPs and other indirect approaches: removing the obstacles to sustainable development (poverty, shortages of capital, technology and skills) would ‘fix the problem’ and make people embark on pro-conservation paths — in principle, forever. This message about the alleged synergy between development and environment from Brundtland and Rio 1992 was politically attractive, but unfortunately, in the conservation field, the flaws in the ‘teaching-to-fish’ strategy are increasingly apparent.

ICDPs attract two main criticisms. First, although you have taught the man to fish, he might still have enough time and resources to extract logs, shoot game, and clear forests — nothing *per se* obliges him to change his approach. Secondly, what does it take to teach the man to fish? If it takes one strategy paper, two village-development plans, three participatory workshops, four action researchers, a fish-processing plant and an army of project staff and consultants... it might just be cheaper to buy the man a fish every day. This is precisely the justification for PES — the promise of more efficiency from giving the man a fish as a direct reward, *if and only if* he conserves.

Notwithstanding the attractiveness of PES directness, various caveats remain. First, as an ES buyer you need a sustainable source of PES financing, often into infinity. Further, while demand may remain restricted, supply-driven expansion of environmental services is unrealistic. From the provider side, any random upland community cannot just decide

in a village meeting: “What are we going into this year, folks – watershed protection, biodiversity or landscape beauty”? Except for the geographically mobile carbon services, the spatially specific ES character will imply that the buyers or intermediaries will usually take the initiative, approaching providers because they realize the latter control a strategic and increasingly scarce environmental asset.

Second, one has to build the initial trust or “social capital” for PES. The man out there in the wilderness may believe when you offer him fish that you in fact want his land, or some other PES-camouflaged fishy business. Building that trust, and setting up the rules, monitoring and rewards, may be cumbersome, take time and require an ‘honest broker’ like an NGO as intermediary – yet success is still not guaranteed. Indeed, communities may not accept a *quid pro quo* agreement when they are accustomed to multiple donors and agencies offering benefits for free. Decades of paternalistic rural development projects may thus create expectations that are hard for innovative initiatives to break, even if both sides might be better off.

After all, PES can thus also involve high transaction costs. Certainly, there will be cases where outright land purchases are a more rational conservation strategy than the PES approach of buying time-bound land-use rights. In other scenarios, command-and-control will remain preferable to economic incentives. In yet other contexts, the ICDPs remain a better approach, since a ‘win-win’ switch to more sustainable *and simultaneously* profitable private production can actually be achieved through point-wise interventions – indeed an attractive option to the buyer, who would not need to go on paying forever. Perhaps a new generation of ‘contingent ICDPs’ will emerge. PES-ICDP hybrids could be short-run payments rewarding technological adoption, such as in the RISEMP project where ranchers receive conditional payments for two to four years, combined with technical assistance, in order to achieve lasting shifts from treeless to silvo-pastures (Pagiola et al. 2004). In other words, many non-PES approaches will also remain highly relevant, perhaps in new, more direct forms.

Conservation practitioners often feel irresistibly attracted to high-threat scenarios, where intervention seems most badly needed. Is this also where PES should preferably be used? Certainly PES makes sense only when there

is some current or projected threat; without threat there is no additionality and no *raison d’être* for PES. But if high threat means high opportunity costs, PES will usually not be the answer. Often there will simply not be enough funding available; in PES terms, it is best to ‘let go’ these scenarios, and possibly apply other tools. Conversely, if the desired land use is already privately more profitable than the non-desired one, it normally makes no sense to apply PES. PES is thus most useful in the *intermediate* range of positive but numerically small opportunity costs: degraded pastures, marginal croplands, forests in slow-moving agricultural frontiers, etc. Like other economic incentives, PES makes the most sense at the margin of profitability, when small payments to landowners can tip the balance in favor of a desired land use. It was also hypothesized that scenarios with *projected* threats could be ripe for PES as a form of environmental insurance.

9.2. How to design a PES scheme?

If one has chosen to go the PES route, what hints can one give about desirable PES design? Apart from a few exceptions (Costa Rican PES, some carbon projects), most tropical PES initiatives are incipient, so assessing their conservation and livelihoods impacts remains somewhat premature. Conceptually, it is wise to distinguish between ‘true PES’ and the much broader family of ‘PES-like’ initiatives. The former are few, the latter many – and converting some of the latter into the former would seem desirable in order to seriously try out the PES principles, especially conditionality. Area- vs. product-based PES, and state-run vs. private schemes, also infer some design differences. Use-restricting vs. asset-building schemes have different impacts on rural activity levels.

