

Can rewards for environmental services benefit the poor? Lessons from Asia

Beria Leimona

World Agroforestry Centre (ICRAF)

Bogor, Indonesia, Wageningen University, The Netherlands;

L.Beria@cgiar.org

Laxman Joshi

Meine van Noordwijk

World Agroforestry Centre (ICRAF)

Bogor, Indonesia

Abstract: Rewards for environmental services (RES) link global priorities on poverty reduction and environmental sustainability and are designed to balance effectiveness and efficiency with fairness and pro-poor characteristics. Yet, emerging RES approaches tend to focus primarily on the efficiency in provisioning the environmental services and often neglect the perspectives of various actors involved in natural resource management, their livelihood strategies and the multi-dimensional nature of poverty. This paper assesses some key issues associated with the design and implementation of RES in various Asian pilot sites by developing and exploring two propositions related to conditions required for RES to effectively contribute to poverty alleviation, and to preferred forms of pro-poor mechanisms. Our first proposition is that only under specific circumstances will actual cash incentives to individual RES participants contribute substantially to poverty alleviation in ES provider communities. The second proposition is that non-financial incentives to ES providers will contribute to reducing poverty by linking the community (participants and non-participants) to access to various types of capital (human, social, natural, physical and financial). A review of key ratios of relative numbers and wealth of service providers and beneficiaries supports the first proposition and rejects the notion of widespread potential for reducing upstream rural poverty through individual cash payments. Results of community focus

group discussions support the second proposition through context-specific preferences for mechanisms by which RES can help trigger conditions for sustainable development.

Keywords: Asia, conservation, financial payment, non-financial payment, payments for environmental services, pro-poor, poverty

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1. Introduction

The basic rationale for payments for environmental services (PES) is that without benefit transfers that are conditional on environmental service¹ delivery, decisions on local resource use tend to overexploit resources and ignore effects on external stakeholders. Given sufficient scope of independent decision making by people whose actions influence environmental services (ES), incentives from those who receive the services can be effective to ensure continuity of ES. While beneficiaries of ES would generally like to receive these services free of charge, the legitimacy of resource use by others may have to be accepted and PES may be a viable option if it can lead to actual protection and restoration of natural resources and ES. For upstream ES providers, payments must be sufficient to exceed costs for opportunities voluntarily foregone in order for net benefits to emerge.

Design of PES schemes as an incentive-based approach is an alternative to the command-and-control approach that has usually preceded it (Ferraro 2001; Ferraro and Kiss 2002; Wunder 2005, 2007). Yet, since payments can only be provided for legitimate resource management, the effective functioning

¹ Since the Millennium Ecosystem Assessment the term ‘ecosystem service’ is commonly used, but this includes the ‘provisioning’ services or production of goods; we use ‘environmental services’ here as the equivalent of ‘regulating’, ‘supporting’ and ‘cultural’ ecosystem services, as derived from natural or agro-ecosystems (MEA 2005).

of PES mechanisms requires redefinition rather than abolishment of rules and their enforcement. PES refers to a wide range of potential incentives made to ES providers, ranging from one-off direct payments by ES beneficiaries to ES providers to more complex ‘market’ mechanisms involving offset credits traded among many buyers and sellers (Scherr et al. 2006; Smith et al. 2006). Four types of PES schemes can be distinguished and differentiated by the degree of government intervention in administration of the schemes, by the characteristics of the buyers and sellers, and by the source of payments: (1) private payment schemes; (2) cap-and-trade schemes, under a regulatory cap or floor; (3) certification schemes for environmental goods; (4) public payment schemes, including fiscal mechanisms.

In developing PES schemes, economic incentives are seen as the core consideration and conservation is targeted more directly than when it is integrated into broader development approaches (Wunder 2005). Realistic schemes need to be based on clear and recognizable cause-effect pathways involved in the production of ES. Proxies representing these pathways can be accepted as a basis for conditionality only in so far as these proxies are themselves subject to regular evaluation and refinement.

Neglect of the perspectives of all actors in the landscape and their livelihood strategies can jeopardize the success of PES schemes, such as when programmes are disrupted by communities who do not benefit from a PES. Furthermore, under global imperatives such as the United Nations Millennium Development Goals (MDG), concerted action will be required by all sectors of society to achieve MDG targets such as halving the number of people living in absolute poverty by the year 2015. Balance at the nexus of conservation and poverty alleviation is needed to achieve these dual goals. But how to combine PES with broader development approaches remains a major challenge in Asia.

PES mechanisms need to balance effectiveness and efficiency with fairness and pro-poor characteristics, with transaction costs as obstacles to both. Advocates of effectiveness and efficiency tend to see transactions in economic terms and generally prefer the term ‘payments’. Proponents of fairness and equity dimensions as elements that need to be added to effectiveness and efficiency prefer the broader concept of ‘rewards’². Van Noordwijk et al. (2007) developed a set of principles and criteria³ for rewards for environmental services (RES) that are summarized in four attributes (realistic, conditional, voluntary and pro-poor).

² In this paper, we consistently use ‘rewards for environmental services (RES)’ for our concepts and findings and ‘payment for environmental services (PES)’ for other special cases focused on financial transactions.

³ Indicators of such criteria are available in draft version.

- (a) *Realistic*: A RES should be able to reduce and avoid threats to environmental services that are likely to happen in the absence of further intervention; to do so, benefits gained by both sellers and buyers need to be tangible and sustainable. For ES intermediaries, there must be sufficient values accruing from ES to support development of RES mechanisms.
- (b) *Conditional*: A RES should be able to connect actual ES provision with the reward being provided, in a manner that ensures transparency regarding conditions when rewards can be granted or not.
- (c) *Voluntary*: A RES is voluntary when engagement of ES providers in RES schemes is based on free choice rather than on being the object of regulation. The key distinction between RES and purely regulatory solutions to ES issues is that both buyers and sellers voluntarily agree on RES contractual agreements. Bargaining power of both buyers and sellers can increase with insights into each other's strategies.
- (d) *Pro-poor*: A RES considers equitable impacts on all actors, and design of RES mechanisms is positively biased towards poor stakeholders.

