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Evidence of Payments for Ecosystem Services as a mechanism for supporting biodiversity conservation and rural livelihoods

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ABSTRACT

Payments for Ecosystem Services (PES) represent a mechanism for promoting sustainable management of ecosystem services, and can also be useful for supporting rural development. However, few studies have demonstrated quantitatively the benefits for biodiversity and rural communities resulting from PES. In this paper we review four initiatives in Guatemala, Cambodia, and Tanzania that were designed to support the conservation of biodiversity through the use of community-based PES. Each case study documents the utility of PES for conserving biodiversity and enhancing rural livelihoods and, from these examples, we distill general lessons learned about the use of PES for conserving biodiversity and supporting poverty reduction in rural areas of tropical, developing countries.

1. Introduction

Payments for Ecosystem Services (PES) have become popular as a cost-effective and sustainable mechanism for natural resource management. Despite a dearth of empirical evidence, many researchers have speculated that the element of conditionality and the direct compensation modality of PES make this approach more effective than alternative conservation approaches such as Integrated Conservation and Development Projects (ICDPs), where the links between actions and payments are often vague or non-existent (Ferraro and Simpson, 2002; MacKinnon and Wardojo, 2001; Simpson and Sedjo, 1996).

PES has been applied for ecosystem services associated with carbon, water, scenic beauty, and biodiversity. Of these, biodiversity has been the slowest to take off, largely due to the typically low availability of financial support for biodiversity conservation (Wunder and Kanounnikoff, 2009). While fewer biodiversity-based PES initiatives have been developed and/or documented, the role of PES as a conservation tool has received considerable attention in the literature (Pagiola et al., 2005; Redford and Adams, 2010; Sommerville et al., 2010; Wendland et al., 2010). However, more experimentation, in-depth evaluation and field testing are needed to generate guidance on when, where, and how to apply PES approaches for biodiversity conservation, particularly in countries with weak institutions, and unequal and ineffective application of the law (Pattanayak et al., 2010; Wunder and Kanounnikoff, 2009).

In addition to conserving or improving ecosystem services, the utility of PES for providing social benefits has also been explored widely in recent years. In high income nations, PES mechanisms primarily target the conservation or restoration of a key ecosystem service(s). In developing countries, PES also has been viewed as a potential mechanism for poverty reduction (Leimona and Lee, 2008;

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Pagiola et al., 2005; Pattanayak et al., 2010; Wendland et al., 2010). The utility of PES for supporting both conservation and poverty reduction is appealing in places where the two are often deemed incompatible and where PES may offer new and/or additional income generating opportunities for poor land-holders, farmers, or natural resource stewards who are isolated from markets and have few other livelihood options. However, despite a growing body of literature on the potential links between PES and poverty (Grieg-Gran et al., 2005; Kerr, 2002; Landell-Mills and Porras, 2002; Pagiola et al., 2005; Wunder et al., 2008), the quantitative, empirical data for assessing how PES can contribute to poverty reduction and under what conditions remain limited (Engel et al., 2008). Furthermore, many PES scholars and practitioners are concerned by the emphasis on PES as a poverty reduction tool, because it could lead to unrealistic expectations of what PES can do beyond conserving or restoring ecosystem services and, ultimately, could weaken the overall efficacy of the mechanism (Pagiola et al., 2005; Petheram and Campbell, 2010; Wunder, 2005).

