Ensuring that the Poor Benefit from Payments for Environmental Services

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Abstract

Systems of Payments for Environmental Services (PES) are being increasingly used to finance conservation, in Costa Rica, Ecuador, Colombia, and elsewhere. A critical dimension of these systems concerns their impact on the poor. This paper reviews the main linkages that have been hypothesized to exist between PES systems and poverty, drawing on data from the main on-going and planned PES systems in Latin America, and particularly on those supported by the World Bank. The main poverty-reduction impact of PES is likely to come from payments made to often poor natural resource managers in upper watersheds. The extent to which this will occur depends on how many potential participants in PES programs are in fact poor, and on the amount of the payments. There are, however, also some potential threats. Dealing with many small, poor land users can impose high transaction costs, thus threatening to cut the poor off from participating in PES systems. Careful design of the system is needed to avoid this problem, as in Costa Rica's development of collective contracting mechanisms to reduce transaction costs. Where property rights are insecure, the poor who depend on forests and other natural ecosystems for their livelihood may be displaced as PES increases the value of those ecosystems. This seems to have been an issue in Colombia's Cauca Valley, for example. The landless poor may find themselves affected, either positively or negatively, by labor market and other changes induced by the establishment of PES systems (for example, they may be harmed if the conservation practices encouraged by PES systems are less labor intensive than the practices they replace). It is in many cases too early to provide conclusive answers to these questions. The paper focuses on clearly identifying several concrete research hypotheses to be studied in a two-year research program we are undertaking, and reviewing available evidence for any initial lessons.

Ensuring that the Poor Benefit from Payments for Environmental Services

Introduction

Recent years has seen considerable interest in using Payments for Environmental Services (PES) as a way to finance conservation. PES programs seek to capture part of the benefits derived from environmental services (such as clean water) and channel them to natural resource managers who generate these services, thus increasing their incentive to conserve them. PES programs are in operation in Costa Rica, Colombia, Ecuador, and elsewhere, and others are under preparation or study in several countries.

A critical dimension of these systems concerns their impact on the poor. Many potential links have been hypothesized, and some are supported by anecdotal evidence, but none have yet been researched and documented. This paper examines the possible linkages between PES systems and poverty, drawing on the experience of the main on-going and planned PES systems. It then identifies the main hypotheses concerning these links that need to be verified, and outlines a research program designed to verify these hypotheses.

This paper begins by reviewing the PES approach and some of the efforts that have been made to date to implement it. It then discusses the main ways in which PES approaches are thought likely to affect poverty. The main factors involved are then discussed in detail, concluding with some initial thoughts on how PES systems might be designed so as to maximize their positive impacts on the poor and avert potential negative impacts. It is in many cases too early to arrive at conclusive results on the likely poverty impacts of PES approaches. The paper focuses on clearly identifying several concrete research hypotheses to be studied in a two-year research program.

The logic of Payments for Environmental Services

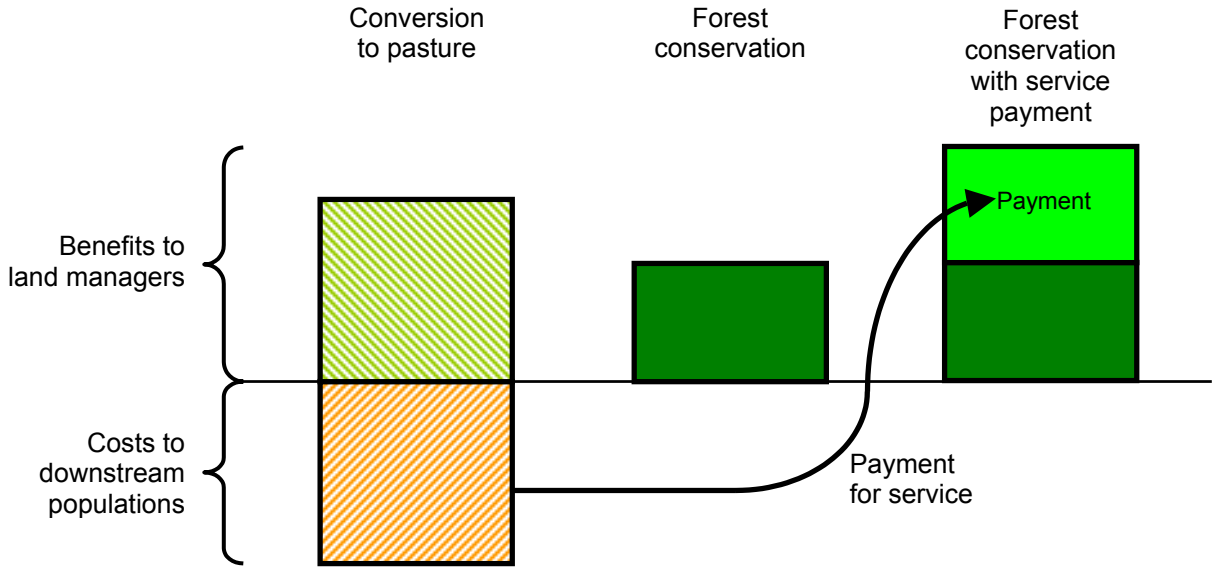
Land uses can provide a variety of environmental services ranging from the regulation of hydrological flows to biodiversity conservation and carbon sequestration. Nevertheless, land uses that provide such services, such as forest, are being lost at rapid rates. An average of almost 15 million hectares of forest were lost every year during the 1990s, mostly in the tropics (FAO, 2001a, 2001b). An important reason for this loss is that land users typically receive no compensation for the environmental services they generate for others. As a result, they have little incentive to provide these services.

