

ACCESS AND BENEFITS IN PAYMENTS FOR ENVIRONMENTAL SERVICES, FOREST CONSERVATION AND CLIMATE CHANGE: LESSONS FROM A GLOBAL REVIEW

S. Mahanty, H. Suich and L. Tacconi¹

Abstract

This paper presents findings from a recent global study that assessed the impacts of Payments for Environmental Service (PES) schemes on livelihoods, and implications for the design of incentive mechanisms for Reducing Emissions from Deforestation and forest Degradation (REDD). It focuses particularly on two key areas that are important to the local impacts of PES and REDD schemes: (i) whether tenure and wealth filter access to schemes by local resource users and managers and (ii) how the design of contracts and the configuration of payments and other benefits impact local livelihoods and the sustainability of schemes. In terms of access, the PES schemes reviewed occurred on land falling under diverse tenure arrangements, and full ownership rights were not a prerequisite for PES agreements, but the criteria for selecting the location and participants for schemes were important access determinants. The schemes did provide some benefits to participants, for instance a small amount of additional income to participating households, and investments in community infrastructure and services where payments were made to community bodies. Payments were often well below the opportunity costs faced by participants over the life of the scheme, however, which could diminish positive impacts on local livelihoods and ultimately undermine the sustainability of such schemes. Passing on transaction and monitoring costs to participants also reduced the flow of benefits to local actors, and payment schedules often did not cover the full duration of the PES contract, which diminished the likely sustainability and conditionality of the schemes. Such factors will have to be clearly addressed in the design of REDD schemes.

Key words: forests, environmental services, REDD, livelihoods, rights, benefit sharing

1 INTRODUCTION

In a Payment for Environmental Services (PES) scheme, the providers of an environmental service receive payments for the adoption of land uses and practices that maintain those services. There is strong interest amongst governments, donors and conservation organisations in PES schemes because of their potential to mobilize new financial resources for forest conservation. Enthusiasm for PES is not unalloyed; at issue are questions of social impact and long-term viability – whether such schemes, on balance, create more opportunities than risks for rural resource users and managers.

The heightened interest in PES has emerged because international climate change discussions envisaged such schemes as an important mechanism to provide local incentives for reducing emissions from deforestation and forest degradation (REDD²), resulting in the conservation and enhancement of carbon stocks. This development has heightened interest in learning from past and present PES schemes, to ensure that REDD

¹ All authors are affiliated with the Australian National University, Canberra, Australia. This research was supported by a grant from the Australian Agency for International Development (AusAID): EFCC083 “Assessing the livelihood impacts of incentive payments for avoided deforestation”.

² The term used for REDD in the UNFCCC is REDD-plus, which includes deforestation, forest degradation and enhancement of carbon stocks. REDD is used here for simplicity to refer to REDD-plus.

develops with an awareness of the rights and livelihoods of local resource users and managers.

The research presented in this paper aims to investigate the livelihood impacts of current PES schemes and to determine what lessons could be drawn to inform the design and implementation of REDD schemes. While the full study looks broadly at impacts on key livelihood assets and factors determining access to REDD, this paper focuses on two of most significant areas of international debate about the viability and equity of REDD: (i) the role of tenure and wealth in filtering access to PES schemes and (ii) contractual arrangements, particularly how the configuration of payments impacts rural livelihoods and the long-term viability of schemes. We start with a brief discussion of key concepts related to PES, REDD and livelihoods, followed by an overview of the study methodology and findings. We then examine what the findings mean for the design and implementation of REDD schemes, if such schemes are to mitigate adverse impacts on rural livelihoods.

2 ASSESSING THE LIVELIHOOD IMPACTS OF PES: CONCEPTUAL ISSUES

A PES scheme is commonly defined as a voluntary transaction where a well-defined environmental service (ES) (or a land-use likely to secure that service) is 'bought' by a (minimum of one) ES buyer from a (minimum of one) ES provider, if and only if the ES provider secures ES provision (conditionality) (Wunder 2005: 3). We work with this definition (primarily because it was widely accepted when the research started in 2008) in order to have an agreed framework for the case studies and to maintain consistency across cases.

In reality, however, PES schemes seldom resemble the ideal model described by Wunder (2005). Many schemes have been implemented in situations where there is no functioning environmental service market with clearly delineated buyers or sellers (Corbera et al. 2007a, Corbera et al. 2007b). For this reason, governments and non-government organisations have often played an important role in facilitating agreements between potential buyers and sellers – and thus developing markets – though this critical intermediary role goes unrecognised in the original definition of PES (Vatn 2010). In addition to their facilitating role, many PES schemes have in fact been financed by those governments or non-government organizations (Engel et al. 2008).

2.1 PES and REDD

Although REDD has followed a distinct trajectory to PES, tied to the international climate change policy arena, there are important connections between REDD and PES. REDD in one sense represents PES writ large, where developed countries provide conditional financial incentives to developing countries to undertake forest conservation measures. As noted, PES is also flagged as a likely mechanism to link national level REDD payments to sub-national resource management activities, in order to deliver localised incentives and benefits to forest users and managers within developing countries (Angelsen et al. 2008). For example, governments could use a PES mechanism to provide financial incentives for reducing emissions on private, community or even state lands, according to the amount of carbon conserved by these stakeholders.

As with any market mechanism, welfare improvement was never a core objective of PES. However concerns about livelihood impacts have gained greater significance with the potential for the number and geographical coverage of environmental service agreements to increase exponentially under REDD. The concerns of community and indigenous advocacy organizations centre on the fact that REDD schemes will target forests that are

formally state owned, potentially disenfranchising resource users with unrecognised rights in the design and implementation of REDD schemes. Some have cautioned that implementation of REDD schemes without due regard to rights and livelihood issues could increase risks including renewed and even increased state and 'expert' control over forests to protect lucrative forest carbon reservoirs, and the unequal imposition of the costs of forest protection on indigenous peoples and local communities (Griffiths 2007; Sikor et al. 2010) without enabling those communities to benefit from payments for improved environmental service provision. Distributive mechanisms to share REDD income at the local level are therefore considered integral to the equity and effectiveness of REDD. This is particularly so with respect to state forests that neighbour or are inhabited by communities without recognised use and/or management rights, or recognition, for example, of ancestral rights over certain areas. Such communities may bear the greatest costs of landuse restrictions associated with REDD and, advocates argue, should therefore gain a share of associated benefits (Griffiths 2007).

The possible future connection between REDD and PES schemes make the experiences of existing PES schemes, which have been under implementation for several years, of considerable interest for REDD. An analysis of the type presented here can generate a clear understanding of the livelihood impacts of existing PES schemes so that critical lessons can inform the development of REDD mechanisms.

2.2 Access to schemes

Access to PES schemes is a critical influence on their livelihood impacts because access determines who benefits, and who does not. The barriers to participation also need to be understood given that non-participants may suffer negative impacts such as inflation in land prices and loss of informal resource access (Landell-Mills and Porras 2002). The significance of access in understanding potential winners and losers from PES schemes has prompted scholarly attention to key determinants of access (Pagiola et al. 2005), which have been grouped into three main areas.

Eligibility constraints: Key constraints include (i) whether individual households satisfy any requirements for land ownership, which have been common in PES schemes and automatically exclude the rural landless, and (ii) the criteria used to determine the location of schemes, for example targeting a specific conservation area or watershed (Pagiola et al. 2008; Wunder 2008).

Desire to participate: whether, once eligibility is satisfied, households are willing to participate given the expected benefits of participation (Pagiola et al. 2008; Wunder 2008).

Ability to participate: whether households have the capital and resources to negotiate and implement an agreement (Pagiola et al. 2008; Wunder 2008).