In this paper, we address some of these issues and through case evidence, contribute to the growing body of knowledge on the utility of PES for supporting biodiversity conservation and contributing to poverty reduction in developing countries. Specifically, we address the following questions: how can biodiversity benefit from PES?; how can biodiversity-based PES support rural livelihoods?; and what are the necessary institutional factors for developing successful biodiversity-based PES in developing countries, where governance may be weak? To answer these questions we draw from user-financed, biodiversity-based PES initiatives in Latin America, Africa and Asia, and provide critical details on how the mechanisms were designed and implemented, and the results generated with respect to impacts on key ecosystem services and rural livelihoods. The case studies come from biodiversity rich landscapes that are home to impoverished rural communities that depend on the direct use of natural resources for their livelihoods. The cases include: community-based trophy hunting of turkeys in Guatemala; community land-use easements to conserve wildlife habitat in Tanzania; and community-based ecotourism and 'Wildlife Friendly' agricultural production in Cambodia. We consider these initiatives to be PES approaches because all of them involve a buyer making a voluntary, conditional payment to a seller, only if the key ecosystem service(s) of interest is conserved or enhanced by the seller through direct or indirect actions. In all of the cases presented, these conditional payments provide an incentive that enables and encourages the seller to engage in activities that help protect and maintain an ecosystem service, which is important to the buyer. These PES initiatives were selected for this analysis because of the data available with respect to their influence on conserving or enhancing key ecosystem services and generating benefits for local communities. Given there are few PES projects for which sufficient information is available to analyze effectiveness (Tallis et al., 2009), especially in developing countries, an analysis of these cases may provide useful guidance to other burgeoning PES schemes. While we realize that there is no single model for the successful implementation of a PES program or project (Kemkes et al., 2010), we conclude with a synthesis of lessons learned about the use of PES as a tool for supporting biodiversity conservation and benefitting poor, rural communities in tropical, developing countries with weak institutions and governance.

2. PES in the Maya Biosphere Reserve: community-based trophy hunting of the ocellated Turkey

2.1. Background

The wild turkey (*Meleagris gallopavo*) occurs across much of North America, where five regional subspecies are recognized (Aldrich, 1967). A century ago the species had been extirpated throughout most of its range by overhunting and habitat loss and where they remained, most populations were severely reduced by unregulated subsistence hunting. Today this species is again abundant and increasing in many areas, and occupies a broader range in the United States and Canada than in pre-Columbian times. This recovery was due primarily to a transition from unregulated hunting to state-managed sport hunting in the United States, supported by science based wildlife management policies and improved regulatory capacity (Aldrich, 1967). These achievements were supported financially and politically by broad public participation in sport hunting.

The only other living turkey species is the ocellated turkey (*Meleagris ocellata*), which is endemic to the Yucatan Peninsula of Mexico and northern Central America (American Ornithologists' Union, 1998). This species is currently following the historic downward trajectory of its fellow congener. Overexploitation and habitat loss have led to its extirpation from much of its former range and where they persist most remaining populations are subject to destructive and uncontrolled subsistence hunting (Kampichler et al., 2010).

To address these threats to the ocellated turkey, the Wildlife Conservation Society, a wildlife researcher working in the area, and a wild turkey expert from North America worked together with local communities to develop a community-based ocellated turkey sport hunting enterprise in some of the community forestry concessions of the Maya Biosphere Reserve (MBR) in Guatemala (Fig. 1). The concessions and all wildlife are state owned, but the concessionaire communities have been granted extraction rights for all renewable resources for the duration of the concession period (25 years). The conservation concept is based on the premise that if local communities earn a significant proportion of commercial sport hunt proceeds by assuming responsibility for most field operations, this will provide a sufficient incentive to reduce unsustainable subsistence hunting practices and supports local forest conservation efforts. A niche market for ocellated turkey sport hunting exists among members, of the National Wild Turkey Federation (NWTF), a US-based NGO with over 350,000 members that promotes turkey conservation through sustainable use (National Wild Turkey Federation, 2010). Many NWTF members participate in an internal prestige system that recognizes hunters who successfully hunt and register specimens of the different wild turkey sub-species and the ocellated turkey (Baur et al., 2008).