Recognition of this problem and of the failure of past approaches to dealing with it has led to efforts to develop systems in which land users are paid for the environmental services they generate, thus aligning their incentives with those of society as a whole (Landell-Mills and Porras, 2002; Pagiola and others, 2002a). The central principles of the PES approach are that those who provide environmental services should be compensated for doing so and that those who receive the services should pay for their provision (Pagiola and Platais, 2003). This approach has the further advantage of providing additional income sources for poor land users, helping to improve their livelihoods. Several countries are already experimenting with such systems, many with World Bank assistance.

The simple logic of PES is illustrated in Figure 1. Land users often receive few benefits from forest conservation—often, less than the benefits they would receive from alternative land

uses, such as conversion to pasture. But deforestation can impose costs on downstream populations, who no longer receive the benefits of ecological services such as water filtration. A payment by the downstream beneficiaries can help make conservation the more attractive option for land users, thus inducing them to adopt it. The payment must obviously be more than the additional benefit to land users of the alternative land use (or they would not change their behavior) and less than the value of the benefit to downstream populations (or they would not be willing to pay for it).

Figure 1. The logic of payments for environmental services



PES systems promise to be more efficient than traditional command-and-control approaches (Pagiola and others, 2002a; Pagiola and Platais, 2003). The reason for this advantage is simple: the costs of achieving any given environmental objective are rarely constant across all situations. Market-based instruments such as PES take advantage of this difference, by concentrating effort where costs are lower. Likewise, the benefits of conservation can differ substantially from case to case. Market-based instruments seek out and concentrate on the higher-benefit cases.

Two important aspects of PES are particularly noteworthy from the perspective of its potential impact on poverty. First, because services are the result of particular kinds of land use, payments made under PES programs are payments to land users. This makes the distribution and ownership patterns of land critical for their poverty impact. Second, participation in PES programs is voluntary, and participants receive payments for doing so. This creates a *prima facie* presumption that participants are at least no worse off than they would be without the PES program. Were this not the case, they could simply decline to participate. Many have concluded from this that this impact can only be positive. As we will see below, the situation is a little more complicated.

Current PES programs

There has been considerable interest in the use of PES throughout the world. Interest has been especially high in Central and South America, where the effects of Hurricane Mitch in 1998 underscored the dependence of the population, especially poor people, on the environmental services and the protection provided by natural ecosystems.

Costa Rica has the most elaborate PES system: the *Pago por Servicios Ambientales* program (PSA), operated by the National Fund for Forest Financing (*Fondo Nacional de Financiamento Forestal*, FONAFIFO) (FONAFIFO, 2000; Pagiola, 2002). Under the 1997 Forestry Law, land users can receive payments for specified land uses, including new plantations, sustainable logging, and conservation of natural forests. This program is financed in a variety of ways, including revenues from a fossil fuel sales tax, sales of carbon emission reduction credits, and payments from private water users, and is now being supported by a World Bank loan and GEF grant (Box 1). Costa Rica has also seen numerous other PES initiatives, including the use of an 'environmentally adjusted water tariff' to finance the conservation of watershed areas near Heredia (Castro, 2001) and a bilateral agreement between La Manguera SA, a private HEP producer, and the Monteverde Conservation League, the NGO that owns the watershed from which the La Esperanza HEP plant draws its water (Rojas and Aylward, 2002).