A baseline is essential for ES buyers to plan and later assess PES additionality, otherwise funding can be wasted paying for things that would have happened anyway. Some idea about ES providers’ conservation or restoration opportunity costs can be very helpful in this respect – often more helpful than hard-fought attempts to undertake full economic valuation of the ES flows proper. To reward basically anybody who ‘delivers an ES’, based on a politically attractive fairness principle (Rosa, Kandel, and Dimas 2003; van Noordwijk, Chandler, and Tomich 2004; Gutman 2003), seems unwise. First, current funding levels would fall far short of the money required for indiscriminate payments. The Costa Rican PES, with enrolment applications exceeding

available funding by about factor of three, is illustrative (Rojas and Aylward 2003).

Second, being a so-called 'ES provider' often just means *not being* an environmental vandal. Across-the-board entitlements could endorse blackmail by anybody owning a non-threatened asset, from Scandinavian forest owners threatening to cut down their trees to receive carbon payments, to remote indigenous people threatening to deliberately pollute a river to receive watershed payments from downstream users. It is crucial that the underlying 'victim pays principle' in PES should not be taken to such absurd extremes. On the contrary, payments need to be applied strategically in those cases where additionality can clearly be demonstrated. Only in this manner can users' willingness to pay over time be broadly enhanced. Yet this also means that people already living in approximate harmony with Nature, without any credible reason to endanger ES, nor any external threat, will generally not qualify as PES recipients.

If noble savages, nature lovers and farmers involuntarily being environmentally benign are not the prime targets of PES, then who should be paid? One should pay a critical mass of agents that both bear some current or projected conservation opportunity costs and have credible, site-specific claims. A timber company would qualify only if it has a concession and profits from it. A land squatter would require informal but widely respected and enforced claims on the land, and the prospect of privately benefiting from its extensive exploitation. ES buyers should not necessarily refrain from contracts with informal tenants as long as they can demonstrably deny access to third parties. Buyers may also use 'carrots' on top of existing legal 'paper sticks' that have proved ineffective, unless this glaringly leads to perverse incentives. These targeting options will be superior in private, localized PES schemes, as opposed to the state-run PES systems where flexibility and additionality will typically be lower.

Payment modes should be negotiated in advance with PES recipients, leading to a choice of cash, in-kind or technical assistance – or customized combinations of these. *De facto* irreversible benefits, like tenure-security provision, may eventually be a precondition for PES establishment, but they would not be effective incentives providing ES. Likewise, schemes biased towards large up-front benefits, whether cash or in-kind, are not compatible

with long-run, continuous service provision, and should generally be avoided. The choice of payment modes should consider whether the opportunity costs are in cash or forgone in-kind benefits. Mimicking regular income flows with small but frequent payments will often be socio-economically rational.

Will PES become a motor for poverty alleviation? The existing comparative assessments (Landell-Mills and Porras 2002; Rosa et al. 2003; Pagiola et al. 2005; Grieg-Gran et al. 2005) seem to conclude that:

- net positive effects for ES sellers are likely. Gains include non-income benefits, often in particular for moderately poor smallholders;
- some access rules and structural constraints hamper participation by the poor, while others are in their favor;
- PES has mixed effects on impoverished non-sellers, but the landless poor engaged in environmentally degrading activities could lose out significantly;
- the small scale of PES application generally also constraints poverty alleviation.

Perhaps the main take-home lesson is that if PES does not deliver the service, buyers will not continue to support it, and thus PES will also not benefit the poor. Well-meant targeting efforts should be careful not to jeopardize the basic functionality of PES. Poverty alleviation is an important side objective, which can be pursued through timely interventions (targeting, transaction-cost reduction, pro-poor premiums and subsidies), but it should never become the *primary* objective. If we impose a lot of side objectives on PES (poverty alleviation, gender, indigenous people, human rights, and other noble causes), PES would become the new toy of donors, NGOs, and government agencies. At the same time, the outreach to the private sector would be much more limited, thus losing new financing options. Eventually, PES would become 'old wine in new bottles', subsumed into the generic family of altruistic development projects to which they were actually meant to be an alternative.