The communities of Uaxactún (688 residents) and Carmelita (388 residents) where the community-based hunting enterprise known as *Project Pavo* operates are two of the largest and oldest permanent settlements within the MBR (Ramos et al., 2001). Previous research found that local turkey hunting by villagers was not extensive relative to other important species for meeting local dietary protein needs (Baur et al., 2008). This helped ensure that the opportunity costs of establishing an enterprise based on

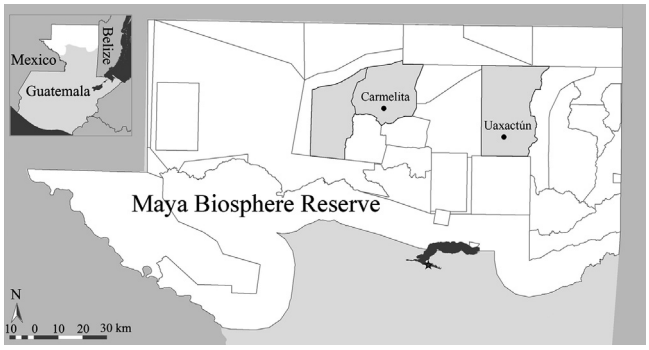

Fig. 1. Map of the Maya Biosphere Reserve in Guatemala showing the communities of Carmelita and Uaxactún and the three participating forest concessions in the Project Pavo.

sustainable, controlled sport hunting of the ocellated turkey in these concessions were minimal.

The local economies of both communities are dominated by natural resource extraction. Traditionally household income is generated from wild harvests of the fronds of *xate* (*Chamaedorea* spp.) palms exported for use in floral arrangements, allspice (*Pimenta dioica*) fruit, and the resin of gum trees (*Manilkara zapota*) (Ramos et al., 2001). Numerous other non-timber forest products (NTFPs) are collected for food, medicine, and household or furniture construction. Since the advent of the community forest concessions local income from selective timber harvests has surpassed that of NTFPs. Most resident families also cultivate maize and other crops for household consumption and raise swine and poultry. Thus, Project Pavo provides a compatible and sustainable option for diversifying local income generating activities (Baur et al., 2012).

Ocellated turkeys are highly suitable for selective harvesting and sustainable use. Turkeys are promiscuous and males play no role in nesting or caring for young (Bailey, 1967). Adult males compete for access to multiple hens and relatively few dominant birds deprive most other adult males of breeding opportunities. As a result only a minor percentage of adult males in a population are actually required for annual reproductive purposes.

2.2. Project design

A US-based company, Real Turkeys, is responsible for marketing the turkey hunts and booking clients. A Guatemalan counterpart business manages the permitting associated with sport hunting and firearms in the country, and annual hunt logistics. Individual turkey hunts last for a maximum of 4 days with no more than 6 hunters per group. Hunts are only scheduled between the second week of April and the first week of May (Baur et al., 2008), which corresponds to the period following the annual breeding peak to minimize negative impacts on reproduction. Harvests are selective for adult male turkeys and are applied at low densities to avoid compromising hunting success and quality. Timing of the hunting season allows dominant males to contribute to subsequent generations before being harvested and leaves many surviving dominant males and most remaining adult males for breeding purposes (Williams et al., 2010).

Hunters pay communities a standard fee for the right to harvest one turkey and related services. They are entitled to a partial refund if they do not have the opportunity to harvest a turkey, which has never occurred. Hunters pay additional fees to the community if they choose to hunt more than one turkey. When Project Pavo is at full capacity hunters are limited to a maximum of two turkeys, but when not at full capacity hunters may hunt the legal limit of three turkeys (Baur et al., 2012). Thus far hunters have had a 100% success rate, which is an important indicator of hunt quality and is appealing to prospective customers. The project conforms to PES criteria because payments for turkeys are based upon a voluntary transaction between the hunters (the buyers) who pay the community (the sellers) upon the condition that turkeys are sufficiently abundant for a high quality hunting experience. The only cost to local residents is to avoid hunting turkeys for subsistence purposes in the portions of each concession where the project operates.