In this paper, we assess some key issues associated with design and implementation of RES by developing and exploring two propositions related to conditions required for RES to effectively contribute to poverty alleviation, and to preferred forms of pro-poor mechanisms. These propositions are explored through analysis and empirical findings from a set of case study sites in Asia where RES projects are being implemented.

2. Key issues for rewards for environmental services

The pro-poor nature of a RES scheme can be interpreted from either a design or a poverty impact perspective. RES strategies can be deliberately designed to be biased in favour of the poor when considering tradeoffs between the efficiency and fairness of the mechanisms employed (Gouyon 2003; Van Noordwijk et al. 2007). From a poverty impact perspective, a RES can be assessed by its contribution to poverty reduction through payments that actually reach poor land users or poor ES providers. A RES could, for example, target support for small and medium sized farmers and land owners, and even give them additional portions of benefits such as income from RES (Hope et al. 2005; Van Noordwijk et al. 2007).

2.1. Stages in developing RES and their constraints

Literature on PES is already rich with discussions on a broad range of issues and constraints in establishing pro-poor PES, mostly in the context of Latin America (Grieg-Gran et al. 2005; Pagiola et al. 2005; Robertson and Wunder 2005), with

some in Asia (Tomich et al. 2004; Huang and Upadhyaya 2007) and only a few thus far in Africa (Ferraro 2007). Our summary of these constraints is framed by four stages of RES development, recognizing that high transaction costs can be an important constraint in all stages:

- (a) *Scoping*. This stage clarifies linkages between land management by ES providers and the ES that are actually provided. ES intermediaries and buyers target specific areas considered to be environmental service hot-spots. This spatial specificity may not coincide with areas where the poor live (Grieg-Gran et al. 2005; Van Noordwijk et al. 2007), and the poor may be excluded from such schemes because they may not qualify as ES providers. Even when the poor are legitimate ES providers, they usually own limited land. Most ES services (and payments) are based on particular land use at a given spatial scale. As small land-holders, the poorer members of a community will receive smaller proportions of benefits from PES than their better-off neighbours with larger land holdings. Moreover, PES programmes require long-term investment in order to achieve significant environmental impacts, so where land tenure is insecure, it may be difficult to attain these types of investments (Pagiola et al. 2005).
- (b) *Stakeholder analysis of RES key actors*. Problems at this stage appear similar to those in the first stage, especially regarding inclusion versus exclusion of the poor as ES providers.
- (c) *Negotiation between ES sellers and buyers*. Insecure land tenure can become a constraint for ES sellers in negotiating with buyers. It can undermine the legal legitimacy of sellers and limit their access to financial services needed to conduct activities required by the contractual agreement. And since poor people usually have less power in negotiation, there are risks that their voices will be neglected or undermined during contract formulation.
- (d) *Implementation problems in reaching the poor*. Four types of negative outcomes may be associated with RES implementation. Firstly, PES may provide incentive for powerful groups to take control of currently marginal lands (Landell-Mills and Porras 2002; Grieg-Gran et al. 2005; Pagiola et al. 2005). Secondly, livelihoods of the landless may be negatively affected if PES conditions limit their access to forested land (Kerr 2002), especially where the landless are women or herders whose livelihoods depend on gathering non-timber forest products, but who do not participate in PES programmes. Thirdly, farm labourers may lose their jobs when land use practices promoted by PES have much lower labour intensity (Pagiola et al. 2005). Fourthly, since most PES are area-based, there is an obvious risk the local distribution of rewards may further enhance existing disparity in wealth.

2.2. Cash incentives and non-financial incentives of RES⁴

The RES argument is built on local provision of environmental services that benefit external stakeholders, but which depend on deliberate human action. Environmental services to be delivered are often supplied at suboptimal levels due to competing opportunities to produce marketable goods and/or participate in paid service or industrial (urban) jobs. RES as a source of income that is in a form equivalent to the benefits derived from marketed goods may shift decision making along the goods versus services trade-off curve for local agroecosystems. This argument may seem to favour financial forms of freely disposable rewards, unless another form of rewards more effectively provides welfare at a collective action level that an individual would not be able to buy with cash in hand.

In order to have a significant effect, rewards must be sufficient relative to income and at least commensurate with costs of opportunities that must be forgone. Only then can RES seriously influence decisions about land use and their impacts on local natural capital and provision of environmental services. This criterion may be easier to meet when poverty levels are high.

Cash payments are frequently viewed as having the highest degree of flexibility because they can be converted to local goods and services as prioritized by the receiver. Any other form of reward can be seen as indirect and 'patronizing'. Notwithstanding these valid arguments, in practice, it is often clear that cash payments are much smaller than opportunity costs for people to fully provision an environmental service (Grieg-Gran et al. 2005; Huang and Upadhyaya 2007; Leimona et al. 2007). In most cases, the quantum of payment, often about US\$1 per capita per year, is too small to be very meaningful for receiving households. Thus, we have seen that communities often prefer that cash available for payments be used for village or community funds for social and local development activities. For example, in Cidanau, Indonesia, farmer groups have mobilized themselves to use their payments in ways that can benefit all community members, including protecting and enhancing local water supplies, including investment in water pipes, and building a mosque (Munawir and Vermeulen 2007). In Latin America, communities in a PES initiative for watershed protection in Santa Rosa and Los Negros in Bolivia agreed on an annual payment of one artificial beehive for every 10 ha of forest protected for a year (Asquith et al. 2008). This has a cash equivalent of about US\$3/ha/year, plus the value of accompanying apicultural training.

⁴ We define cash incentives of RES as direct financial payments from ES buyers to ES providers (participants of RES) either to improve their land use practices or to increase ES provisions. Non-financial incentives of RES are non-cash benefits gained by ES providers because of their engagement in the scheme, such as capacity building provided by intermediaries for participants of RES, collective benefits (such as infrastructure), access to microcredit, or various types of recognition from government, which in aggregate can contribute to broader development efforts and include non-participants of RES.