Literature Cited

- Adams, W.M., R. Aveling, D. Brockington, B. Dickson, J. Elliott, J. Hutton, D. Roe, B. Vira, and W. Wolmer. 2004. Biodiversity conservation and the eradication of poverty. *Science* 306:1146-1149.
- Albán, M., and M. Argüello. 2004. Un análisis de los impactos sociales y económicos de los proyectos de fijación de carbono en el Ecuador. El caso de PROFAFOR - FACE. In *Mercados para Servicios Ambientales*, #7. London: IIED.
- Almeida, O., and C. Uhl. 1995. Developing a quantitative framework for sustainable resource use planning in the Brazilian Amazon. *World Development* 23:1745-1764.
- Asquith, N., M. Vargas-Ríos, and J. Smith. 2002. Can forest-protection carbon projects improve rural livelihoods? Analysis of the Noel Kempff Mercado Climate Action Project, Bolivia. *Mitigation and Adaptation Strategies for Global Change*, 4 September 2002, 323-337.
- Balmford, A., A. Bruner, P. Cooper, R. Constanza, S. Farber, R. Green, M. Jenkins, P. Jefferiss, V. Jessamy, J. Madden, K. Munro, N. Myers, S. Naeem, J. Paavola, M. Rayment, S. Rosendo, J. Roughgarden, K. Trumper, and R. Turner. 2002. Economic reasons for conserving wild nature. *Science* 297 (950-953).
- Balmford, A., and T. Whitten. 2003. Who should pay for tropical conservation, and how could the costs be met? *Oryx* 37 (2):14.
- Bayon, R. 2004. Making environmental markets work: Lessons from early experience with sulfur, carbon and wetlands. Washington DC: Forest Trends.
- Brandon, K., K.H. Redford, and S.E. Sanderson, eds. 1998. *Parks in Peril. People, politics and protected areas*. Edited by T. N. Conservancy. Washington DC: Island Press.
- Brundtland. 1987. Our Common Future. Report of the Brundtland Commission on Environment and Development. Oxford: Oxford University Press.
- Bruner, A., R. E. Gullison, R.E. Rice, and G.A.B. da Fonseca. 2001. Effectiveness of parks in protecting tropical biodiversity. *Science* 291:125-128.
- Costa, M.M., and M. Zeller. 2003. Peasants' production systems and the integration of incentives for watershed protection. A case study of Guatemala. Paper read at Forests, Livelihoods and Biodiversity, April 2003, at Bonn.
- Deci, E. L., R. Koestner, and R. M. Ryan. 1999. A meta-analytic review of experiments examining the effects of extrinsic rewards on intrinsic motivation. *Psychological Bulletin* 125:627-668.
- Echavarría, M., J. Vogel, M. Albán, and F. Meneses. 2004. The impacts of payments for watershed services in Ecuador. In *Markets for Environmental Services*. London: IIED.
- Ferraro, P., and A. Kiss. 2002. Direct payments to conserve biodiversity. *Science*, November 29, 2002., 1718-1719.
- Ferraro, P., and R. Simpson. 2002. The cost-effectiveness of conservation payments. *Land Economics* 78 (3):339-353.
- Ferraro, P.J. 2001. Global habitat protection: limitations of development interventions and a role for conservation performance payments. *Conservation Biology* 15 (4):990-1000.