2.3. Results

2.3.1. Ecosystem service impacts

As of 2011, Project Pavo had conducted 16 community-based hunts, provided services to over 187 hunters, and harvested over 296 turkeys (Baur et al., 2012). The project's consistent efforts to monitor harvest impacts are unprecedented for this species (Baur et al., 2012). Based on harvest densities and the results of annual population surveys, the project's harvests have represented between 4% and 14% of the adult-male component of harvested populations and between 0.7% and 3.8% of the overall populations. Wild turkey populations can sustain annual harvests of up to 40% of the adult-males and up to 10% of total populations (both males and females), so the project's harvests are quite conservative by North American management standards (Mosby, 1967). Turkey abundance actually improved in the harvest areas of both the Uaxactún and Carmelita concessions over the same period that the project's harvest levels were at their highest levels, indicating that the selective, low-density harvests have not had any discernible negative impacts on turkey abundance (Williams et al., 2010).

2.3.2. Community benefits

Local prices for turkey meat and feathers occasionally used for local handicrafts value individual turkeys at between US$5 and US$10 (Baur et al., 2012). Communities receive US$1450 from each hunter for the first turkey harvested and US$700 for the second turkey. Payments have increased from original rates when the hunting project started of US$1250 and US$500, respectively, as a result of improvements in the quality of the hunts. During low capacity years, hunters are permitted to harvest a third turkey for an additional US$500 to the communities. Secondary local income from Project Pavo is derived from skinning and trophy preparation, tips from clients, associated local research and administrative spending by the project's private-sector stakeholders, and several small grants that have been awarded to the project (Baur et al., 2012).

Income from the harvests grew consistently from 2000 through 2008, however, the global economic downturn has significantly reduced demand for ocellated turkey sport hunting. Assistance from the private-sector stakeholders and donors covered all start up costs of the project at the community level and has allowed Project Pavo to remain profitable for participating communities when client numbers were insufficient for commercial viability at the project level. Since the project began Uaxactún has earned an accumulated gross harvest income of US$217,175 over 10 years of hunts. Together Carmelita and the San Andrés concessions have earned a total of US$112,600 in harvest income (over 6 and 2 years of hunts, respectively). The participating concessions have benefitted from at least US$80,000 in additional secondary benefits (Baur et al., 2012). In contrast, before Project Pavo began, annual subsistence turkey harvests (of a greater number of turkeys harvested indiscriminately with respect to gender, age, or season) were worth approximately US$250–750.

Communities use the project harvest income to generate local employment opportunities, which accounts for approximately 50% of gross income, and also make contributions to local concession authorities. After the annual expenses of local hunt operations, communities usually retain sufficient profit margin to support local civic efforts, such as community celebrations and potable water improvement projects so that the economic benefits of the project are more broadly distributed throughout the communities. In Uaxactún, the Project Pavo has also contributed to local teachers' salaries, the construction of a new schoolroom, and provided support for the local concession management authority's control and vigilance commission. Each year Project Pavo maintains roads and trails, benefitting local residents and improving the ability of management authorities to respond to forest fire threats.

Over time participating community forest concession management authorities permitted Project Pavo to maintain semi-independent committees whose members manage local finances, personnel, and field operations in coordination with the management authorities (Baur et al., 2008). The Project Pavo has helped develop and strengthen local organizational and financial management skills, and provided significant local experience in the planning