{Colombia: Cauca Valley.} (Echevarría, 2002b)

{Ecuador: FONAG, ETAPA.} (Echevarría, 2002a; Echevarría and others, 2002; Lloret Zamora, 2002)

{Mexico, others}

{Philippines: RUPES} (Delos Angeles, 2003)

{Small-scale initiatives} (Dimas, 2003)

The World Bank is working with several countries to develop PES systems, through loans, technical assistance, and capacity building (Box 1). It should be noted that the World Bank did not originate the PES concept. It has played an important role in launching such projects primarily because its borrowing countries have requested its assistance in doing so. By virtue of its role in assisting many countries, it has been able to cross-fertilize efforts in individual countries with the lessons learned in others (Pagiola and Platais, 2003).

Box 1. World Bank support for PES

- **Costa Rica**. The *Ecomarkets Project*, which supports the country's PES program, includes a US$32.6 million loan from the World Bank to help the government ensure current levels of environmental service contracts and a US$8 million grant from the Global Environment Facility (GEF) to assist the program's conservation of biodiversity (FONAFIFO, 2000; Pagiola, 2002; World Bank, 2000).
- **Colombia, Costa Rica, and Nicaragua.** The *Regional Integrated Silvopastoral Ecosystem Management Project* (RISEMP) is piloting the use of PES as a means of encouraging a shift from unsustainable agricultural practices to sustainable silvopastoral practices (Pagiola and others., 2003a; World Bank, 2002).
- **Guatemala.** The *Western Altiplano Natural Resources Management Project* (known as MIRNA from its Spanish acronym), under preparation, will include a component aimed at testing and piloting PES mechanisms at the local level and support the development of the required national policy framework and instruments.

- **Mexico.** The World Bank is supporting the government's efforts to establish a PES system.
- **Dominican Republic, Ecuador, and El Salvador.** Pilot PES programs are under preparation in these countries. El Salvador is at the most advanced stage.
- **Venezuela.** A GEF-financed project focusing on Canaima National Park is under preparation, with significant co-financing from hydropower producer CVG-EDELCA.
- **South Africa.** The *Cape Action Plan for the Environment* (CAPE), under preparation, aims to use a PES approach as one of the tools to encourage conservation in the Cape Floristic Region.

In addition, the World Bank's training arm, the World Bank Institute (WBI), has provided training on PES targeted to technical personnel in ministries, conservation agencies, and nongovernmental organizations (NGOs) involved in implementing PES programs.

PES and poverty

The PES approach was conceptualized and designed as a mechanism to improve the efficiency of natural resource management, and not as a mechanism for poverty reduction. However, many proponents have also argued that PES can also have positive impacts on poverty (Landell-Mills and Porras, 2002; Pagiola and others, 2002a).

In most cases, the main mechanism by which PES is assumed to contribute to poverty reduction is through the payments themselves, which are thought to go mainly to poor land users. This assumption can be seen most explicitly in the very name of the RUPES program in the Philippines: Rewarding the Upland Poor for Ecosystem Services. This is the main mechanism envisaged for the beneficial poverty impacts expected in the PES projects supported by the World Bank. In some cases, this positive impact is implicitly assumed to occur automatically; in others, activities under the PES program are specifically targeted to poorer land users. Thus, the proposed Western Altiplano Natural Resources Management Project in Guatemala targets as beneficiaries the poor rural farm households and emphasizes the impact of market-based natural resource management strategy on the livelihood of the poor. Similarly, the proposed National Environmental Management Project in El Salvador explicitly links poverty alleviation goals with market-based natural resource management, also targeting the small farmers to benefit from this strategy.

The impact of PES programs is not necessarily positive, however. Two main concerns have been expressed. Landell-Mills and Porras (2002) warn that by increasing the value of currently marginal land, PES programs would increase the incentive for powerful groups to take control of it. Thus PES might exacerbate problems in situations where tenure is insecure. A different concern is voiced by Kerr (2002). He cautions that the livelihoods of the landless poor—the women and herders who are non-participants in PES programs and who often depend on gathering non-timber products from forests—may be harmed if PES conditions limit their access to forested land.

These considerations lead to several questions that need to be addressed to further the understanding of the poverty dimensions of PES.[1] These are partly logical, and partly empirical. They are as follows:

[1] In thinking about the potential impact of PES on poverty, two aspects need to be distinguished: whether PES can help reduce poverty among program participants, and the broader question of whether PES can help reduce overall poverty in a country. We focus here on the first question. The answer to the second will depend partly on the answer to the first and partly on the extent to which PES approaches can be applied an any given country, which is outside the scope of this paper.

- Who are actual and potential participants in PES , and how many of them are poor?
- What are the impacts of PES on participants?
- What are the obstacles to the poor's participation in PES?

The following sections examine these issues in turn.

Who are the potential participants in PES systems?

Any PES system involves two main groups of participants: the downstream service users who pay for receiving services, and the upstream service providers who get paid.