The above research particularly addresses the question of whether poor households have been able to address PES schemes and, therefore, whether PES has the potential to contribute to poverty alleviation. In this paper, poverty is considered not just as a lack of material income or financial assets, but also the lack of basic capabilities that enable a person to live a life and make choices that he or she values (Sen 1992). As such, poverty may involve deprivation across critical social, political and personal assets that go well beyond financial resources (Bebbington 1999; World Bank 2002). Given that new primary data was not collected for this study, only Rios and Pagiola (2010) conducted a disaggregated analysis of participation in relation household-level poverty based on their existing data. Thus the term 'poor households' in this paper refers to households that are

asset and income deprived according to the indicators of the case study country. These categories are highly context specific, but broadly represent a reduced ability to access and effectively use the five livelihood asset types to improve their situation, as well as facing higher levels of risk, vulnerability and powerlessness (Hobley 2007), relative to their neighbours.

Prior research on access to PES schemes by poor households has in some respects been optimistic about the capacity of poor households to participate, drawing primarily on Latin American experiences (Pagiola et al. 2008; Wunder 2008). These authors also recognise, however, that informal and insecure land tenure, as well as high transaction costs associated with agreements with smallholders act to constrain access by poor households (Pagiola et al. 2008; Wunder 2008). Three main categories of tenure – private ownership, customary or common property, and state domain – are used in our analysis of tenure in PES schemes (von Benda-Beckmann et al. 2005). Rights over land and resources are not always clear cut; access, use, management and transfer rights over different resources in the same geographical area often overlap (Schlager and Ostrom 1992). Data limitations restrict us from considering tenure in its full complexity, but we do consider the interplay of formal rights – those recognised by states – and informal rights (that are unrecognised by states), because the risk that REDD might pose to informal rights has been a major concern in the REDD debate.

2.3 Livelihood impacts

Livelihoods broadly encompass ‘the capabilities, assets (stores, resources, claims and access) and activities required for a means of living’ (Chambers and Conway, 1991: 6). They are dynamic, involving continuous management and modification of assets and choices about trading off and/or drawing down natural, financial, human, physical and social–political assets (Scoones 1998, Bebbington 1999). The use of the livelihoods framework usefully directs attention away from a sole focus on income, to consider how PES schemes interact with a wider set of natural, financial, human, physical and social–political assets and processes available to households (see Corbera 2010). The scale of analysis is the household, and the focus is on understanding changes to the five above-mentioned asset types; for instance in terms of financial flows and assets, and access to or ownership of land.

Scoones (2009) challenges this focus on household level assets alone, as it can detract from attention to distributional issues that hold important equity implications. Applying the sustainable livelihoods framework also presumes that most benefits flow to – and can therefore be best measured – at the household level. Although this research focused primarily on household level impacts (Section 4.3), some of the cases provided findings on community level impacts, which are described where appropriate.

3 METHODS

This research applied a multiple case study approach (Yin, 2009) to assess and compare livelihood impacts across eight case studies of PES schemes.

The impacts of each PES scheme were analysed in relation to the biophysical environment, the livelihoods of participants and of non-participants. Case study authors were asked to address a number of specific research questions for each livelihood asset category (Table 1) and the impacts on participants and non-participants belonging to different wealth strata, for instance, the poorest versus less poor. However, as most of the

cases selected drew on existing data collected by the authors, it was not possible for each case study to address every thematic question.

Table 1 Research questions on livelihood impacts of PES schemes

Assets	Key questions
Financial	Does the PES scheme increase the overall income of participating households? (compared with opportunity costs of alternative activities, appropriately discounted) Is a diversity of income sources for participants sustained? Does the PES scheme contribute to increases in the cost of living?
Human	Does the PES scheme improve capacity, skills and knowledge, and for whom? Does the PES scheme impact on health? Is PES income (especially at the community level, if any) invested in education and health improvements?
Natural	Does the PES scheme contribute to a change in access to resources, particularly in common property regimes? Does the PES scheme result in a change of the perceived status/value of natural resources? Does the PES scheme affect resource tenure (that is, land tenure, access to common resources)? Does the PES scheme affect cultural motivations for environmental protection?
Social/political	Does the PES scheme impact on the social capital of the relevant local communities? Does the PES scheme impact on coordination and influence with wider institutions and decision-making processes?
Physical	Does the PES scheme impact on investment in local infrastructure?

On the basis of the thematic questions outlined in Table 1, a cross-case comparative analysis was conducted, in order to identify and compare relevant findings from each study. Case study material was coded to enable systematic comparison of findings against the relevant questions. As noted above, an acknowledged limitation of this research was that it drew on existing data. Gaps are noted, where relevant, in the results below.

The case studies were selected through an open call, based on several criteria that were developed to maximise the relevance of findings for REDD. We believed that a range of factors had the potential to greatly affect the livelihood outcomes of PES schemes, including the scale of the scheme, its geographical location and the land tenure arrangements of the land on which the scheme was implemented. As a result the following criteria were chosen to ensure the case studies represented the widest range of PES scheme design possible, to reflect the widest possible range of livelihood impacts. It was hoped that this would allow an analysis of the widest range of experiences possible, maximising the potential for lessons learned from PES implementation, and the implications for REDD. Cases were therefore:

- drawn from countries or geographic regions with high deforestation rates that are likely targets for REDD;
- selected to represent a range of project scales from national to sub-national (although the majority of those selected are sub-national);
- selected so that different types of tenure, including private, common property and state lands were considered; and

- implemented over a sufficient period of time to assess the impacts of payments or other benefits.

As most carbon PES schemes have been implemented only relatively recently, the final criteria required the inclusion of schemes that worked with a range of environmental services such as biodiversity and watershed protection.

Seven of the selected cases dealt specifically with projects from countries in Africa, Asia and Latin America. The eighth dealt with the multi-project PES portfolio of the Global Environment Facility (GEF), with particular reference to schemes in Costa Rica and Mexico (Table 2). The latter study was selected because of the opportunity it provided to derive lessons from a range of approaches to PES in multiple countries, implemented in differing national contexts. The scale of the selected schemes ranged from nation-wide to sub-national and small-scale village or multi-village schemes, and the schemes were implemented on state-owned land, common property and private property. This paper draws particularly on the seven country-based case studies.

Table 2 Characteristics of case studies

Case study (Author)	Environmental service targeted	Scale of scheme	Ownership of land
Global GEF review, particularly Costa Rica and Mexico (Haskett and Gutman)	Variety of case studies including carbon, watershed protection	National to sub-national	State, common property, private
Mexico* (Corbera)	Carbon (also hydrological services, biodiversity and agroforestry)	National	Common property and private
Brazil* (Bartels et al.)	Bundle – reduced deforestation, carbon sequestration, biodiversity conservation, hydrological functions, fire management	Sub-national (nine states of the Amazon region)	Private and collective (also one group with no recognised tenure)
Indonesia* (Leimona et al.)	Watershed protection	Sub-national (watershed spanning two regencies and six sub-districts)	Private
Philippines (Soriaga and Annawi)	Watershed protection	Sub-national (spanning multiple local government units)	State
Uganda (German et al.)	Carbon	Sub-national (small scale)	Private and state
Mozambique	Carbon	Sub-national (small scale)	Common property

(Jindal)		scale)	
Nicaragua and Colombia (Rios and Pagiola)	Biodiversity conservation, carbon sequestration	Sub-national (small scale)	Private

The five cases marked with an asterisk considered schemes in countries that are listed in the top 20 deforesting countries (FAO 2006), as these are priority targets for REDD. Two were in geographic areas that have a country in the top 20 list, and one study reviewed several PES projects funded by the GEF.