Community-based Trophy Hunting of the Ocellated Turkey/Guatemala	
Governance	
Organizational Structure	3 village level concession authorities: 1 each for Uaxactún, Carmelita, and San Andrés concessions 2 private sector stakeholders: Real Turkeys for marketing and booking, quality control; IEWMS for permitting, logistics, quality control, some service delivery National Protected Area (PA) authority as the legal co-administrator of concessions
Property Rights	Concessions are awarded for a 25 year period contingent on compliance with contract specifications Wildlife is the property of the state and all harvests must follow national hunting protocols
Contracts	The private sector stakeholders negotiated terms with each community management authority
Monitoring	The NGO partner, WCS, monitors village level project performance and acceptability and contributes to integrated turkey population and natural resource monitoring efforts; the PA authority requires strict legal compliance with contracts
Costs and Benefits	
Start-up costs	High and covered entirely by private sector stakeholders and donor organizations
Revenue	
Community Funds	US$ 20,000 - US$ 36,000 per village/year (up to 10% of concession earnings)
Individuals	US$100 - $750 per individual depending on responsibilities and length of contract 10 -20% of adult males per village employed annually on a temporary basis
%Revenue Captured Locally	50%-60% of total project proceeds
Financial Sustainability	Contingent upon market forces and demand
Ecosystem Service Results	
Wildlife Enhancement	Yes - turkey abundance has improved and/or stabilized in harvest areas; defacto reduction of subsistence hunting pressure due to employment generation
Habitat Conservation	Yes - project proceeds support broader concession management objectives, contributing to the lowest deforestation rates in the Maya Biosphere Reserve
Exclude Immigration	Yes - project proceeds support broader concession management objectives , contributing to the lowest immigration rates in the Maya Biosphere Reserve

Fig. 2. Details of the community-based trophy hunting project in Guatemala.

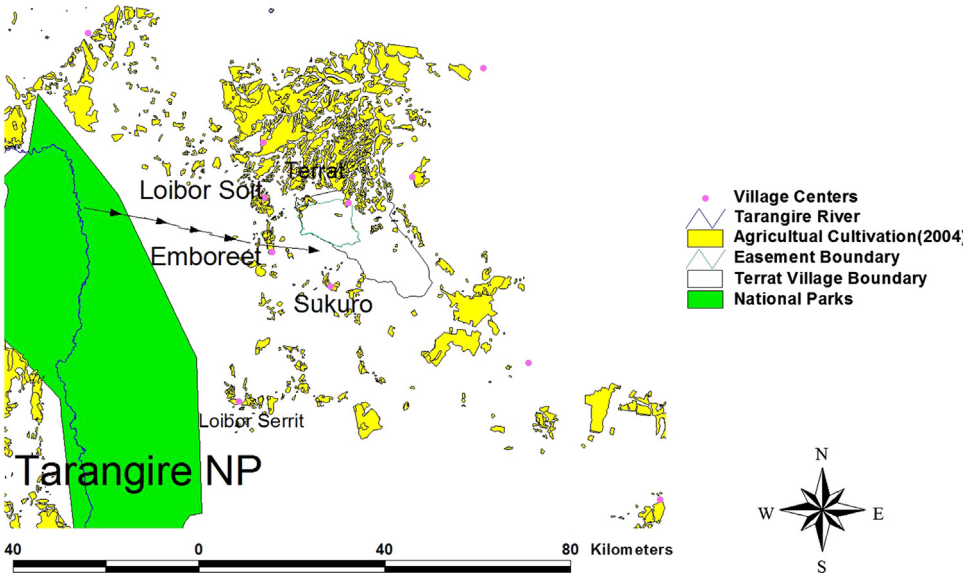

Fig. 3. Map depicting Tarangire National Park and Terrat Village. Arrow represents general path of wildlife migration to the Simanjiro plains, which are becoming encircled by agriculture on all sides, particularly from the north.
Sourec: From Nelson, 2008

and execution of remote, group field activities. Fig. 2 presents a summary of the characteristics and results of Project Pavo.