Upstream service providers

Payments made under a PES system are payments for land use, and thus payments to land users. An initial, critical question thus concerns the identity of land users in upper watersheds. The presumption has been that these land users tend to be among the poorer members of society. Indeed, most of the poor tend to be found in rural areas, and particularly in marginal areas such as the steep slopes of the upper watersheds {NEED SOME REFERENCES}.

In Guatemala, Nelson and Chomitz (2002) find that watersheds that are most hydrologically sensitive (defined as watersheds in which the interface between agriculture and forest is found on slopes of 8 percent or more and represents a significant proportion of the watershed's area) also tend to have the highest concentration of poverty. The 77 most sensitive watersheds had a poverty rate of 70 percent and included a third of the country's poor. They find a similar result in Honduras, although the relationship there is less pronounced. Studies of the biological corridors targeted for GEF-financed payments under the Ecomarkets program—some of which overlap with watersheds targeted by water service payments—found them to be among the poorest areas in Costa Rica (World Bank, 2000).

These findings are tantalizing, but not conclusive. For one, they do not take into account the extent to which watersheds provide services. Some hydrologically sensitive watersheds may have very downstream water users, and so little potential for being included in a PES system. Moreover, the definition of 'hydrologically sensitive' focuses on watersheds in which deforestation is actively occurring. But the role of PES is not limited to avoiding deforestation so as to avoid further loss of ecosystem services. It may also include restoration of ecosystem services in watersheds where they have already been lost. Indeed, this latter role may well prove more important, as these watersheds are likely to be more densely populated and so more important from a service perspective. As PES programs are tied to areas with substantial downstream benefits, they cannot be targeted to areas of high poverty.

Second, even if the poverty rates in target watersheds are high, it does not follow that payments will be received solely, or even principally, by the poor. In some cases, payments may go to better-off land users simply because they may happen to be better positioned to provide land uses that generate the desired environmental services (for example, owners of riparian lands—which are often very important from an environmental service perspective—may be better off). But even if all land owners might in principle be able to provide the desired land uses, better-off land users may have an advantage in getting access to the program. However, landowners with high-productivity land are less likely to participate in a PES program, as their

opportunity cost is much higher. Owners of low-productivity land are more likely to be poor than owners of high-productivity land.

Even with a critical watershed, there is likely to be some degree of variability among land users. In Costa Rica, many land owners in the densely-populated Cordillera Volcanica Central area are relatively well-off urban dwellers (Miranda, 2003). Thus, a large proportion of participants in Costa Rica's PSA program in this area were found to be urban dwellers (Ortiz and others, 2002).

Land users in upper watersheds might differ in a number of ways that are relevant to the potential impact of PES:

- **Wealth.** Even in watersheds with high poverty rates, some land users are likely to be better off. Even within the poor, there can be substantial variability in the level of poverty. A PES system might not automatically reach the poorest, especially if the poorest face constraints in their ability to participate (as discussed below). The wealth of a household can also have a direct impact in cases where adopting PES-promoted land uses requires an investment (for example, reforestation).
- **Main source of income.** Some land uses lend themselves well to the adoption of PES-promoted land uses, others less so. This partly depends on the profitability of current land uses (the lower the profitability, the lower the opportunity cost of switching) but also on their characteristics ({EXAMPLE}). The extent to which land users receive income from off-farm work may also affect their predisposition and ability to adopt PES-promoted land uses.
- **Size of holding.** Larger holdings may have more flexibility in adopting PES-promoted land uses than smaller, subsistence-oriented holdings.
- **Tenure.** Both the security of tenure and its legal recognition might differ across land users, with a variety of impacts.
    a. As PES payments are payments to particular land uses, it may not be possible to undertake a PES program if tenure is insecure.
    b. Titling is a separate issue. Generally, titles may not be necessary as long as tenure is secure. Titles did emerge as an issue in Costa Rica's PSA program, however, as national law forbade using public funds to pay land owners who lacked formal title (Pagiola, 2002). The problem was eventually resolved by creating a parallel contract that only used funds from private sector service buyers.
    c. Another concern is whether the existence of a PES program would worsen or improve tenure security. As noted above, PES some have argued that by making land more valuable, PES could result in politically powerful groups muscling out poorer land users who lack secure tenure (Landell-Mills and Porras, 2002 {CHECK}). There is some anecdotal evidence that this has happened in parts of the Cauca Valley, for example ({NEED REF}).
    d. The situation of tenants is particularly problematic: there would have to be some agreement between owner and tenant over the distribution of the costs and benefits of participating in a PES program. Implementation of a PES program might also affect the owners' incentive to continue renting out the

land. None of the PES programs implemented to date have been in areas where land rental is common, so there is little evidence on this issue.