Other alternatives discussed, including road improvement and marketplace or bridge construction, were more costly. They assumed the mediating NGO would be able to deliver a ready-made complete ‘package’ of benefits, which appeared to be a rational preference because local capacities for savings, investment and entrepreneurship are limited. Indeed, PES recipients in Santa Rosa specifically rejected the option of payments in cash (Robertson and Wunder 2005; Asquith et al. 2008).

Preference for non-financial payments in the Latin American case is consistent with findings from other case studies in Asia (Huang and Upadhyaya 2007; Munawir and Vermeulen 2007). The most frequent reason given by rural people is that money is spent rapidly for conspicuous consumption and in the end leaves no long-run benefits for their livelihoods. However, cases from Cidanau and Brantas show that when access to information and facilitation is available from external parties such as NGOs or local government to support capacity building for starting new business ventures and income diversification, then cash payments can provide small amounts of immediately accessible start-up capital for these new livelihood options (Munawir and Vermeulen 2007).

In developing RES, the service being sold to external groups may also benefit the sellers. Internal benefits to ES sellers may appear to weaken the negotiating position of sellers based on arguments such as “why should we pay for a conservation effort that also benefits the sellers?” But ES buyers often must acknowledge that their limited budget will not be sufficient to provide a competitive choice relative to more profitable alternative land use. Thus, inclusion of additional non-financial benefits received by local people for managing or protecting ES can actually enhance chances for a successful RES when budgets of buyers are limited.

Benefits of non-financial payments can be channelled to a community as a whole and not just to the poor providers among them. Another type of consideration that can often be important is the use of public funds by government or other non ES-buyers to invest in specific assets and infrastructure, such as schools, health centres, or strengthening of human capital with skills not available locally. Such investments may provide benefits within a timeframe that is compatible with expected external benefits from the environmental service. Thus, various forms of co-investment and mutual responsibility may be able to emerge among ES sellers, ES buyers and government units with compatible mandates.

3. Methods

3.1. Propositions

Based on our review of literature, case studies and empirical experience, we developed two propositions related to the effectiveness of financial rewards in alleviating poverty:

Proposition 1: Only under *specific circumstances*, will cash incentives from payment for environmental services contribute *substantially* to increasing

disposable income and thus poverty alleviation of environmental service providers.

Proposition 2: Indirect non-financial benefits at community scale for those who engage in a RES scheme contribute to reducing poverty by linking the community (both participants and non-participants) to *access* to critical forms of capital, including human, social/political, natural, physical (e.g. infrastructure) and financial (e.g. microcredit).

We explored these propositions at two levels: 1) a model of the potential magnitude of financial payments and their relevance for upstream income (Proposition 1); and 2) analysis of findings from focus group discussions at six RES action research sites across Asia in order to capture stakeholder perceptions of poverty, constraints faced by ES providers, and preferred types of RES (Proposition 2).

3.2. A model of RES value as fraction of upstream income

Assessment of proposition 1 requires estimates of the potential total value of financial RES transfers relative to current income of poor ES providers. Given a total value, either a small group can benefit substantially or a large group marginally, but policy-relevant impact on rural poverty alleviation can only be expected if a large group can benefit at a daily income level that helps in meeting the \$1 per person per day threshold (or its national poverty line equivalent).

In formulating estimates for a potential RES we use an upstream/downstream terminology that can be taken literally in the case of watershed services, and more abstractly in case of biodiversity or climate change mitigation.

A RES scheme that is based on willingness to pay of downstream beneficiaries can generate a total volume of payments TP_d (\$ day⁻¹):

$$TP_d = A_d P_d I_d \cdot \beta_d \quad (1)$$

where A_d = Area downstream (ha), P_d = population density downstream (ha⁻¹), I_d = per capita income downstream (\$ day⁻¹) and β_d = fraction of income that is potentially available for such payments. The per capita benefits, expressed as fraction of the upstream income that this can generate upstream (RP_u) are:

$$RP_u = TP_d \cdot (1 - T) (1 - \alpha_u) (A_u \cdot I_u P_u)^{-1} \quad (2)$$

where A_u = Area upstream, P_u = population density upstream, I_u = per capita income upstream, T = fraction of downstream payments that is needed to cover the transaction costs and α_u = fraction of what the upstream population receives that is offsetting the opportunity costs of alternative land uses that might generate

more income but provide less environmental services. By combining equations (1) and (2) we obtain:

$$RP_u = (A_d A_u^{-1})(I_d I_u^{-1})(P_d P_u^{-1})\beta_d(1 - \alpha_u) \cdot (1 - T) \quad (3)$$

which expresses the per capita benefits in terms of a number of dimensionless ratios: area, population density, income, willingness to pay by downstream beneficiaries, transaction costs and offset-fraction. RP_u may have to be a ‘significant’ fraction of upstream income before upstream land users will take notice of the opportunity and respond.

As a criterion for use in exploring proposition 1, we tentatively postulate a modest target of 5% of current average annual disposable income of upstream rural households as a meaningful contribution to poverty reduction. Analysis of existing data can provide the ratios of downstream/upstream population densities, the areas involved and the relative income levels.

3.3. Rewards for environmental services initiatives

To assess proposition 2, we synthesize lessons from the RUPES project⁵, which seeks to develop pro-poor RES mechanisms in Asian contexts. Analyses are based on five years of implementation at six RUPES action sites and other partners’ sites in Indonesia, the Philippines and Nepal, combined with findings from participatory research conducted to elicit information about people’s perceptions and preferences related to potential payments for environmental services.

The study sites (Table 1) include biodiversity-rich jungle rubber (Bungo), good quality sources of upstream river and spring water (Singkarak), suitable land and climatic conditions for coffee plantations (Sumberjaya) and for upstream agricultural crops such as vegetables and rice (Bakun and Kulekhani), and both high biodiversity and abundant water (Kalahan). All sites are forest areas considered to be “under threat”, where communities are allowed to harvest non-timber forest products for their own consumption. As in upstream areas in other parts of Asia, average areas of household cultivable land are <2 hectares, and most sites are located in undulating upstream areas.