3. PES in the Simanjiro Plains of Tanzania

3.1. Background

Tanzania's Maasai Steppe covers approximately 35,000 km^2 in the north-central part of the country. During the dry season, large herds of wildebeest and zebra concentrate along the Tarangire River inside Tarangire National Park, as do other species such as elephant, buffalo, lion, hyena, leopard and cheetah. These dry season aggregations of wildlife draw large numbers of international tourists. Historically, the most important wet season habitat for wildebeest and zebra in this ecosystem has been on the Simanjiro plains. This area of short-grass savanna lies between 25 and 40 km east of Tarangire National Park (Fig. 3), well outside of the protected area boundaries, and attracts huge herds of zebra and wildebeest because the grasses (e.g., *Panicum coloratum* and *Digitaria macroblephara*) have a high phosphorus content, a critical nutrient for calving and lactating for both wild and domestic ungulates (Kahurananga, 1981).

The Simanjiro plains, as with over 90% of the Maasai Steppe, occur on lands owned and managed by local communities (Sachedina and Nelson, 2010). Most of the Simanjiro District is populated by Maasai pastoralists. The Maasai traditionally manage most of their lands as communal rangelands and employ spatial and temporal systems of movement and pasture rotation to prevent overgrazing and to mitigate risks posed by the region's

highly variable rainfall (Homewood and Rodgers, 1991). Additionally, Maasai pastoralists avoid spatial intermingling of cattle and wildebeest during relatively brief seasonal calving periods because the afterbirth of calving wildebeest carries a pathogen that causes Malignant Catarrhal Fever, which is deadly to cattle. As wildebeest calving occurs during the wet season on the Simanjiro plains, livestock herders avoid these areas during that part of the year. All grazing areas are shared by members of the community and rules over grazing access are determined and enforced collectively.

A tradition of rotational grazing as insurance against drought and to avoid intermingling cattle and wildebeest during calving periods may have predisposed the Maasai of the Simanjiro plains to accept the proposal developed by a group of collaborating conservation, tourism, and local development organizations. The proposal involved using a private sector-based PES mechanism to protect these important wet season grazing areas from conversion to smallholder farming. Pressures on grazing areas have been increasing throughout the area due to population pressure and factors related to the security of communal land tenure.

Most revenues from direct utilization of wildlife in Tanzania remain under the control of central government agencies despite a wildlife policy that advocates devolution of wildlife benefits and management authority to local communities to create local-level incentives for conservation. In particular, the lucrative trophy hunting industry, largely based on concessions located within community lands as in the Simanjiro District, has remained under control of the national government. In Simanjiro annual revenue generated from trophy hunting is approximately

US$250,000, all of which is directed out of the area to the national treasury (Sachedina, 2006).

3.2. Project development

Local communities, conservation organizations, and wildlife tourism operators working in the area have long recognized a major challenge to conservation in Simanjiro: wildlife needs to generate economic returns for local communities, but Tanzania's centralized conservation policies undermine this aim and thus fuel negative local attitudes towards conservation (Sachedina, 2008). Additionally, although community-based tourism ventures through contractual concession agreements with tourism companies have enabled villages to protect much of the habitat immediately bordering Tarangire National Park (Sachedina and Nelson, 2010), tourism is not viable on the Simanjiro plains because the soil conditions render game driving treacherous during the rainy season when wildlife are abundant. These realities mean that during the early 2000s as pressures grew, alternative strategies to secure key areas of habitat through voluntary local conservation measures were needed. Through a series of stakeholder discussions the possibility of designing a PES-type framework, or a community-based 'conservation concession' emerged as an option to be explored.

After discussions with stakeholders in the region, the village of Terrat was chosen as the site to attempt to implement a PES arrangement financed by annual contributions from a small group of tourism operators. Dorobo Tours, which had established the first village-operator concession area agreements in the area in the early 1990s, was the private sector actor with the longest history in Simanjiro and extensive experience in community negotiations and collaborative conservation processes. Dorobo consequently led efforts to build support among a core group of private operators for a village-based PES mechanism. A local civil-society organization called the Ujamaa Community Resource Team (UCRT) fulfilled the role of local capacity building facilitator to broach the concept with local communities.