4 RESULTS

The results of the study contribute to the empirical understanding of livelihood impacts from PES schemes. The focus of this section is on the findings about factors determining access to schemes (Section 4.1) and contractual arrangements (Section 4.2), followed by an overview of the remaining livelihood impacts and the environmental outcomes of the schemes (Section 4.3).

4.1 Access to PES schemes

This section examines factors constraining the eligibility of households, particularly poor households, to participate in PES schemes. It also examines other factors that constrained the ability of prospective participants to participate once initial eligibility requirements were addressed. Case study findings were silent on the question of willingness to participate in schemes, so no findings are presented on this point.

Almost all studies explicitly reported participation by poor households to some degree. The only study that did not comment on participation by poor households was the Indonesian study, where the researchers found villagers at the PES site to have relatively similar land holdings and assets, (Leimona 2010). The Nicaragua-Colombia case authors disaggregated their analysis to look at participation by different categories of poor households, finding that although there was strong participation by the poor, the poorest households were less well represented amongst participants.

4.1.1 Eligibility to participate

A necessary condition for PES is said to be the identification of 'land stewards with reasonably good control over clearly delimited lands' (Wunder 2009: 221). In many PES schemes this is ensured by focusing on private property, often precluding access to schemes by the rural poor, particularly those with weak or non-existent land rights (Pagiola et al 2008; Wunder 2008). This research does not fundamentally challenge the conclusion that a lack of clear and secure tenure can preclude access to PES schemes, but highlights that such rights can occur outside of the privately owned lands that have commonly been targeted in PES schemes. Several schemes considered in this study were developed on common property, or on state lands where residents had recognised use rights. . Table 3 relates reports of participation to the tenure context for different PES schemes.

Table 3 Participation and tenure

Case	Reported participation by poor HH	Tenure
Brazil	Yes	State and private: • 60% of participants in state-owned extractive

		reserves (20–30 year leases)
		<ul style="list-style-type: none"> • 40% are private landholders • one community awaiting official recognition of title to independently settled land.
Indonesia	N/A	Private
Philippines	Yes	State land under ancestral domain claim
Uganda	Yes	State and private: participants are farmers or farmer groups with private land or use rights over national forest reserves
Mozambique	Yes	Common property that includes: <ul style="list-style-type: none"> • community woodlands • household farm plots
Nicaragua-Colombia	Yes	Private
Mexico	Yes	Common property (<i>ejidos</i>) (90%) and private landholders (10%)

Source: case studies in Tacconi et al. (2010).

A relationship was observed between agreements on common property and notably high levels of participation by poor households. For example, in Mexico, the *ejidos* overlap with high poverty incidence (Haskett and Gutman 2010; Corbera 2010); and in Mozambique: 80% of local households were enrolled in the PES scheme; of which 85% were below the poverty line (Jindal 2010).

A Mexican scheme in the GEF portfolio – Payments for Forest’s Hydrological Environmental Services Programme (*Programa de Pagos por Servicios Ambientales Hidrológicos de los Bosques*, PSA-H) – was developed by the government of Mexico, with a focus on increasing fresh water availability, particularly groundwater (Haskett and Gutman 2010). The project explicitly aimed to improve the socio-economic status of marginalized communities by focusing on *ejidos*, rural communities on legally recognized communal lands. Targeting areas with known high rates of poverty, as well as the scope to work with communal lands, contributed to the high rate of involvement by poor households in that scheme (ibid).

In the Mozambican case, land reforms have placed the land covered by the project under communal ownership, and individual households may take up subsistence farming on small plots. Although individual tenure is less secure as households do not possess title deeds, once a household starts farming a certain plot of land, it has *de facto* ownership of that plot (Jindal 2010). For these reasons, and because the project targeted both individually farmed areas and community woodlands, land access was not a constraint to participation by poor households. On the other hand, the same study found that households with larger resource endowments, in terms of farm area and employment were more likely to adopt agroforestry contracts rather than rely on income from the community woodlands activity.

The Nicaragua-Columbia project, which focused on private landowners, was a third case that reported high rates of participation by poor households (Rios and Pagiola 2010). Participation was assessed in relation to the relative contribution of poor households to improved land management outcomes, rather than assessing the overall proportion of poor households in the scheme. The authors conclude that poor households contributed significantly to the environmental outcomes of the scheme.

As noted earlier, lack of secure tenure has been cited as a major constraint to access in PES schemes (Pagiola et al. 2008; Wunder 2008). In this set of case studies, lack of land ownership did not necessarily constrain local participation in schemes. For instance, the Philippines case involved agreements between the central government (Department of Environment and Natural Resources) and local government units (*barangays*) to protect the fire-prone pine forests of Mountain Province, part of the Cordillera Administrative Region in northern Philippines and the ancestral domain of several indigenous groups. The design of the agreement to focus on *barangays* and state lands meant that in this case also, eligibility was not constrained by a lack of land ownership (Soriaga and Annawi 2010). The implications of this contractual arrangement for benefit distribution are significant, and are discussed in more detail in Section 4.3.

Another example is Brazil's *Proambiente* program, where around 60% of households lived in extractive reserves, which are located on state land with 20–30 year concessions granted to communities. Eligibility for schemes was determined on the basis of social criteria rather than land ownership, including support by grassroots organisations (e.g. Federation of Workers of Amazonia, Coordination of Indigenous Nationals of Amazonia and others) (Bartels et al 2010).

In both of these cases, the legal context played a critical role. The common property schemes both evolved within a policy context where common property was formally recognised by the state. In the Philippines case, while there was no transfer of rights on the part of the state; the contractual agreement was made with a local government unit. In the Brazilian case, a significant proportion of participants were concessionaires holding (legal) use rights to state land.

A third key factor in access to schemes was the criteria for selecting sites. Some schemes used social criteria to select participants, for instance the Brazilian *Proambiente* program: “A total of 4,214 families are registered with *Proambiente*. Family selection was not focused primarily on environmental criteria. In fact, *Proambiente* families were targeted mostly in accordance with their social and political associations” (Bartels et al. 2010: 85)

Indeed, Bartels et al. (2010) characterise *Proambiente* as a rural development program, an indication of its strong focus on social and economic welfare alongside environmental outcomes. Similarly, the Mexican PSA-CABSA project (the PES scheme for carbon, biodiversity and agroforestry) targeted poor indigenous communities due to strong advocacy by peasant and forest-based organizations, who saw an opportunity to promote returns to communities engaged in forest conservation and shade coffee production (Corbera 2010).

The examples above show that eligibility criteria with social objectives in mind can potentially broaden access to PES schemes. Haskett and Gutman though note the possibility of diminished environmental outcomes if social targeting takes precedence: “Mexican PES programmes seem to do better socially than environmentally and there may in some instances be a trade-off between these two goals. In some instances, environmental goals have not been optimally achieved. Several studies have found that areas at very high or high risk of deforestation are currently under-represented in the [PSA-CABSA , the carbon] programme, while areas of low or very low risk of deforestation are over-represented. Similarly, overexploited aquifers were under-represented in the payment areas of the current PSA-H programme,

while the majority of payments go to areas where aquifers are in equilibrium or had a margin for expanded use.” (Haskett and Gutman 2010:44)

While the evidence on trade-offs is limited within this research, this is an important issue for REDD schemes (see Section 5.2) and is worthy of further investigation.

4.1.2 Ability to participate

Meeting eligibility criteria to join PES schemes does not automatically ensure that prospective participants are able to enter agreements in practice. This section focuses on key findings in relation to the *ability* of prospective participants to access schemes.