⁵ The Rewarding Upland Poor for Environmental Services that they provide (RUPES) project Phase I was a project coordinated by the World Agroforestry Centre (2002–2007). The goal of the project was to enhance the livelihoods and reduce poverty of the upland poor while supporting environmental conservation through rewards for ES. For further reference, see <http://www.worldagroforestrycenter.org/sea/networks/rupes/index.asp>. To enhance the livelihoods and reduce poverty of the upland poor while supporting environmental conservation on biodiversity protection, watershed management, carbon sequestration and landscape beauty at local and global levels.

Table 1: Action sites for testing reward mechanisms.

Site	Focus of ES	Current status
Indonesia		
Bungo	Jungle rubber for conservation of the diversity of local plant species and wildlife habitat	<ul style="list-style-type: none"> • Testing mini hydropower as intermediate reward for biodiversity conservation • A private buyer (automotive wheel industry) showing interests for rubber for “green” vehicles
Singkarak	<ul style="list-style-type: none"> • Water quality for hydropower, native fish conservation and ecotourism • Carbon sequestration for voluntary markets under CDM setting 	<ul style="list-style-type: none"> • Conservation fund from local government to revitalize organic coffee in the upstream watershed • Carbon market negotiated with private buyer (consumer goods distributor)
Sumberjaya	<ul style="list-style-type: none"> • Water quality for hydropower • Watershed rehabilitation for the District Forestry Service 	<ul style="list-style-type: none"> • Conditional tenure rewarded to farmer groups • Hydroelectric Power company (HEP) royalty agreements signed for River Care groups along the river
The Philippines		
Bakun	Water quality for hydropower	HEP royalty agreements signed
Kalahan	Carbon sequestration under voluntary market	Carbon market initial agreement with private buyer (automotive industry)
Nepal		
Kulekhani	Water quality for hydropower	HEP royalty agreements signed

Bungo In Bungo, farmers are committed to preserving jungle rubber biodiversity. The challenge of developing mechanisms for payments for biodiversity services is that jungle rubber does not shelter any charismatic animal species. Rather, it functions by providing important corridors that allow movement of wild animals and dispersal of plant species. Rubber gardens in Bungo household portfolios consist of both small plots of intensively managed rubber and small plots of extensively managed jungle rubber located either near their villages or further away. Farmers regard jungle rubber as a second best management system, after the more intensive monoculture plantations they would plant if they had the resources to do so. Farmers agreed to maintain jungle rubber based on rewards that enhance the value of their intensively managed agroforestry plots, while awaiting a longer term RES. The bundling of biodiversity conservation and watershed functions from jungle rubber is also being tested by installing micro hydropower plants to bring electrical supply to villages.

Sumberjaya About 40 percent of this 45,000 ha watershed is protected forest. It has a history of conflict, including forced evictions that caused relationships between local people and various levels of government to deteriorate rapidly. The RUPES-Sumberjaya project has facilitated conditional tenure agreements for community-based forest management that provide rewards by reducing transaction costs for

possible win-win solutions. Under this approach the government acknowledges that properly managed agroforests can bring the same watershed benefits as natural forests. In exchange for secure land tenure, farmers promise to conserve existing patches of natural forest and to use good management practices. Another RES scheme employs a RiverCare group to respond to challenges of conditional reward schemes. Community members of this group learned to monitor and control local sources of sediment in their streams and take soil conservation actions. Under a financial reward scheme, the hydropower company provides some upfront funds and then pays additional specified amounts based on effects actually achieved. RUPES also tested direct payments to the community based on a sliding scale starting at US\$250 for a sediment reduction of <10%, and up to US\$1,000 for a sediment reduction of 30% or more. This is an example of a payment for watershed services directly tied to delivery of the service – in this case reduction of sedimentation in the river.

Singkarak Singkarak Lake is located in West Sumatra, well known for its culture of blending its matrilineal society with Islamic tradition, entrepreneurship, a strong tradition of village governance (*Nagari*), and collective management of land belonging to clans (*Ulayat Kaum*) and local Nagari groups (*Ulayat Nagari*). In 2002, National Strategy Studies on CDM conducted by the Indonesian Ministry of Environment identified the Singkarak watershed as a potential site for implementing a national reforestation-carbon project. But despite its preparedness, the project has no confirmed buyers of the carbon. One of the difficulties in identifying investors is that the project was initiated when most rules regarding implementation of the Kyoto Protocol and the carbon market in Indonesia were still in an embryonic stage. Beyond the carbon market, the RUPES-Singkarak team sought to have hydropower royalty money flow to upstream communities, to clarify links between land use and environmental services, and to facilitate emergence of appropriate institutional arrangements for managing land use. In 2005, the Nagaris surrounding the lake received about US \$40,000 under their first allocation of hydropower royalties. The system uses criteria that include compensation for damage to livelihoods in *Nagaris* bordering the lake, which favors relatively poor *Nagaris*. Funds are intended to provide incentives for maintaining healthy environmental conditions. As the amount of royalties available depends on the amount of electricity produced, all players have a strong interest in the good performance of the hydropower company.

Bakun The Philippines also has a policy of royalty payments for hydropower. There is a tax of about 2% on the value of power produced, some of which is meant to be spent locally, but rarely is. At the Bakun site there is also an agreement between the hydropower company and local government providing a royalty of another 2% of the value of the power in return for watershed protection. But there are no specific targets for watershed protection. The Bakun

Indigenous Tribes' Organization (BITO) has attempted to negotiate additional payments, but has not succeeded. BITO is also negotiating with the local government to utilize a portion of their royalty revenue for conservation. BITO has been more successful in negotiating an agreement with the hydropower company for a new project. The company will also pay an annual amount of P500,000 (about US\$10,000) to the *barangay* government where its plant is located. The *barangay* of 316 households will benefit from these payments, which were negotiated by BITO and facilitated by the National Council of Indigenous Peoples (NCIP).