- Grieg-Gran, M. 2000. Fiscal incentives for biodiversity conservation: The ICMS Ecológico in Brazil. In *IIED Environmental Economics Discussion Paper #00-01*. London: International Institute for Environment and Development.
- Grieg-Gran, M., I.T. Porras, and S. Wunder. 2005. How can market mechanisms for forest environmental services help the poor? Preliminary lessons from Latin America. *World Development* (accepted).
- Gutman, P., ed. 2003. *From goodwill to payments for environmental services*. Washington DC: WWF, Macroeconomics for Sustainable Development Program Office.
- Hanlon, J. 2004. It is possible to just give money to the poor. *Development and Change* 35 (2):375-383.
- Hardner, J., and R. Rice. 2002. Rethinking green consumerism. *Scientific American* May:89-95.
- Heyman, J., and D. Ariely. 2004. Effort for payment. A tale of two markets. *Psychological Science* 15 (11):787-793.
- IPCC. 2001. Summary for policy makers. Climate change 2001. Impacts, adaptation, and vulnerability. In *A report of working group II of the Intergovernmental Panel on Climate Change*.: Intergovernmental Panel on Climate Change.
- James, A., K. Gaston, and A. Balmford. 2001. Can we afford to conserve biodiversity? *BioScience*, 43-52.
- Kaimowitz, D. 2004. Forest and water: a policy perspective. *Journal for Forest Research* (9):289-291.
- Karsenty, A. 2004. Des rentes contre le développement? Les nouveaux instruments d'acquisition mondiale de la biodiversité et l'utilisation des terres dans les pays tropicaux. *Mondes en développement* 127 (3):1-9.
- Karsenty, A., and R. Nasi. 2004. Un commentaire sur l'article de E. Niessen et R. Rice. Les "concessions de conservation" sonnent-elles le glas de l'aménagement forestier durable? *Revue Tiers Monde XLV* (177):153-162.
- Kerr, J. 2002. Watershed development, environmental services, and poverty alleviation in India. *World Development* 30 (8):1387-1400.
- Landell-Mills, N., and I.T. Porras. 2002. *Silver bullet or fool's gold? A global review of markets for forest environmental services and their impact on the poor, Instruments for Sustainable Private Sector Forestry*. London: IIED.
- Margulis, S. 2003. "Causas do desmatamento de Amazônia brasileira." 100. World Bank: Brasília.
- May, P.H., F. Veiga Neto, V. Denardin, and W. Loureiro. 2002. Using fiscal instruments to encourage conservation: municipal responses to the 'ecological' value-added tax in Paraná and Minas Gerais, Brazil. In *Selling forest environmental services. Market-based mechanisms for conservation and development*., edited by S. Pagiola, J. Bishop and N. Landell-Mills. London & Sterling: Earthscan.
- Milne, M. 2000. Forest carbon, livelihoods and biodiversity. A report to the European Commission. Bogor: CIFOR.
- Miranda, M., I. Porras, and M. Moreno. 2003. The social impacts of payments for environmental services in Costa Rica. In *Markets for environmental services #1*. London: IIED.