The case studies found that the level of skills, education and negotiating capacity of environmental service sellers were key determinants of whether they were able to participate in PES schemes. This was typically recognised by program designers prior to implementation, and thus capacity-building was considered an important prerequisite to enable broad access to PES schemes. The training provided by PES schemes ranged from activities to improve local understanding of PES, through to technical assistance regarding implementation activities and governance of local bodies (Table 4).

Table 4 Capacity building activities

	Environ- mental awareness	Land manage- ment	Traditional ecological knowledge	Gover- nance of local bodies	Business develop- ment	PES
Indonesia	X	X		X	X	X
Philippines	X	X	X			X
Mozambique		X			X	X
Uganda	X	X	X			X
Brazil		X		X		X
Mexico						X
Nicaragua/ Columbia		X				X

However, there was little evidence presented of the long-term impact of capacity-building activities, or the extent to which new knowledge and skills were applied in practice. In a number of cases (e.g. Mozambique, Uganda and Indonesia), farmers showed persisting confusion about the details of their PES contracts, suggesting that capacity-building outcomes were weak. For instance, in Mozambique, the fact that payments were going to end in year seven of a 100-year contract was not fully understood by many of the participants (the implications for the sustainability are discussed in Section 5.1).

The lack of skills and knowledge of some intermediaries was also noted in some cases (e.g. GEF, Mexico, Brazil), which diminished their ability to design workable projects and to manage revenue flows. This in turn contributed to conflict between community members and intermediaries at those sites.

Overwhelmingly, the case studies found that implementing land management practices under a PES scheme involves significant up-front financial and labour costs to participants, for instance to introduce new land management practices (Nicaragua/Colombia) and for tree planting (Indonesia, Mozambique). Such investment needs were another key barrier for poor households in joining PES schemes.

In the Nicaragua/Columbia silvo-pastoral project, critical determinants of participation included labour availability, household assets such as herd size, and access to credit and off-farm income (Rios and Pagiola 2010). For this reason, participation was stronger by poor rather than the poorest households.

In the Mozambique case, the capital assets of individual households, including land and savings, were critical determinants of whether they could invest in carbon forestry (Jindal 2010). The size of land holdings was important because of the trade-offs associated with meeting food security and carbon forestry needs on smaller farm sizes. This tension between securing subsistence requirements and gaining income from PES was also highlighted in the Ugandan study (German et al. 2010).

The Nicaraguan/Colombian scheme addressed the issue of up-front costs by offering contract-holders a range of land-use measures that could be chosen to suit varying household budgets, labour availability and technical capacity. While this was effective in facilitating participation, the authors noted that participation was still stronger amongst poor rather than the poorest households in these countries. Another strategy to support up-front implementation costs was front-loading payments to deliver a large proportion of payments early in the scheme. This approach can, however, pose a risk to the long term sustainability of schemes, and is discussed in more detail in Section 4.3.2).

4.2 Contractual arrangements

This section assesses how the configuration of contractual arrangements in PES schemes affected, in particular, the types of payments made, the investment benefits generated and for whom. A key point of difference explored is whether contracts are made with, and payments delivered to, individual households, collective bodies or a combination of these. Finally, we examine how the returns from PES compare to the actual and opportunity costs incurred by participants.

4.2.1 Individual versus collective payments

As noted, some PES schemes involved contracts with, and therefore payments to individual households while others involved contracts with community organizations or village councils, which then managed these payments (see Table 5).

Table 5 Overview of payment arrangements

Case	Contracted party	Distribution of monetary benefits
Brazil	Community	Contracts are collective, but payments are made to individual householders. There is also a possibility for in-kind benefits to be provided by local government
Indonesia	Individual	Money to individual contract holders; in some cases 5% directed for group investments (infrastructure)
Philippines	Local govt unit	Money to <i>barangays</i> (local government units)
Uganda	Individual	At start: 57% to individual contract holder and rest to intermediaries After a few years: 51% to farmers, 6% to community fund and rest to intermediaries + verification activities

Mozambique	Collective and individual	Agroforestry: money to individual contract holder with small proportion to community trust fund REDD: half to community trust fund and half as wages to forest guards Project funded microenterprise promotion
Nicaragua-Columbia	Individual	Payment to individual contract holder
Mexico	Collective or individual	Payment to contract holder, which could be an individual household, a landowners' association, or another type of community body

In two cases, Mozambique and Brazil, explicit reference was made to non-financial in-kind benefits resulting from PES agreements (e.g. technical assistance, improved linkages with other government programs). While most cases also cited significant project funding for capacity building as a non-financial benefit, it is regarded here as an indirect benefit from activities to support access and implementation of schemes rather than a direct benefit from selling environmental services (particularly given the questionable impact of training activities to date).

Collective contracts, and the funds generated by PES activities were either managed by existing local organisations (Mexico, Philippines), or newly established ones (Mozambique, Indonesia). Given the focus of these case studies on the livelihood impacts of PES schemes, there is insufficient data to compare governance outcomes between these organisations, but this is a fertile area for research given the likely importance of collectively managed funds in the REDD context.

In all of the cases, collectively-managed funds were invested in infrastructure (water supply, roads, community buildings) and services (primary health care, schools) (Table 6).

Table 6 Use of collective funds

Cases with collectively managed funds	Use of collective funds
Mexico	Anecdotal evidence of expenditures on tools, machinery, local infrastructure, community building improvements
Mozambique	Employment of forest guards, construction of school buildings, and a primary health clinic
Philippines	Erosion control, drainage canals, water tanks
Indonesia*	Water supply

*Note: this case involved individual payments which were collectively invested in one village.

These investments contrasted with payments to individual households, which tended to be used to meet general household needs, for property improvements and to enable access to health and education services. This connection between collective income and infrastructure/services is unsurprising, given that the provision of these types of goods and services would not normally attract individual investment.

However, the Indonesian case was an interesting anomaly – smallholders there chose to invest 5% of their household-level payments towards a community water supply system.

This site also had an active farmers' organisation to facilitate this investment process. This indicates that contracts with individual households, and therefore household-level payments do not rule out investments in community infrastructure where individuals believe sufficient returns are generated and are able to coordinate their investment.

Conversely, collective contracts did not preclude income being paid directly to households. In the Mexican case, for instance, Corbera (2010) describes one community in which the Coffee Producers Organisation retained 20% of the PES income, and distributed the remainder amongst the individual farmers involved in tree-planting. In Brazil, contracts were made with groups of farmers, but all payments were made at the household level.

Unlike individual payments, investments made from collective payments could be used by both participants and non-participants. In Indonesia, non-participants accessed the water supply built from PES revenues by paying a service fee. Similarly, in the Philippines, the infrastructure built was reportedly accessed by all villagers, with evidence that villagers have maintained this over the 10 years since the infrastructure was installed.

The above discussion highlights the differing impacts that can arise from individual and collective payments, and the relative ease with which collective contracts could be entered into where there was a functioning or newly established body to manage such funds.

4.2.2 Payments relative to costs

An overview of household income from PES (Table 7) highlights that payments were modest relative to the annual household income, except in Uganda and Mozambique. In these two cases, the large lump-sum payments that came in the early years of the PES scheme were quite significant for the participating households, enabling repayment of debts and expenditures on land and home improvements, school fees and medical services. While precise data on the PES contribution to household income were not available in the Mexican case, Corbera notes that PES income was most significant for the poorest households, but not sufficient to move them out of poverty (2010: 71).