Kalahan The Kalahan forest reserve in Nueva Vizcaya province of the Philippines supports the livelihoods of approximately 550 Ikalahan families, as well as forests with diverse plant and animal species. Resources in the reserve, which covers 14,730 hectares of ancestral land, are managed by the indigenous Ikalahan people under an agreement with the Philippine Government. Originally hunters and gatherers, the Ikalahan have been swidden farmers for at least two centuries, coaxing the thin, acidic soils of their land to produce their traditional food, sweet potatoes or *camote*. Implemented by the Kalahan Educational Foundation (KEF), the RUPES project is developing contracts for carbon sequestration with carbon buyers. Monitoring of forest reserve carbon stocks is an on-going activity for avoided deforestation buyers. To date, the KEF has conducted preliminary activities to prepare for these markets, especially through project idea notes and awareness building among members of the indigenous group.

Kulekhani In Nepal, the Kulekhani watershed is located in Makwanpur district of the Central Development Region of Nepal, 50 km southwest of Kathmandu. The watershed supplies water to two major hydropower plants that generate about 17 percent of Nepal's current total hydroelectricity. The state hydroelectric company by law pays royalty to the central government, who then channels part of the royalty back to districts. Thus, the hydropower company, the central and district governments all benefit from the hydrology services that Kulekhani conservation activities provide, making all three potential buyers. Existing policy is for generators to pay a 6% royalty on the value of hydro-electric power they produce. The distribution of the payment is 88% for the central government and 12% for the district. After formal assessment of the current socio-political scenario and existing laws and regulations in Nepal, an alternative mechanism of reward transfer was proposed wherein the district government sets aside a portion of its hydropower royalty from the central government for the upland communities. A newly established group with representatives of Kulekhani communities proposed conservation programmes as their contract commitment to the royalty share. The project has been successful in securing an agreement that 20% of the royalty paid to the district will be given to the local village administration (known as the Village Development Committee) at Kulekhani.

This amounts to 0.144% of the value of power produced, which for Kulekhani is about US\$50,000 per year.

3.4. Participatory approach and data analysis

To explore the second proposition, we conducted focus group discussions with communities at each site on how they perceive poverty, constraints in implementing RES, and preferred types of RES. To ensure consistency in the process and the outputs of focus group discussions at various locations, we conducted a cross-site training workshop and developed a set of working procedures and agreements on research steps to be undertaken at all sites. The results from each focus group discussion were collated into coherent categories to identify patterns and analyse their responses.

Participants in these discussions were members of communities where RUPES project activities had been implemented. Most participants were already familiar with RES principles. One limitation of this method is that local perspectives could be biased towards on-going interventions because RUPES and other stakeholders were making progress towards RES. Table 2 shows the number of targeted respondents from each site.

Table 2: Sample respondents representing the households of environmental service providers at each site.

Sites	Targeted respondents	Number of respondents	Percentage of households
Indonesia			
Bathin III Ulu, Bungo	Five groups in sub-villages at jungle rubber locations	90	28
Paninggahan, Singkarak	Eight groups in two Nagari or village levels	80	43
Sumberjaya	Three community groups: 1) two community forestry groups; 2) one River Care group; 3) one land conservation group	103	27
The Philippines			
Bakun	Three main clusters based on elevation: 1) lower (1 barangay or village); 2) middle (4 barangays); and 3) upper (2 barangays)	124	39
Kalahan Ancestral Domain	Two community groups based on elevation: 1) high elevation – (3 barangays); and 2) low elevation – (4 barangays)	40	27
Nepal			
Kulekhani	Seven village development committees or VDCs	97	78
Total		534	36

All case study analyses employed a multidimensional perspective of poverty, drawing to some extent on the Sustainable Livelihood Approach (SLA) originally developed by Chambers and Conway (1992). SLA is a unified concept of well-being that encompasses both economic and non-economic aspects, and it has been used both for project design and for evaluation of impacts (Ashley and Hussein 2000). Assumed advantages of SLA are that it is people-centred and participatory, and that it recognizes the importance of 'assets' that the poor do not own. It is also informative about causal processes that reduce or increase poverty (Mukherjee et al. 2002; Grieg-Gran et al. 2005). Critics have pointed out that effects of different assets are overlapping (Angelsen and Wunder 2003; Grieg-Gran et al. 2005). Despite such valid critiques, SLA can at least provide a useful checklist of possible livelihood impacts related to introduction of environmental service rewards.

4. Results

4.1. Payment for environmental service value as fraction of upstream income

The model of PES value as a fraction of income suggests that downstream to upstream ratios of population density, income per capita, and coverage area can provide rough estimates of minimum financial transfers to ES providers. For example, if there is an ability of the downstream population to pay about 1 percent of their income in order to generate an increment from RES equivalent to 5 percent⁶ of income in the upstream population, the ratio of downstream population density to upstream density must be at least five. In other words, the number of ES buyers must be at least five times greater than the number of ES providers.

Spatial analyses of agroecosystems in Indonesia conducted by the World Agroforestry Centre (ICRAF) estimated the ratios of downstream to upstream population density and the ratios of downstream to upstream areas covered by agroecosystems (Table 3). The ICRAF team identified the ratio of downstream/upstream agroecosystem areas by their relative positions in a digital elevation model (DEM). Their analysis also found that the downstream to upstream ratio of population density in Java/Bali was 2.2 (Table 4). Java/Bali agroecosystems represent a typology that has potential problems related to watershed functions. The ES beneficiaries are rice-field farmers or urban citizens, while their upstream neighbours practice intensive mixed cropping. Watershed problems in these settings are mostly reduced water quality caused by heavy use of agricultural chemicals and fertilizers; and/or insufficient water quantity due to competing domestic and agricultural uses. Another important typology is found in islands outside Java and Bali, where downstream farmers cultivate tree crops or intensive mixed crops areas and forests are located upstream. The potential ES problem

⁶ We select the 5 percent as the minimal threshold for an appreciable financial incentive share to income.

Table 3: Downstream/upstream ratios of population density and areas covered by agroecosystem combinations found in Indonesia (adapted from Hadi and van Noordwijk 2005).