- Miranda, M., I.T. Porras, and M.L. Moreno. 2004. The social impacts of carbon markets in Costa Rica. A case study of the Huetar Norte region. In *MES*. London: IIED.
- Mohr, E. 1990. Burn the forest!: a bargaining theoretic analysis of a seemingly perverse proposal to protect the rainforest: Kiel Institute of World Economics.
- Muñoz, R. 2004. Efectos del programa de servicios ambientales en las condiciones de vida de los campesinos de la Península de Osa, (thesis), Evaluación de Programas y Proyectos de Desarrollo, Universidad de Costa Rica, San José.
- Nielsen, E., S. Ratay, and R. Rice. 2004. Achieving biodiversity conservation using conservation concessions to complement agroforestry. In *Agroforestry and biodiversity conservation in tropical landscapes*, edited by G. Schroth, G. A. B. da Fonseca, C. A. Harvey, C. Gascon, H. L. Vasconcelos and A.-M. N. Izac. Washington, Covelo & London: Island Press.
- Nielsen, E., and R. Rice. 2004. Sustainable forest management and conservation incentive agreements. *International Forestry Review* 6:56-60.
- Pagiola, S., P. Agostini, J. Gobbi, C. de Haan, M. Ibrahim, E. Murgueitio, E. Ramírez, M. Rosales, and P.R. Ruíz. 2004. Paying for biodiversity conservation services in agricultural landscapes. In *Environment Department Paper #96*. Washington DC: World Bank.
- Pagiola, S., A. Arcenas, and G. Platais. 2005. Can payments for environmental services help reduce poverty? An exploration of the issues and the evidence to date. *World Development* 33 (2):237-253.
- Pagiola, S., J. Bishop, and N. Landell-Mills, eds. 2002. *Selling forest environmental services. Market-based mechanisms for conservation and development*. London & Sterling: Earthscan.
- Pagiola, S., and I.-M. Ruthenberg. 2002. Selling biodiversity in a coffee cup: shade-grown coffee and conservation in Mesoamerica. In *Selling forest environmental services. Market-based mechanisms for conservation and development.*, edited by S. Pagiola, J. Bishop and N. Landell-Mills. London & Sterling: Earthscan.
- Pearce, D., F. Putz, and J. Vanclay. 2003. Sustainable forestry in the tropics: panacea or folly? *Forest Ecology and Management* 172 (2-3):229-247.
- Poore, D.P. 2003. *Changing landscapes. The development of the International Tropical Timber Organization and its influence on tropical forest management*. London & Sterling: Earthscan.
- Rice, D., R.E. Gullison and J.W. Reid. 1997. *Can sustainable management save tropical forests?* New York: Scientific American.
- Robertson, N., and S. Wunder. 2005. Fresh tracks in the forest: Assessing incipient payments for environmental services initiatives in Bolivia (draft). In *CIFOR*. Bogor.
- Rojas, M., and B. Aylward. 2003. What are we learning from experiences with markets for environmental services in Costa Rica? *A review and critique of the literature*, November, 102.
- Romero, C., and G.I. Andrade. 2004. International conservation organizations and the fate of local tropical forest conservation initiatives. *Conservation Biology* 18 (2):578-580.
- Rosa, H., S. Kandel, and L. Dimas. 2003. Compensation for environmental services and rural communities. San Salvador: PRISMA.
- Salafsky, N., and E. Wollenberg. 2000. Linking livelihoods and conservation: A conceptual framework and scale for assessing the integration of human needs and biodiversity. *World Development* 28 (8):1421-1438.
- Sayer, J.A. 1995. *Science and international nature conservation*. Bogor, Indonesia: Center for International Forestry Research (CIFOR).
- Scherr, S., A. Khare, and A. White. 2004. For services rendered. Current status and future potential of markets for ecosystem services of tropical forests: an overview. In *Technical Series #21*. Yokohama: International Tropical Timber Organization (ITTO).
- Scherr, S., A. White, and A. Khare. 2004. Tropical forests provide the planet with many valuable services. Are beneficiaries prepared to pay for them? *ITTO Tropical Forest Update* 14 (2):11-14.
- Shilling, J., and J. Osha. 2003. Paying for environmental stewardship. Washington DC: WWF Macroeconomics for Sustainable Development Program Office.
- Simpson, R., and R.A. Sedjo. 1996. Paying for the conservation of endangered ecosystems: a comparison of direct and indirect approaches. *Environment and Development Economics* 1:241-257.
- Smith, J., and S. Scherr. 2002. Forest carbon and local livelihoods: assessment of opportunities and policy recommendations. In *CIFOR Occasional Paper*. Bogor, Indonesia: CIFOR.
- Sokolow, A.D., and A. Zurbrugg. 2003. A national view of agricultural easement programs. Davis (CA): Center for Agriculture in the Environment, American Farmland Trust.
- van Noordwijk, M., F. Chandler, and T.P. Tomich. 2004. An introduction to the conceptual basis of RUPES. In *Rewarding Upland Poor for Environmental Services*. Bogor: ICRAF - World Agroforestry Center.
- Vogel, J. 2002. Markets or metaphors? A sustainable livelihoods approach to the management of environmental services: two cases from Ecuador. London & Quito: IIED & Ecodecisión.
- Wunder, S. 2001. Poverty alleviation and tropical forests - what scope for synergies? *World Development* 29 (11):1817-1833.
- Wunder, S., B. Campbell, R. Iwan, J.A. Sayer, and L. Wollenberg. 2004. When donors get cold feet: The community conservation concession in Setulang (Kalimantan, Indonesia) that never happened, chapter for submitted for Bishop, Pagiola & Wunder (eds): *Buying biodiversity* (Earthscan).
- Wunder, S., Bui Dung The, and E. Ibarra. 2005. Payment is good, control is better: why payments for environmental services so far have remained incipient in Vietnam (draft). In *CIFOR*. Bogor.
- Wunder, S., and M.T. Vargas. *Beyond "markets" - why terminology matters* 2005, March 2005, Available from http://ecosystemmarketplace.net/pages/article_opinion.php?component_id=1252&component_version_id=2354&language_id=12

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