Table 7 Direct household income from PES activities

Case	Type of contract	Estimated annual income to participating households (USD)	Percentage of annual household income
Brazil	Individual	282	14 ⁱ
Indonesia	Individual	42 ⁱⁱ	3
Philippines	Local govt unit	-	
Uganda	Collective and individual	Year 1: 250 ⁱⁱⁱ	265% in first year
Mozambique	Collective and individual	Agroforestry: 79 ^{iv} Microenterprise: 515	Equivalent to 2 months wage labour
Nicaragua-Columbia	Individual	-	-
Mexico	Collective or individual	33–508 per year depending on location	-

ⁱ This figure represents estimated increase in household income, rather than proportion of household income

ⁱⁱ Calculated on the basis of USD120 per hectare x average farm size of 0.2-0.5Ha (.35Ha).

ⁱⁱⁱ This figure represents the Year 1 payment from a payment schedule as follows: Year 0 = 30% of total payment; Year 1 = 20%; Year 3 = 20%; Year 5: up to 20%; Year 10 = up to 10%.

^{iv} This figure represents an average based on payments as follows: Year 1 = 30%; Year 2-6 = 12% per year; Year 7 = 10%.

- No data.

The time and money involved in the negotiation of PES contracts – transaction costs – can impose significant barriers to PES participation, and in all the cases considered in this research, such costs were substantial. A common approach to addressing transaction costs was the provision of subsidies, channelled through intermediaries (almost always non-government organizations), who provided information and other assistance to participants to negotiate contractual arrangements and navigate implementation activities. In cases where such subsidies were not available or were insufficient to cover operating costs, these same intermediaries met their costs by retaining a share of PES revenue (close to 50% in the case of Uganda). This had the effect of reducing the level of payments received by the environmental service sellers.

The use of collective rather than individual contracts with many small-holders was another approach to reducing transaction costs. Collective contracts were used in schemes on private lands (e.g. in Indonesia, Brazil and Uganda), as well as on common property and indigenous reserves on state lands (e.g. in Mexico). The use of collective contracts had important implications for the management of revenue flows (see Section 4.2.1).

In a few cases payments were, at least initially, based on calculations of opportunity or transaction costs; but they were more frequently based on input costs and/or the estimated market value of the environmental service. While opportunity costs are notoriously difficult to calculate, let alone match, PSA-CABSA in Mexico attempted to peg payments to the risk of deforestation. Payments to different areas were scaled according to their relative level of deforestation risk from urbanisation, agriculture conversion, logging and cattle ranching (Corbera 2010). The PSA-H program, also in Mexico, originally calculated prices on the basis of opportunity cost of alternative agricultural and livestock land uses, but were subsequently increased because stakeholders thought they were too low (Haskett and Gutman 2010).

The Ugandan study found that the gap between opportunity costs relative to payments would increase over time after payments ceased, when income from crops would have declined due to land being diverted to tree-crops but carbon-offset payments were no longer coming in to compensate farmers (German et al. 2010).

4.2.3 Timing and conditionality of benefits

As noted earlier, a lack of capital to invest in PES-related land management activities can be a significant barrier to accessing PES schemes. Most of the case studies therefore ‘front-loaded’ their payments to varying degrees – paying a disproportionately high proportion (if not all) of the PES income in the early years of the contract to offset costs of land use change. This was most striking in the Ugandan and Mozambican schemes. In Uganda, contracts ranged from 25–50 years, but all the payments were disbursed by year 10 (German et al 2010). In Mozambique, the duration of the contract was even longer – 100 years – but the value of offsets would be paid out by year seven of the contract. The benefits from land productivity, selective timber harvesting and high value fruit and other non-timber forest products were expected to provide sufficient incentives for protection over the remaining 93 years (Jindal 2010). The Indonesian case also reported a reliance on the value gained from fruit trees to provide ongoing incentives to maintain tree cover, but in a less extreme manner than in Mozambique.

Front-loading payments has a clear rationale, but raises important risks:

“Although the agroforestry systems are expected to provide valuable benefits such as timber and non-timber products, these benefits alone may not compensate for the loss of carbon payments after the end of the first seven years. On the other hand, reducing the contract length would reduce the number of carbon offsets and hence the payment made to a household” (Jindal 2010: 189).

Jindal (2010) also notes that such contractual arrangements create an expectation of future generations to maintain the agreed landuse, when they have not enjoyed any of the related PES payments.

4.3 Other livelihood impacts and environmental outcomes

A comprehensive overview of the case studies and findings are available in Tacconi et al. (2010). Major points from the cross case analysis are summarised in Table 3, with some pertinent points discussed further below.

Table 3 Overview of access and livelihood impacts of case study PES schemes

Access and Impact	Key findings from cross-case analysis
Financial flows and assets	<ul style="list-style-type: none"> • Contracts involved payments to individuals as well as community bodies • Household payments were a small part of household income, but helpful because they were paid as in lump sum form at agreed times • Income from PES compared poorly with the transaction and opportunity costs of participating • Group payments were often invested in the provision of community infrastructure and services
Human capital	<ul style="list-style-type: none"> • Capacity building by intermediaries was a key focus in all cases, but there was little evidence of whether or how new knowledge and skills were applied in practice
Natural capital	<ul style="list-style-type: none"> • One case of lost informal land use by poorer households • Generally, locally observed improvements in natural resource status
Social/ political capital	<ul style="list-style-type: none"> • Working closely with community institutions strengthened their resource management and social coordination capacity • Report of greater social cohesion amongst participants. • Expansion of ‘bridging capital’ – networks and influence of the community with other actors and in local and regional planning processes • One case reported conflict between participants and non-participants
Physical capital	<ul style="list-style-type: none"> • Collective income often invested in infrastructure (water supply, irrigation, roads) and services (health, education)

More thorough discussion of access and impacts on financial capital arising from contractual arrangements can be found in sections 4.2 and 4.3.

As noted above (Section 4.1.2) capacity building was said to be a key impact of all the PES schemes reviewed. Such activities were made possible through the explicit support of government, donors and non-government organizations. However, there was little evidence of positive long term impacts of capacity building, and continuing confusion amongst farmers about the details of their PES contracts indicates that local understanding of how PES operates was often poor.

With regard to natural assets, two cases (the Philippines and Uganda) found evidence of changes to resource access. For instance in Uganda, smallholder afforestation reduced access to (previously) fallow land that had once been used informally by poorer households. In the Philippines, fire suppression activities reportedly reduced the new growth of new grass after fires, which had been an important fodder source for cattle.

Schemes that worked closely with community institutions were found to strengthen social capital in terms of local resource management and social coordination capacities. Projects working directly with individual smallholders were also reported to foster a sense of social cohesion amongst participants. The expansion of networks beyond the community – ‘bridging capital’ – was also facilitated in a number of cases, which often led to more effective linkages between participating communities and local government, stronger local participation in planning processes, greater negotiating capacity or political voice amongst participating groups.

However, tensions were starting to emerge between participants and non-participants, notably in the Indonesian and Brazilian cases. For instance,

“there were some signs of jealousy amongst non-participants about their exclusion from the PES scheme ... The interaction between participants and non-participants in the same village decreased as the interaction between participants and other external stakeholders increased” (Leimona et al. 2010: 122).

The potential was also noted for changes in gender roles and labour patterns to contribute to intra-household conflict, though no substantial evidence had yet been found in these cases.

Investment in physical capital, in the form of infrastructure (roads, water supply, community buildings) was commonly found when PES income was paid to community-level institutions. Perhaps unexpectedly, in the Indonesia case, the involvement of a strong farmers’ organisation enabled farmers to organise and collectively invest part of their individual income in community infrastructure including water supply and new community buildings (as discussed in more detail in Section 4.2.1).

Most studies noted improvements in the status of environmental services, though the scale of impact was typically small and its relationship to PES scheme activities was not always clear. The attribution problem arose because monitoring activities typically focused on proxies for the environmental services being targeted. For instance, land use was a measured proxy for the maintenance of watershed services, but land use is generally only one of a range of factors that influences the quality and quantity of the environmental service provision. Furthermore, the localised scale at which monitoring took place often made it difficult to assess whether leakage was occurring, a point noted as particularly relevant in the Brazilian case.