	Population Density $P_d P_u^{-1}$	Area $A_d A_u^{-1}$	Factor (Population Density \times Area)
Lowland: rice/urban; Upland: intensive mixed	1.6	0.36	0.58
Lowland: rice/urban; Upland: forest	11	0.06	0.66
Lowland: intensive mixed; Upland: forest	6	0.26	1.56
Lowland: tree crop mixed; Upland: intensive mixed plantation	0.6	0.56	0.34
Lowland: tree crop mixed; Upland: forest	3.6	0.79	2.84

Table 4: Ratio of downstream/upstream population density in agroecosystem combinations that occur in various areas of Indonesia (adapted from Hadi and van Noordwijk 2005).

Population density ratio (downstream/upstream)	Jawa/Bali	Sumatra	Sulawesi	Kalimantan	NTT/NTB/ Maluku	Papua
Downstream: rice/urban; Upstream: intensive mixed crops	2.2	0.6	1.8	–	–	–
Downstream: rice/urban; Upstream: forest	–	6.4	–	–	20.0	6.8
Downstream: intensive mixed; Upstream: forest	–	3.7	6.3	5.8	8.0	–
Downstream: tree crop mixed; Upstream: intensive mixed plantation	–	0.7	–	0.6	–	–
Downstream: tree crop mixed; Upstream: forest	–	2.5	–	4.6	–	–

in such areas is forest biodiversity loss due to crop expansion. The ratio of downstream to upstream area ranges from 0.06 (rice/urban downstream and forest upstream) to 0.79 (mixed tree crop downstream and forest upstream). In other words, upstream areas are more extensive in comparison to downstream areas in almost all parts of Indonesia.

Since urban poverty is a major problem in Indonesia, ratios of downstream income to upstream income also tend to be low. The average range of the ratio

between urban and rural income in 2003⁷ was about 1.3 for cities with moderate level of income, such as ones outside Java, to 2.0 for cities with high income level, and this proportion has been stable since 1996. Transaction costs of community-based resource management in Nepal were found to range from 14 to 26% (Adhikari and Lovett 2006). This range of values appears reasonable and is supported by research on transaction costs of small scale carbon projects where they were found to range from 13 to 30% of total project cost (EcoSecurities and Development 2003; Cacho et al. 2005).

Using the data above, we undertook a modelling exercise to illustrate use of information on downstream–upstream population density, area, and welfare in assessing the feasibility of an ES reward scheme based on cash payments. First, we generalize the above information as defaults for Asian conditions. We then multiply each factor to make the estimated ES payment more realistic. We consider a payment ‘realistic’ if the value to income fraction is more than 0.05, or the payment is more than 5 percent of disposable income. Second, we show how ES payments as income fractions vary among different scenarios.

Our analysis suggests that if we consider current Asian upstream–downstream situations as defaults, several conditions need to be satisfied to achieve target payment levels as follows (Table 5): (1) the downstream coverage area should be at least 3.6 times larger than the upstream coverage area; (2) downstream buyers should have income at least 7.1 times higher than the upstream sellers; (3) the number of downstream buyers should be 7.1 times larger than the number of upstream sellers; (4) buyers should be willing and able to pay at least 4 percent of their income as a contribution to ES provision from upstream.

In other words, a cash payment scheme that seeks to contribute substantially to poverty alleviation will require certain conditions: targeted ES buyers occupy a relatively large area with high population density, such as big cities, and high willingness and ability to pay relative to their income (Table 6). The analysis did not include the forgone income of ES providers joining a RES scheme or

Table 5: Multiplying factors for targeting payment of 5 percent of upstream income.

Scenario	$A_d A_u^{-1}$	$I_d I_u^{-1}$	$P_d P_u^{-1}$	β_d	T	α_u	TP_u
Default	1	2	2	0.01	0.3	0.5	0.0140
Downstream/upstream area ratio	3.57						
Downstream/upstream income ratio		7.14					
Downstream/upstream population density ratio			7.14				
Downstream willingness and ability to pay				0.04			

⁷ Formal data from BAPPENAS – the Indonesian National Planning Agency downloaded from www.tempointeractive.com

Table 6: Outcomes from different scenarios on area, population density and welfare.

Scenario	$A_d A_u^{-1}$	$I_d I_u^{-1}$	$P_d P_u^{-1}$	β_d	T	α_u	TP_u
Default	1	2	2	0.01	0.3	0.5	0.0140
ES providers occupied large area	0.2	2	2	0.01	0.3	0.5	0.0028
ES buyers occupied large area	4	2	2	0.01	0.3	0.5	0.0560*
Poor downstream buyers	1	0.5	2	0.01	0.3	0.5	0.0035
Rich downstream buyers	1	5	2	0.01	0.3	0.5	0.0350
Highly populated upstream area	1	2	0.75	0.01	0.3	0.5	0.0053
Highly populated downstream area	1	2	10	0.01	0.3	0.5	0.0700*
Low willingness and ability to pay of buyers	1	2	2	0.003	0.3	0.5	0.0042
High willingness and ability to pay of buyers	1	2	2	0.05	0.3	0.5	0.0700*

Note: *indicating that such scenarios have potential for downstream–upstream ES transactions.

the transaction costs involved. Transaction costs in developing a RES scheme involve costs of stakeholder participation, negotiation processes and institution building, which usually are expensive (Perrot-Maître and Davis 2001). These costs may increase further if other aspects of implementation are included, such as monitoring and enforcement, conflict management, and making necessary changes in legal and regulatory frameworks. Inclusion of opportunity costs and transaction costs will indeed reduce the net share of RES payments that increase upstream incomes.

4.2. Local perspectives on poverty

This section examines local people's opinions on factors that contribute to poverty. Poverty factors are classified into the five types of capital used in the Sustainable Livelihoods Approach (SLA), as shown in Table 7.

While results show substantial variation among communities at different sites, some general similarities exist. In the case of human capital, for example, lack of knowledge and access to higher education are the most important aspects that people at sites in all types of landscapes perceived as poverty related. Lack of human capital mainly limits opportunities for better jobs. Site-level discussions revealed that access to health services is also an important problem at most study sites, and especially in Kulekhani, Sumberjaya, and Bungo. With the exceptions of Singkarak and Sumberjaya, access to education is limited to elementary level, and drop-out levels are high. The condition is worse in Kulekhani where surveys indicate not more than 50% adult literacy rates.