Indigenous groups and other groups that operate land collectively (such as Mexico's *ejidos* or some agrarian reform cooperatives in El Salvador) pose particular problems as they often usually bring together many of the above characteristics. {…}

There is a clear need, therefore, to have a better sense of who the potential participants are. The composition and structure of the population in the upper watershed will matter both to the success of the PES system itself and for its impact on poverty levels.

Other upstream groups

Beyond participating land users, many other upper watershed residents may find themselves affected by PES systems. These include people who are employed in agriculture or who collect a variety of products from forests.

- Employment impacts depend on the difference in labor demand between current land use practices and those promoted under the PES system. In many cases, this impact might be negative. Maintaining natural forest cover, for example, is likely to require less labor than converting that land to some agricultural use. To the extent that PES-promoted land uses lower demand for labor, those who depend on such employment for their livelihood could be adversely affected. The extent of this impact will depend both on the change in local labor demand and on the existence of other sources of employment. But note that it is not necessarily true that PES-promoted land uses reduce labor demand. The silvopastoral practices promoted under the World Bank's Regional Integrated Silvopastoral Ecosystem Management Project in Colombia, Costa Rica, and Nicaragua, for example, are expected to increase labor use by {GET NUMBERS} (World Bank, 2002).
- The impact on the collection of non-timber products depends on the extent to which the availability and access to such products. This is not necessarily negative. Smith and Scherr (2002), for example, argue that land use practices such as agroforestry have benefits to local people in terms of employment, food, medicine and other indirect services.

Downstream service users

In general, downstream service users are likely to be better off than upstream service providers. Urban residents with access to services such as electricity and piped water are almost by definition better off than the vast majority of rural residents. Likewise, farmers with irrigated land tend to be better-off than farmers in upper watersheds, being able to grow higher-value crops and having more reliable output. But there may well be important sub-groups of beneficiaries of environmental services that are not well off. One group stands out in particular: the poor may be disproportionately represented among those at risk from flooding ({NEED REF}).

PES programs aim to have these beneficiary groups pay for the services they are receiving. As such, PES programs appear to impose an additional cost on these users, and so could be thought to have the potential of imposing a hardship on them. While this is true, the alternative is generally that services go un-protected and hence are lost—a result that is likely to

have much higher adverse consequences than the need to pay an additional fee. Water vendors, for example, often charge prices that are ten times or more those charged by public utilities (Pagiola and others, 2002b). It is also worth noting that it is very hard, if not impossible, to get floodplain residents to pay for flood risk reduction services (Pagiola and Platais, 2003), so the fact that they are mostly poor does not matter in practical terms.

What are the impacts of PES on the participants?

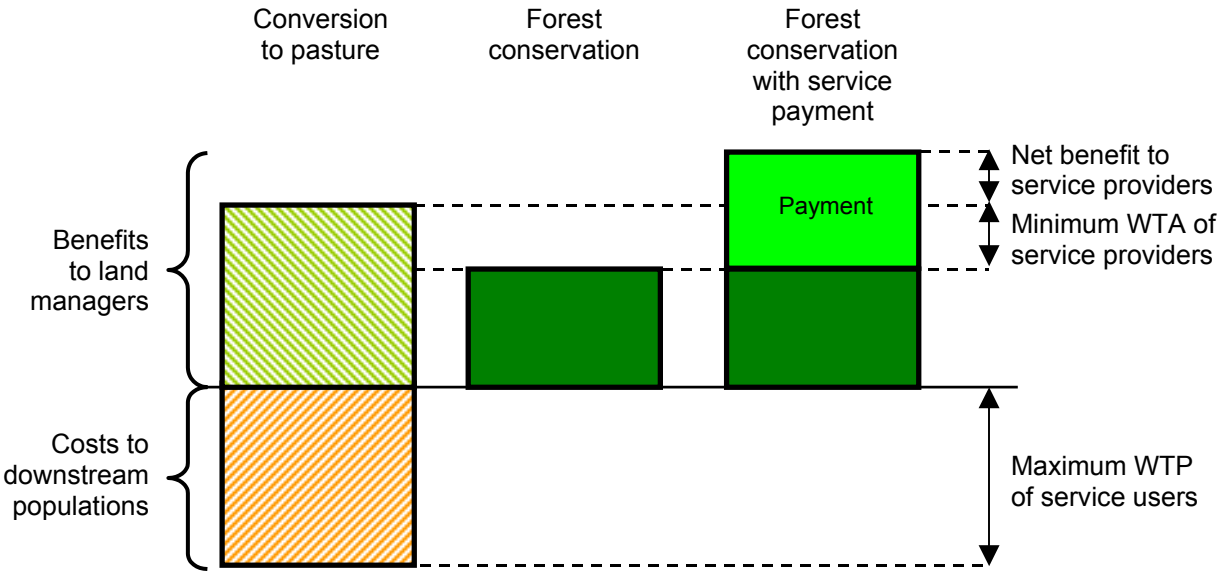
The most obvious impact of a PES program on participants is through the additional income it provides. In addition, there might also be a range of non-income impacts, such as social benefits. In addition, there may be indirect and second-order effects.