5 IMPLICATIONS FOR THE DESIGN OF REDD

The following discussion synthesises the key findings regarding the impacts of PES on livelihoods, and the implications for using PES as a distributive mechanism for REDD.

5.1 Access

As noted earlier, the architects of PES have often emphasized the role of private landholdings in viable PES schemes. However, in many countries, the primary focus for REDD activities is likely to be state or communally owned land; the cases considered here illustrate that PES schemes can proceed on lands that are not under private ownership –

on common property³ and state lands, as long as the contractees have recognised stewardship and/or use rights to the resources.

Where there are conflicting claims over ownership and use rights over state forests, tenure reform has been advocated as a precondition for effective, equitable and efficient implementation of REDD (Sunderlin et al. 2009). This research indicates that such reforms need not necessarily include changes in the ownership of land – REDD programmes could be implemented if use and/or management rights over forests and their products were to be recognised. The latter approach of devolving more limited use and management rights is common to Asia's community forests (Mahanty et al. 2009).

It is recognised that transferring land rights from the state to communities (that is, to common property regimes)⁴ would be a better option from the perspective of rural communities because it enables more choices over the use of forest land. In the context of REDD, an option would be to transfer rights to the use of forests and the carbon they contain (Streck 2009). Indeed this research provides examples of agreements based on use and/or management rights to forests (e.g. Brazil, Mexico) and of schemes involving communities without any formal rights (Philippines). In this latter extreme example, communities were involved in a PES-like scheme without having any formal rights over forest carbon. Local government received payments for avoided fires, which were distributed to local communities in the form of improved services and infrastructure. Participatory planning processes were used to gain community input to the selection of these investments. While there were problems with the scheme, arising from lack of government commitment to its ongoing implementation, it does provide a working example of a PES scheme on state-owned land.

PES schemes that involve communities instead of individual landholders in implementation have the further benefits of reducing transaction costs, and building on local community institutions – and if necessary supporting new ones – to strengthen social capital.

Informal access to land and other resources was seriously negatively impacted by some PES schemes, particularly for non-participants. This raises some cautionary issues for PES for REDD schemes focusing on state forest lands where altered resource access is likely to be significant (and is said to disproportionately affect the landless poor). Informal use of these areas and the multiple values associated with them need to be assessed in order to mitigate and minimise negative impacts.

The criteria for site selection, a key determinant of access by the poor in the cases considered here, will also be critical for the impact of REDD activities on the rural poor. REDD will focus on forest areas, which are often remote and have a high percentage of poor households (Sunderlin et al. 2005), in theory creating considerable scope for REDD-related PES to contribute to the livelihoods of the poor. The nature of such a contribution and whether it eventuates, however, depends upon a number of factors.

Using social criteria to select REDD sites might favour activities in remote forests with their relatively higher levels of poverty arising from their limited access to markets and fewer economic opportunities. However, the greatest contribution to climate change mitigation will come from action in areas of highest deforestation threat (Wunder, 2009), such as

³ This does not imply that the design of the PES scheme considered in these cases are perfect.

⁴ We do not consider transfer of land rights to individuals (private property) because this is not proposed in the existing literature on REDD and there would be considerable challenges with its implementation in forest areas.

(typically less remote) forests near markets and roads. Given the connections between site selection criteria and participation by poor households found in this study, an emphasis on environmental criteria alone could reduce the benefits to poor households from REDD. However, if REDD is to have social as well as environmental benefits, national-level REDD planning will need to take account of environmental, social and economic parameters in their selection of areas for REDD activities, as has occurred in the Brazilian PES scheme considered here.

Up-front investment needs have been shown to pose a significant barrier to prospective participants in PES schemes, even once eligibility criteria have been satisfied. The costs depend to some extent upon the types of land management choices available in particular schemes, and the ability to tailor these to the assets and labour available to individual households. This research has demonstrated that without up-front support and flexibility, the ability of the poorest households in particular to enter into PES agreements is limited. However, the front-loading of payment schedules to encourage participation can have serious implications for the sustainability of schemes, as discussed in more detail in the next section.

5.2 Contractual arrangements

While PES income streams have typically been small relative to household income, the size of PES for REDD payments will depend on a range of factors, including the market value of forest carbon.

Participants' preferences and the configuration of property rights must be considered in deciding whether the payments are made to individual households and/or to communities. When households commit their own resources (e.g. agricultural land) to the provision of the environmental service, there is a clear justification for directing at least a proportion of payments to individuals. When communities commit shared resources, as is more likely with forest lands, the provision of community-level payments may be appropriate. These could then be paid to households that participate in REDD activities (e.g. involvement in monitoring forest conservation), and to households that do not participate directly, but who may be affected by the conservation activities (e.g. through loss of access to forest products).

Regarding the use of collective payments, two cases in particular (Mexico and Philippines) demonstrated that collective payments could be effectively managed and invested in community infrastructure and services when vested with existing and functioning institutions for collective action. However, where such institutions do not exist, individual benefits or a combination of approaches may need to be considered. The case in Brazil demonstrated the potential for success of collective contractual arrangements with household level payments. Whether payments are made to households or communities, and whether they are paid in cash, through provision of services or a combination of the two, will also need to be considered by PES schemes for REDD.

As these cases illustrate, collective payments have the benefit that they can be invested in community infrastructure and services. This option may therefore benefit groups of individual participants who find it difficult to access certain services (e.g. training), as demonstrated in the GEF's PES schemes, and can also benefit non-participants where they can access the newly provided infrastructure or services. REDD programs could further improve their positive impacts arising by integrating or coordinating their activities with government and other activities occurring locally, thus improving the bridging capital of participants.

In relation to infrastructure investment, it is important to take heed of prior research in community forestry which highlights that both community-level infrastructure and services are subject to elite capture (Dev and Adhikari 2007). Implementation intermediaries should monitor the impacts of expenditure choices to reduce the potential for inequities in access to employment or community infrastructure to deepen social disparities and become a point of conflict.

On the issue of opportunity costs, the study findings raise important questions for whether PES for REDD would be sustainable if payments fail to cover the opportunity costs faced by participants due to restrictions imposed on land use. Over time, any mismatch between income and opportunity costs would cause negative livelihood impacts as well as non-compliance with contracts. To avoid these social and environmental risks, it is imperative that REDD activities assess opportunity costs in sufficient detail to provide financial or other in-kind benefits that adequately compensate participants for what they are giving up.

One system for matching opportunity costs and PES income is through the use of auctions to set prices (Jack et al. 2009); resource rights holders bid to offer their resources for inclusion in a PES scheme at a certain price. Such auctions have been recommended for REDD-related PES schemes (Wunder 2009). However, they require the suppliers of services to be individual landholders, so their application may be constrained by resource rights issues – most forests that may become eligible for REDD activities are state owned, where local residents would not have the necessary rights to engage in an auctioning process.

The match between the schedule of payments and the length of the contract is another issue that PES schemes for REDD will need to address. Misunderstandings about contract duration, as occurred in the Mozambique case, would be highly problematic for the viability of REDD activities, which would normally be expected to last for several decades.⁵

As noted, the use of front-loading payments to facilitate participation to offset the costs of land use changes, and the subsequent mismatch between payment schedules and contract duration has several serious implications. First, it is extremely likely that the sustainability of schemes comes into question once contract holders pass through the 'seductive lure of high up-front payments' (German et al 2010: 174). These authors note a difficult balancing act between front-loading payment schedules to enable poorer households to join up and securing the sustainability of schemes and livelihoods over time where payments are disbursed well before the end of the contract. This balancing act may be particularly difficult for program designers who wish to encourage the participation of poor households, and where the incentives associated with PES contracts encourage smallholder farmers to convert land used for food production to agroforestry or other carbon sequestration activities. Such actions can have drastic implications for household food security, especially for poor households, which tend to have smaller farm sizes.