Compared to other sites, perceived need for physical/financial capital is the highest in Kalahan, where all land is either remote core forest or conservation forest. Communities in Kalahan use poorly maintained roads that are often inaccessible during the rainy season. The nearest market for upstream communities in Kalahan is about 11 to 24 km, depending on road condition, whereas distance to market at other sites varies from 1 to 5 km.

Table 7: Local perspectives on factors contributing to poverty.

Capital/Site	Bungo	Singkarak	Sumberjaya	Bakun	Kalahan	Kulekhani
Financial	Low income Lack of financial investment	Low income	Low income	Low income Lack of financial investment	Low income No financial planning No savings Low prices of farm products	Low income
Physical	Poor road infrastructure	Not mentioned	Poor living condition	Poor living condition Poor access to road	Lack of farm irrigation and farm inputs (fertilizer, good quality seed) Small number of livestock Poor access to road	Poor living condition Poor road infrastructure No access to market
Human	Lack of knowledge Laziness Lack of future planning Lack of creativity Poor health services	Low education level	Low education level Poor nutrition status No access to job market Poor access to children education Poor health services	Low education level Laziness Unmotivated and bad working attitude	Low education level Laziness	Low education level No access to job market Poor health services Insecure food supply Large family size
Natural	Small land size Disturbance of pests and disease to rubber plantation	Not mentioned	No access to good quality of land	Small land size	Small land size	Small land size
Social	Not mentioned	Insecure land ownership	Low social participation	Not mentioned	Not mentioned	Not mentioned

Although people at case study sites in all types of landscapes have low income⁸, they rated financial capital as being only moderately associated with poverty. Discussions revealed that people have access to credit from various sources, which can include both formal sources (bank credit, local cooperatives, microcredit) and informal sources (relatives, friends, middle-men). Trends toward increasing levels of consumptive credit with high interest rates are associated with changing lifestyles in rural areas that include increased levels of consumption.

These findings capture fairly well existing poverty conditions at each site, and also disclose major livelihood concerns of communities including social aspects. At all sites except Sumberjaya, small size of landholdings (natural/financial capital) was seen as an attribute of poverty, whereas social capital was not mentioned. In the case of Sumberjaya, communities have a higher social diversity that includes three major ethnic groups: Semendo (native Lampung), Javanese (from Central and East Java) and Sundanese (from West Java). Sumberjaya was a target area for migration from Java and widespread evictions were experienced in the past, which has resulted in high levels of legally insecure land tenure. This also happened in Kalahan in the past, where the indigenous people, the Ikalahan, struggled for the legal control of their ancestral domain claims. Interestingly, no site other than Bungo mentioned lack of other types of natural capital, and in Bungo this was in connection to investments for controlling pest and diseases in the field.

4.3. Perceived constraints on rewards for environmental services

Locally perceived constraints on implementing RES schemes are summarized according to the four stages of RES development (Table 8):

- (a) *Scoping by identifying valuable ES and measures to increase them.* A constraint expressed in Bakun was lack of information about types of land management practices to maintain watershed functions. In Singkarak, people mentioned limited land ownership that might limit ability to contribute to ES provision.
- (b) *Stakeholder analysis of RES key actors.* Bungo communities had difficulty in identifying buyers, and even the notion of global buyers for biodiversity seemed very abstract for them. For Kalahan and Sumberjaya, internal constraints among community members were mostly related to needs for strengthening their local institutions before dealing with buyers, and for improving balance with regard to local equity (such as rights for being consulted and making collective decision) and transparency of information (such as contract contents, type of rewards gained).

⁸ Secondary data from 2000–2005 show that income per capita in these areas is less than US\$2 per day (Philippines National Statistics Office, 2000; Bakun Municipal Baseline Survey 2005; Bungo District website www.bungokab.go.id; The Nepali Makawanpur DDC 2003; Sumberjaya in Numbers 2003; Tanah Datar in Numbers 2002).

- (c) *Negotiation between ES sellers and buyers.* People at sites in all types of landscapes easily recognized this stage and identified it as a serious constraint. They are also concerned about the cumbersome nature of negotiation processes (due to power imbalance between the sellers and buyers, or even between sellers and government or intermediaries: “rewards never flow back to community”). The long gap between project planning and its realization is also problematic. A further concern is that buyers might not have enough funds for equitable RES.
- (d) *Implementation and monitoring of contractual agreements.* At this stage, people focused on the difficulties in monitoring ES. Bungo communities mentioned concern about procedures for monitoring biodiversity. They are worried about contractual obligations resulting from the negotiation stage and how well local people will adhere to agreed practices. The sustainability of RES implementation was one of the concerns of people in Kalahan.

Table 8: Local perspective of constraints at each RES development stage.

Stages/Site	Bungo	Singkarak	Sumberjaya	Bakun	Kalahan	Kulekhani
Scoping	Not mentioned	Limited land size to provide ES	Not mentioned	Lack of information about types of land management practices	Not mentioned	Not mentioned
Stakeholder analysis	Difficult to identify (international) buyers	Not mentioned	Weak local institutions	Not mentioned	Individual rights/local equity Ensuring transparency of decision	Not mentioned
Negotiation	Lengthy and cumbersome	Lengthy and cumbersome Unbalanced power of negotiation, low capability of sellers to negotiate	Conflict existing with potential buyers Time consuming Limited funding from buyers	Unsure that rewards will flow back to the community	Asymmetric information available between sellers and buyers Unclear negotiation rules	Potential risk that the poor's concerns neglected Lengthy and cumbersome
Monitoring and implementation	Difficult to monitor ES	Not mentioned	Not mentioned	Not mentioned	Payment not sustainable	Not mentioned

4.4. People's preferences on rewards

In order to facilitate comparison with findings in Section 4.2 on factors contributing to poverty, we analysed preferred forms of rewards identified by communities by classifying them under the five types of SLA capital (Table 9). Two communities,

Table 9: Expected environmental service rewards by locals.