Income impacts

Many of the potential suppliers of environmental services are likely to be poor. The upper watersheds that are critical sources of water services, for example, are often inhabited by poor subsistence farmers, and payments for environmental services could be an important addition to their incomes. This will not happen automatically, however.

Note that the payment itself is not a good measure of the financial benefit to participants. The appropriate measure is the payment net of the opportunity cost of adopting the PES-promoted land use (Figure 2). {NUMERICAL EXAMPLE} This obviously complicates the task of assessing the impact, as the payment is much more easily observable than the opportunity cost.

Figure 2. Minimum and maximum payments in a PES system



Note: WTA: Willingness to accept; WTP: Willingness to pay

An important factor in the extent to which PES can have an impact on poverty levels is the level of payment. In general, this payment must lie between the minimum WTA of upstream land users to change their land use and the maximum WTP of the downstream service receivers

for the service they want (Figure 2). In practice, payment levels have tended to be set close to the minimum WTA. Upstream land users tend to be small and dispersed, and often ignorant of the downstream effects of their actions. The only information they know better than anyone else is their own opportunity cost of changing land use, but it's usually relatively simple to estimate this opportunity cost, at least on average. In contrast, it's much more difficult to estimate the maximum WTP of downstream users. This places upstream service providers in a weak bargaining position relative to downstream service users.

The willingness of upstream land users to participate in a PES program provides an important indication of whether they perceive that it will improve their livelihoods. Thus, Costa Rica's PSA program has proven very popular with landowners, with requests to participate far outstripping available financing. By mid-2000, over 200,000 ha of forest had been incorporated into the program, and FONAFIFO had pending applications to participate covering an additional 800,000 ha, which it has been unable to fulfill due to lack of funding.

There is at present little empirical evidence on the extent to which income from PES increases household income among participants. In the Pimampiro watershed in Ecuador, payments under the local PES scheme were found to average about US$21 per month per household (Echevarría and others, 2002), but as noted above, this is not a good measure of the benefits received. In Costa Rica, a survey of PSA program participants found that PES payments accounted for less than 10 percent of family income for almost three quarters of respondents (Ortiz Malavasi and others, 2002). Although this survey is likely to have had significant sample selection bias (it was conducted entirely by telephone, and so likely over-sampled the better-off respondents) it does show that for a relatively significant proportion of respondents, benefits from that program are relatively low. {EXAMPLE FROM IIED COSTA RICA STUDY}.

An important aspect of the benefits provided by a PES program is that the income received by participating households is likely to be much more stable than the income they receive from other sources. Unlike crop prices, payments for environmental services do not vary from year to year, although they are subject to being periodically re-negotiated. This stability might have important welfare benefits for many poor households.

Non-income impacts

There are indications that the establishment of PES programs also has social and cultural impacts which can affect the lives of the poor. The most obvious and most general we will mention here while the rest would be explored in the case studies that we will be doing in the near future. The situations mentioned here are from past studies done in Ecuador and India although the issues and points they raise are general in application.

There are indications also that the institutional building process needed for the implementation of PES creates opportunities for social capital building. PES draws the stakeholders together often in a participatory environment to draw out plans for efficient implementation. Such a situation provides a forum for the community to get to know its members and forge relationships among the stakeholders. The situation is a possible social capital building exercise not only between the sellers and the buyers, but the managers of the PES program as well. This is exemplified by the experience of Sukhomajri in India where the establishment of payment for the services that the villagers provide enhanced the cooperation and harmony in the community

The existence of PES programs also provides the opportunity for the poor to empower themselves through collective action. PES proponents avoid dealing with many small land-users and instead prefer to deal with fewer entities to reduce transactions costs. It is in the interest of land-users to band together as a group to collectively apply for participation in PES programs. While organizing the small land-users may have been done to address a particular need, the organization may in time represent the land-users in other issues relating to the needs of the community such as infrastructure. Organizations evolve in time as the members' needs change but it takes a solid collective objective—such as representation and participation in PES—that the members can identify with to allow the organization time to mature and evolve. Individually, the needs of the poor may not be allowed to participate in decision-making, but collectively the poor has a greater chance of being heard. Echavarría and others (2002), for instance, found that the implementation of payment systems helped create an institutional capacity in the Nueva America community in the Pimampiro area in Ecuador, that influenced the municipality to enforce environmental regulations.