The long duration of REDD activities also has important implications for future generations who would expect to receive benefits from the form of land use agreed in the contract. If the payment schedule equalled the contract length and kept up with opportunity costs, current payments would not deprive future generations of their right to benefit from resources. A similar argument applies to payments through the provision of services and

⁵ See Tacconi and Bennett (1995) for an example of a payment stream designed over the life of the conservation activity.

infrastructure – which cannot necessarily be expected to benefit future generations given that it deteriorates over time, unless appropriate maintenance is undertaken.

A second implication of front-loading payments is that enforcing compliance with PES agreements becomes weaker if all payments have been disbursed before the end of the contract period, as it will be impossible to withhold payments if contractual obligations are not met. The Mozambique case, where compliance is expected for 93 years after payments have been fully disbursed is a particularly stark example of weak conditionality.

The conditionality of payments is supposed to be a fundamental characteristic of PES schemes (Wunder 2009) and also has implications for the permanence of carbon stocks. However, PES schemes have to date undertaken limited monitoring and enforcement of agreements. As carbon stock permanence is fundamental to REDD activities, the establishment of baselines and the monitoring of services (that is, carbon sequestration) will be integral to PES schemes for REDD.

Whether PES schemes for REDD will actually be able to ensure permanence is an open question, depending on human as well as natural events, such as wildfires. In the event that carbon is emitted, it is unlikely that payments provided to communities could be recovered. In some cases, such recourse may even be inappropriate, for instance, where the events are beyond the control of the individuals or communities involved in the scheme. Ways of insuring against these risks need to be developed carefully so as not to create moral hazard (e.g. forests being cleared with intentionally-lit fires, that are made to appear accidental).

6 CONCLUSIONS

In terms of livelihood impacts, PES income was generally a modest contributor to participants' household financial capital, though in several cases PES revenues were considered an important supplement to household budgets, particularly for poorer households. Where PES contracts were made with groups, the provision of infrastructure and services also contributed positively to physical capital. Broadly, the schemes also had positive effects on human capital through capacity building (though the long run impacts of these were questionable), and on social capital, particularly where PES schemes worked with existing community organisations. The schemes also generally reported positive environmental outcomes, however, the monitoring of these outcomes was a weakness of virtually all schemes.

In general, impacts on non-participants were benign; and there is potential for positive impacts on this group, particularly where the infrastructure or services arising from collective investments are made available to non-participants. In contrast, the loss of informal access to land and other resources was a unintended (and perhaps unforeseen) impact that would need to be mitigated by project design elements in future.

This research indicates that neither tenure nor wealth need filter access to schemes – though it is true that under certain circumstances they do reduce access, particularly where land ownership is a requirement for participation, and only costly land management options are available. Building on previous research that suggests clear and secure tenure is a prerequisite to participation, our findings show that PES schemes can be implemented on private, state and communal lands – as long as use and stewardship rights are recognised. The selection criteria for REDD sites will also determine the potential for poor households to participate. It is likely that a trade-off may be involved between selecting

sites with high poverty and selecting sites under greatest threat of deforestation and forest degradation.

Several factors affect the ability of households – particularly poor households – to participate in schemes, including the levels of skills, education and negotiating capacity and the ability to cover the necessary investment costs of land use change. This research demonstrated that capacity strengthening activities need to be improved in terms of their long term impacts in order to improve sustainability. The current situation where participants remain confused about the details of their contract jeopardises the sustainability of these agreements. While the front-loading of payments can facilitate the participation of poor households that could not otherwise cover the necessary costs of improved land uses, these too raise questions of sustainability – particularly when the payment schedule is decades shorter than the contract duration.

REDD program designers will need to make choices that will affect the extent and direction of household-level impacts (i.e. whether they are positive or negative). Program design choices will include whether individual or collective contracts are offered. However, the choice is not straight forward. Individual contracts have the advantage of providing typically higher direct incentives for land use change, but are more expensive to secure. Collective contracts reduce transaction costs, and thus potentially enable contracts with larger number of smallholders. Further, while collective contracts often have the additional benefit of building social capital, particularly when working with existing community institutions, they also risk elite capture.

The design of payment schedules is also critical. Front-loading of payments can enable households to meet the investment costs of land use change, thus improving their incentive effect. However, when payments are disbursed decades before the end of the contract, questions are raised about overall program sustainability. Questions of sustainability are also raised where long contracts are offered, based on the implicit assumption that the following generation will maintain land uses. In practice, they may not agree with land use decisions – particularly if contracts have been completely paid out prior to their assuming control over the land. The mismatch between PES revenues and the opportunity costs faced by contract-holders – which were significant in many cases – could also potentially reduce the attractiveness of the PES scheme over time.

In conclusion, this research has shown that access to PES schemes by poor households is possible, under certain circumstances, typically requiring a supportive policy context regarding recognition of common property and allocation of use or management rights on state lands. REDD designers will need to generate a similarly supportive context if they wish to emulate PES agreements on state and common property. Contractual arrangements, primarily relating to payments – how much, to whom and when – are critical. However, choices about contract design may require trade-offs between the extent and type of social impacts and environmental outcomes.

References

- Angelsen, A., S. Brown, C. Loisel, L. Peskett, and C. Streck. 2009. Reducing Emissions from Deforestation and Forest Degradation (REDD): An Options Assessment Report. Prepared for the Government of Norway. Washington D.C: Meridian Institute.
- Bartels, W-L., M. Schmink, E.A. Borges, A.P. Duarte and H.D.S. dos Santos Arcos. 2010. Diversifying livelihood systems, strengthening social networks, and rewarding environmental stewardship among small-scale producers in the Brazilian Amazon: Lessons from Proambiente. In: *Payments for environmental services, forest conservation and climate change: livelihoods in the REDD?* (eds. Tacconi, L., S. Mahanty and H. Suich) Northampton: Edward Elgar Publishing.
- Bebbington, A. 1999. Capitals and Capabilities: A Framework for Analyzing Peasant Viability, Rural Livelihoods and Poverty. *World Development* 27, 2021–2044.
- Chambers, R., and G. Conway, G. 1991. *Sustainable Rural Livelihoods: Practical Concepts for the 21st Century*. Sussex: Institute of Development Studies.
- Corbera, E. 2010. Mexico's PES-carbon programme: a preliminary assessment and impacts on rural livelihoods. In: *Payments for environmental services, forest conservation and climate change: livelihoods in the REDD?* (eds. Tacconi, L., S. Mahanty and H. Suich) Northampton: Edward Elgar Publishing.
- Corbera, E., K. Brown and W.N. Adger. 2007a. The equity and legitimacy of markets for ecosystem services. *Development and Change* 38, 587–613.
- Corbera, E., N. Kosoy and M. Martinez-Tuna. 2007b. The equity implications of marketing ecosystem services in protected areas and rural communities: case studies from Meso-America. *Global Environmental Change* 17, 365–380.
- Dev, O.P. and Adhikari, J. (2007) Community forestry in the Nepal Hills: practice and livelihood impacts, In: *Forests, People and Power: the political ecology of reform in South Asia* (eds. Springate-Baginski, O. and P. Blaikie), Pp. 142-176. London: Earthscan.
- Engel, S., S. Pagiola and S. Wunder. 2008. Designing payments for environmental services in theory and practice: An overview of the issues. *Ecological Economics* 65, 663-674.
- Food and Agriculture Organization of the United Nations. 2006. Global Forest Resources Assessment 2005: Progress Toward Sustainable Forest Management, Rome: FAO.
- German, L.A., A. Ruhweza and R. Mwesigwa with Kalanzi, C. 2010. Social and environmental footprints of carbon payments: a case study from Uganda. In: *Payments for environmental services, forest conservation and climate change: livelihoods in the REDD?* (eds. Tacconi, L., S. Mahanty and H. Suich) Northampton: Edward Elgar Publishing.
- Grieg-Gran, M., I. Porras and S. Wunder. 2005. How can market mechanisms for forest environmental services help the poor? Preliminary lessons from Latin America. *World Development* 33, 1511–1527.
- Griffiths, T. 2007. Seeing 'RED'? 'Avoided deforestation' and the rights of Indigenous Peoples and local communities. Moreton-in-Marsh: Forest Peoples Programme
- Haskett, J. and P. Gutman. 2010. Taking stock of the Global Environment Facility experience with payments for environmental services projects. In: *Payments for environmental services, forest conservation and climate change: livelihoods in the REDD?* (eds. Tacconi, L., S. Mahanty and H. Suich) Northampton: Edward Elgar Publishing.
- Hobley, 2007. Where in the World Is there Pro-Poor Forest Policy and Tenure Reform? Washington, DC, Rights and Resources Group.