Capital/Site	Bungo	Singkarak	Sumberjaya	Bakun	Kalahan	Kulekhani
Financial	Not mentioned	Not mentioned	Cash	Not mentioned	Financial assistance	Not mentioned
Non-direct financial	Cooperative for credit access	Reduction in electricity bill	Access to soft loans Forming of a farmer cooperative	Reduction in electricity bill	Access to soft loan	Reduction in electricity bill
Physical	Micro-hydropower Supply of rubber seedlings Road infrastructure Integrated pest management tools	Farming tools Road infrastructure	Road infrastructure	Road infrastructure	Road infrastructure Access to market	Road infrastructure Access to market
Human	Training and cross-site visit	Trainings for alternative small business	Agricultural extension Information on agricultural technology Access to labour market	Health services Access to labour market Educational services Trainings for alternative small business	Public services	Trainings for alternative small business, such as ecotourism management and non-timber forest product
Natural	Not mentioned	Not mentioned	Not mentioned	Not mentioned	Not mentioned	Not mentioned
Social	Recognition as environmental champion	Recognition as environmental champion	Community forest permit	Security of land tenure	Trust from government (to maintain good environment)	Recognition as environmental champion

in Sumberjaya and Kalahan, clearly requested reward money. Communities in all case study sites demanded various forms of indirect cash assistance (such as access to productive credit and reduction in electricity bills), productive physical inputs or assets (such as seedlings, farming tools, roads, access to market), and improvements in human capital (such as health and education services, training for alternative livelihoods and small business). People in Sumberjaya and Bakun demanded social capital in the form of community forestry permits and secure land tenure. These preferences might have been driven by their history of violence due to insecure land tenure. People in all other sites (Singkarak, Bungo, Kulekhani and Kalahan) solicited recognition of and trust in their environmentally-benign land management activities.

5. Discussion and conclusions

Increased global commitments to poverty alleviation and conservation⁹ are inducing scientists and policy makers to focus on balancing trade-offs between poverty and conservation. This paper combined theory and case study evidence of RES in an attempt to analyse the contribution of actual cash for individual ES providers to poverty alleviation, and to observe other non-financial benefits gained by communities engaging in such schemes.

Our model of the income share of RES payment value demonstrates that RES can only have a significant effect on rural income in upstream areas that provide ES if the scheme (1) involves upstream providers who have low population density and/or a small area relative to the beneficiaries and downstream beneficiaries who have relatively higher income than the upstream providers; (2) provides highly critical and non-substitutable environmental services that are substantial and worth paying; (3) is efficient and has low opportunity and transaction costs, but high willingness and ability to pay of downstream beneficiaries. Analysis of income and spatial data on agroecosystems in Indonesia indicates that this condition may be difficult to achieve given the population and income structures of downstream and upstream areas in Asia. Although the Asian data shows upstream income levels tend to be lower than those in downstream/urban areas (IFAD 2002), the ratio between urban and rural income is still quite low (<2.0). Indeed, in East Africa where the highlands provide more profitable agricultural products, we noted that upstream income can even be somewhat higher than downstream/urban income (Brent Swallow pers. comm). Despite current limitations on data, we recommend this simple model as a useful tool for initial diagnosis to determine the feasibility of implementing a RES/PES scheme. Accurate diagnosis during very early stages

⁹ Examples of global commitments are the general acceptance of the Millennium Development Goals and Millennium Ecosystem Assessment and associated international agreements, such as Convention on Biological Diversity.

can help avoid useless investment and over expectations about the role of RES in alleviating poverty.

The RES initiatives in Asia analysed in this study were quite heterogeneous in their types of poverty, landscape characteristics and environmental services provided. They also differed in their socio-cultural backgrounds, and in their modes for involvement of local communities. This reinforces the view that each site needs a localized design for pro-poor RES that takes into account their specific local perspectives, as well as the dominant types of landscapes and the particular environmental services that are most important within the local context.

Assessment of people's perspectives on factors contributing to their poverty in the context of developing a RES payment approach highlights many interesting insights. Results can help portray social, economic and institutional dimensions of current situations that need to be recognized in designing pro-poor RES approaches that are suitable for local conditions. One particularly important aspect of pro-poor RES design is to identify rewards that match with people's needs and expectations. From our analysis, we conclude that rewards in the forms of human capital, social capital and physical capital – or what are often referred to as non-financial incentives – are very often the most preferred and possible types of rewards. This supports our second proposition on how non-financial incentives can make important marginal contributions to local livelihoods, which was especially clear in the case of conditional land tenure in Sumberjaya. Moreover, literature on collective action in natural resource management indicates that social capital of community members influences the magnitude of transaction costs. Higher levels of social cohesion and trust within the community and its external linkages are associated with lower transaction costs. This suggests that investments that provide non-financial benefits to communities, such as strengthening social capital, can help reduce overall costs of RES implementation.

Among the various stages of RES development, constraints faced by communities at the stages of 'stakeholder analysis' and especially 'negotiation' seem to be the most important initial hurdles for communities in all types of landscapes. Although not all communities at RUPES action sites have reached the 'implementation and monitoring' stage, communities at sites dominated by remote core forest and conservation forest seem to be particularly concerned about monitoring of services like biodiversity and carbon sequestration. Overall, it appears that the criteria 'voluntary' and 'conditional' for establishing rewards for ES are the most important issue for local communities. Under our theoretical framework, 'voluntary' refers to involvement based on free choice by each community rather than their being the object of regulation. This relates to all levels of decision making – internally within communities, and externally in their relationships with ES intermediaries and buyers. Furthermore, a conditional RES must ensure transparency regarding conditions when rewards can be granted or not. In designing a RES, solving problems at local levels related to voluntary participation and conditionality can help make the whole process more effective.

Beyond that, the roles of intermediaries and buyers are also very important in ensuring that the RES is realistic and pro-poor.

We limited our study to action research sites that were selected from a larger set of candidates on the basis of expectations that all essential requirements for RES could be met. Thus, these sites may not necessarily represent the broader conditions of all upstream areas of Asia. However, this study's results can contribute to on-going debates related to the interface of fairness and efficiency in providing rewards for environmental services in Asia.

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