The list of possible non-income impacts of PES may be long but what these impacts are depend on many factors and conditions prevailing in the community. It is not hard to discern how the social relationships among the stakeholders can be impacted by the presence of PES. However, relationships are complex and how changes in these relationships translates into in the lives of the poor will vary according to the specific conditions in the community.

Indirect impacts

The extent to which PES programs can have indirect impacts on non-participants remains to be determined. Although plausible links can be postulated through labor markets and access to common resources, as discussed above, there is little empirical evidence in this area to date.

What are the obstacles to the poor's participation in PES?

The potential impacts of PES programs will only be realized if the poor can in fact participate in the program. Several aspect might prevent them from doing so. These include the transaction costs involved, tenure issues, and the need in some instances to make investments.

Transaction costs

One of the most obvious and significant potential hindrances to the poor's participation in PES is transactions costs. Working with many small, dispersed farmers imposes high transaction costs, and special efforts are needed to ensure that the poor have access to the new opportunities created by PES programs. In Costa Rica a system of collective contracting has been developed through which groups of small farmers can join the PES program collectively rather than individually. The issue at hand is whether there are adequate mechanisms embedded in the institutions governing PES that allow the participation of the poor in PES programs.

Tenure issues

Security of tenure is another constraint to participation for the poor. Many of the poor are farmers but not land-owners and may therefore be denied participation in PES programs that are based on land ownership. Secure user-rights requirement is likely to be more effective in impacting the poor through PES than legal ownership.

In Costa Rica, lack of titles emerged as an obstacle to participation by the poor. Under Costa Rican law, only landowners with title can receive payments from public funds. This not only prevented many of the poor from participating—as they were more likely to lack titles than better-off farmers—but it also impeded the effective functioning of the program (Pagiola, 2002). To overcome this problem, FONAFIFO created a separate contract to be used when payments are made under agreement signed with specific service buyers. When FONAFIFO is administering private funds, the legal restrictions do not apply. The solution, therefore, was to create a parallel contract, similar in all respects to the PSA contract, but financed entirely with funds provided by the service buyers.

Investment costs

Participation in a PES program requires adoption of the land uses promoted by the program. In some cases, this may simply involve retaining existing forest. In others, however, participants may be required to undertake investments such as reforestation. Even if this option is in principle profitable, poor land users may be unable to adopt it if they cannot finance the necessary investment.

The solution to overcome this obstacle is naturally access to credit. If the land users are investment-poor as well as consumption poor, credit may be the swing vote that could make a difference. However, access to credit is governed my institutional constraints as well and presents us the issue of who has access to credit. Rural credit is effectively un-available in many areas. Even when it is available, it might require collateral which poor farmers do not have or are not prepared to risk. Addressing these problems is outside the scope of PES programs.

One approach that is within the scope of PES programs, however, is to adapt the payment schedule to take investment constraints into consideration. In Costa Rica's PSA program, payments under the reforestation contract are front-loaded, with a large part of the payment in the early years of the contract, and much smaller payments in later years.[2] In contrast, payments under the forest protection contract, which does not require any initial investment, are spread in equal installments over the length of the contract.

Conclusions and implications for PES design

Table 1 summarizes the main direct and indirect impacts that PES can be hypothesized to have on poverty. Overall, the fact that participation is voluntary creates a strong presumption that participants are better off, particularly for service providers who receive payments. If this were not the case, they could simply refuse to participate, or end their participation. The extent to which they are better off is an empirical matter, which has been little studied to date. It clearly depends substantially on the amount of the payment, and on the opportunity costs land owners must bear to take part, including the cost of forgoing alternative land uses, and any transaction costs that participation may entail.

That upstream land users are likely to benefit from PES does not automatically mean that there will be a substantial poverty impact. Although extent to which these benefits are received by the poor is also an empirical matter, which has been little studied to date. In many upper watersheds, a large proportion of the population is likely to be poor, making a positive poverty

[2] Under the reforestation contract, 50 percent of the US$538 total payment is paid in the first year, 20 percent in the second year, 15 percent in the third, 10 percent in the fourth, and 5 percent in the fifth.

impact likely, but this will not necessarily be true everywhere. Even within watersheds with primarily poor populations, there is no guarantee that payments will reach the poorest.