- Intergovernmental Panel on Climate Change. 2007. Technical Summary: Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Intergovernmental Panel on Climate Change.
- Jack, B.K., B. Leimona and P.J. Ferraro. 2009. A revealed preference approach to estimating supply curves for ecosystem services: use of auctions to set payments for soil erosion control in Indonesia. *Conservation Biology* 23, 359–67.
- Jindal, R. Livelihood impacts of payments for forest carbon services: field evidence from Mozambique. In: *Payments for environmental services, forest conservation and climate change: livelihoods in the REDD?* (eds. Tacconi, L., S. Mahanty and H. Suich) Northampton: Edward Elgar Publishing.
- Kumar, S. and S. Managi. 2009. Compensation for environmental services and intergovernmental fiscal transfer: the case of India. *Ecological Economics* 68, 3052–59.
- Landell-Mills, N. and I. Porras. 2002. Silver bullet or fools' gold? A global review of markets for forest environmental services and their impact on the poor. International Institute for Environment and Development, London.
- Lee, E. and S. Mahanty. 2009. Payments for environmental services and poverty reduction: risks and opportunities. RECOFTC, Bangkok.
- Leimona, B., R. Pasha and N.P. Rahadian, N. P. 2010. The livelihood impacts of incentive payments for watershed management in Cidanau watershed, West Java, Indonesia. In: *Payments for environmental services, forest conservation and climate change: livelihoods in the REDD?* (eds. Tacconi, L., S. Mahanty and H. Suich) Northampton: Edward Elgar Publishing.
- Mahanty, S., Guernier, J. and Yasmi, Y. 2009. A fair share? Sharing the benefits and costs of collaborative forest management, *International Forestry Review* 11(2): 268-280.
- Maharajan, M.R., T. Ram Dakal, S.K. Thapa, K. Schreckenberg and C. Luttrell. 2009. Improving the benefits to the poor from community forestry in the Churia region of Nepal, *International Forestry Review* 11(2): 254-267.
- McDermott, M.H. and K. Schreckenberg. 2009. Equity in community forestry: insights from North and South, *International Forestry Review* 11(2): 155-156.
- Pagiola, S., A. Arcenas and G. Platais, G. 2005. Can Payments for Environmental Services Help Reduce Poverty? An Exploration of the Issues and the Evidence to Date from Latin America. *World Development* 33, 237–253.
- Pagiola, S., A.R. Rios and A. Arcenas. 2008. Can the poor participate in payments for environmental services? Lessons from the Silvopastoral Project in Nicaragua. *Environment and Development Economics* 13, 299–325.
- Pagiola, S., J. Bishop and N. Landell-Mills. 2002. Selling Forest Environmental Services: Market-Based Mechanisms for Conservation and Development. London: Earthscan.
- 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 from Latin America', *World Development*, 33(2), 237–53.
- Porras, I., M. Grieg-Gran and N. Neves. 2008. *All that Glitters: A Review of Payments for Watershed Services in Developing Countries*. London: International Institute for Environment and Development.
- Rios, A. and S. Pagiola. 2010. Poor household participation in payments for environmental services in Nicaragua and Colombia. In: *Payments for environmental services, forest conservation and climate change: livelihoods in the REDD?* (eds. Tacconi, L., S. Mahanty and H. Suich) Northampton: Edward Elgar Publishing.
- Schlager, E. and E. Ostrom. 1992. Property-rights regimes and natural resources: a conceptual analysis. *Land Economics*, 68(3): 249-62.
- Scoones, I. 1998. Sustainable Rural Livelihoods: A Framework for Analysis. Sussex: Institute of Development Studies.

- Scoones, I. 2009. Livelihoods perspectives and rural development, *The Journal of Peasant Studies*, 36, 171–196.
- Sikor, T., Stahl, J., Enters, T., Ribot, J.C., Singh, N., Sunderlin, W.D., Wollenberg, L. 2010. REDD-plus, forest people's rights and nested climate governance, *Global Environmental Change*. Article in press.
- Somerville, M., J.P.G. Jones, M. Rahajaharison and E.J. Milner-Guilland. 2010. The role of fairness and benefit distribution in community-based Payment for Environmental Services interventions: A case study from Menabe, Madagascar, *Ecological Economics* 69, 1262–1271.
- Soriaga, R. and D. Annawi. 2010. The 'No-Fire Bonus' Scheme in Mountain Province, Cordillera Administrative Region, Philippines. In: *Payments for environmental services, forest conservation and climate change: livelihoods in the REDD?* (eds. Tacconi, L., S. Mahanty and H. Suich) Northampton: Edward Elgar Publishing.
- Stern, N. 2006. Stern Review on the Economics of Climate Change. London: UK Treasury/Cabinet Office.
- Streck, C. 2009. Rights and REDD+: legal and regulatory considerations. In: *Realising REDD+: National strategy and policy options* (ed. Angelsen, A.). Pp. 151–162. Bogor: Center for International Forestry Research.
- Sunderlin, W.D., A. Angelsen, B. Belcher, P. Burgers, R. Nasi, L. Santoso and S. Wunder. 2005. Livelihoods, forests, and conservation in developing countries: an overview. *World Development* 33, 1383–1402.
- Tacconi, L. and J. Bennett. 1995. Biodiversity conservation: the process of economic assessment and establishment of a protected area in Vanuatu. *Development and Change* 26, 89–110.
- Vatn, A. 2010. An institutional analysis of payments for environmental services. *Ecological Economics* 60, 1245–1252.
- Von Benda-Beckmann, F., Von Benda-Beckmann, K. and Wiber, M.G. 2006. The Properties of Property, in F. Von Benda-Beckmann, K. Von Benda-Beckmann, and M.F. Wiber (eds) *Changing Properties of Property*, New York: Berghahn Books, 1-39.
- Wunder, S. 2005. *Payments for environmental services: some nuts and bolts*. Center for International Forestry Research, Bogor.
- Wunder, S. 2008. Payments for environmental services and the poor: concepts and preliminary evidence. *Environment and Development Economics* 13, 279–297.
- Wunder, S. 2009. Can payments for environmental services reduce deforestation and forest degradation? In: *Realising REDD+: National strategy and policy options* (ed. Angelsen, A.). Pp: 213–223. Bogor: Center for International Forestry Research.
- Yin, R.S. 2009. *Case Study Research: Design and Methods*. London: Sage.