Table 1. Potential impacts on PES systems

Providers	*Potential impact*	*Extent of Impact*	*Comments*
Participants			
Land owners with secure tenure	Income from PES (+)	Depends on • amount of payment (+) • opportunity cost (–)	
Land owners with insecure tenure	Income from PES (+)	Depends on • amount of payment (+) • opportunity cost (–) • ability to participate (+)	
Tenants	Income from PES (+)	Depends on • amount of payment (+) • opportunity cost (–) • division of benefits with owner	Change in owner's willingness to rent? (–)
Downstream service users	Pay for PES (–) Receive services (+)	Depends on • amount of payment (–) • consequences of lack of PES system (+)	
Non-participants affected by PES			
Farm workers	Change in labor demand (+/–)	Depends on • relative labor needs for current compared to PES-promoted practices (+/–) • other employment opportunities (+/–)	
People dependent on NTFP collection	Change in availability and access to NTFPs (+/–)	Depends on • nature of current and PES-promoted practices (+/–) • local context	

Notes: (+) Positive impact
(–) Negative impact
(+/–) Uncertain impact; depends on case-specific circumstances

Assuming that many potential participants are poor, the primary potential limit to the poverty impact of PES arises from factors that might limit their participation. Unfortunately, many aspects that might prevent or limit participation in a PES program are likely to be correlated with poverty, including insecure land tenure, lack of title, small farm holdings, lack of access to credit. The extent to which these problems will prove to be an obstacle is also an empirical matter that requires further study.

In addition to the direct effects on actual participants, PES programs might also have indirect effects, including changes in the pressure on lands with insecure tenure, changes in labor demand, and changes in the availability and access to non-timber products. Although such linkages can be hypothesized, they have not been documented to date. All could, in principle, be either positive or negative depending on the details of the local situation. The impact on local labor markets, for example, depends on whether land use practices promoted by the PES

program are more or less labor intensive than those currently in use. The extent to which these indirect impacts might occur, and their exact nature, will require further study.

For downstream service buyers, the presumption that they benefit depends not only on the amount they pay but also in their receiving the services they paid for (which could take the form of either in improvement in services or the averted loss of services). In general, service buyers are likely to be better-off, on average, than upstream service providers. This means that the potential for positive poverty impacts is likely lower, and that concern over possible adverse poverty is also likely lower.

As this review shows, much remains to be learned about how PES systems interact with poverty. Specifically, research is needed on the following issues:

- Who are actual and potential participants in PES , and how many of them are poor?
- What are the impacts of PES on participants?
- What are the obstacles to the poor's participation in PES?

In the next year, the World Bank will be undertaking, with support from the Norwegian Trust Fund for Environmentally and Socially Sustainable Development, a series of detailed case studies of on-going and planned PES programs to increase our understanding of these issues.

A broader understanding of the potential linkages between PES and poverty will lead to specific policy questions :

- How can PES systems be designed to maximize positive impacts on poverty and minimize possible negative ones?
- What are the trade-offs between an efficient PES system and poverty reduction objectives?

Based on the initial review, there appear to be several ways in which PES systems can be designed to try to minimize adverse impacts and maximize positive ones. Probably the most important step is to design the payment mechanism so as not to exclude poor land users. This requires keeping the transaction costs as low as possible, and being creative in response to problems such as insecure tenure or lack of titles. This will be easier to do when there are strong local organizations such as community groups or NGOs that can help organize participants and provide a forum for discussing solutions to problems as they arise.

It is particularly important to consider the design of the program when there is reason to think that certain groups may be adversely affected. For example, if PES-promoted land use practices are much less labor intensive, so that farm laborers might lose their jobs, it might be possible to supplement the payments to land owners with programs of conservation work on public and common lands. There are probably many areas in every watershed that need conservation interventions but do not lend themselves to direct payments as they are common lands, such as riparian zones and roadsides. A community-organized program to improve these areas could also help generate environmental services, and so be eligible for financing under a PES program, while generating employment opportunities to replace those lost by the switch to less labor-intensive practices on private lands.

In considering how to best design a PES program so as to improve its poverty impact, it is important not to fall into the trap of considering the program as being primarily a poverty reduction tool. Making poverty reduction objectives predominate is understandably attractive,

but would prove ultimately self-defeating. PES programs will not be sustainable unless service recipients are satisfied that they are receiving the services they are paying for. Subordinating the objective of generating services to that of poverty reduction risks failing to deliver on the services, and thus undermining the very basis of the program. Once service users cease paying, neither poverty reductions nor resource management objectives will be reached. Thus there are many things that PES programs cannot do, no matter how desirable they might be from a poverty reduction perspective. They *cannot*, for example, target their interventions to areas of high poverty, as these may not be the areas which generate the desired services. Within an area that generates services, they *can* try to design the payment mechanism so as to allow the poor to participate. PES programs also cannot choose to promote particular land use practices solely on the basis of the poor being able to undertake them. But they *can* seek to provide support to poor land users, including technical assistance or access to inputs and credit, so that they can adopt the desired land use practices.

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