The basic PES concept was that, although the plains were already protected by the Terrat community as a seasonal grazing area (used mainly during July–October), an added financial payment could provide the necessary incentive and resources to: (a) prevent future conversion of the plains to crop-based agriculture; and (b) encourage the community to not only tolerate, but to actually conserve wildlife by preventing poaching by outsiders. Beyond these direct impacts in Terrat, the initiative would provide a new and locally acceptable framework for community-based conservation that could later be scaled up to include other villages in other key wildlife dispersal areas (Nelson et al., 2009).

The basic agreement between the tour operators and the village involved the tour operators agreeing to pay the village an annual fee on the condition that the village would agree to prevent agricultural cultivation, charcoal production, and illegal hunting on their portion of the Simanjiro plains. The annual payments, conditional upon the continued maintenance of wildlife grazing areas distinguish this easement as a PES-like agreement. Dorobo proposed a sum of five million Tshs (roughly US$4500); a small enough amount that it would be feasible for the operators to contribute every year, but large enough to provide a meaningful incentive at the village level. The community's traditional livestock practices would be permitted to continue. The village also requested that the operators fund four village game scouts who would help monitor the wildlife and other natural resources in the village controlled areas and, thereby, help support the easement provisions. The operators agreed to this request in principle, although the Wildlife Conservation Society (WCS) later agreed to fund the game scouts with UCRT administering their salaries and provision of equipment.

Implementation of the initiative was led by Dorobo Tours and UCRT. Dorobo continued to organize the tour operators and secured pledges of financial support from other operators, several of which owned permanent tourism facilities inside Tarangire National Park. The main motivation for these operators was the conservation of the wildlife populations upon which their businesses relied.

Several factors influenced how the proposal was received at the village level and the relatively harmonious negotiations over the establishment of the PES easement. First, the agreement is based upon support for traditional land use practices. Pastoralist communities in Terrat and elsewhere face their own internal trade-offs with respect to maintaining grazing areas or allowing land to be converted to crop production. In Terrat, the short-grass plains have always been managed as a dry season grazing area for livestock and crop production has been excluded or limited to other village managed areas. Thus, the formal contractual prohibition of crop cultivation in this area bore no immediate costs for the village, but rather provided an incentive that served to reinforce their existing land-use practices.

Second, a potential barrier to implementation was the community's suspicion of wildlife conservation as a threat to local land rights and livelihoods in the Simanjiro plains (Sachedina, 2008). This barrier was addressed strategically by introducing the proposal first to several local traditional and community leaders from Terrat, and including the director of a local development organization that had previously helped mobilize opposition to conservation initiatives. This organization not only supported the PES easement concept, but assisted with the village-level meetings to discuss the proposal that led to its fairly expeditious endorsement.

Third, a history of village-operator tourism contracts and concessions in neighboring villages already existed. Dorobo Tours had been operating in the area for nearly 15 years and was already well known. The community's familiarity with these tourism ventures made the proposal easily understandable and helped allay fears about the possibility of hidden wildlife conservation agendas. Similarly, the proposal was presented as a business deal based on the tour operators' financial stake in the health of wildlife populations. For this reason, the payments were to be

	PES Easement in the Simanjiro Plains of Tanzania
Governance	
Organizational Structure	Tour Operators Village Level Management Board Ujama Community Resource Team (helped broker the relationship) Wildlife Conservation Society (pays the game scouts' salary)
Property Rights	Land owned and managed by the community. Majority of revenues from utilization of wildlife are managed by the central government
Contracts	Between tour operators and village
Monitoring	Undertaken by village scouts
Costs and Benefits	
Start-up costs	Minimal and covered by tour operators
Revenue	
Community Funds	$4,500/year
Individuals	4 wildlife patrol scouts are each paid $50 per month
%revenue Captured Locally	100%
Financial Sustainability	Dependent on tourism market
Ecosystem Service Results	
Habitat Conservation	High- conservation of 9,300 hectares of grasslands

Fig. 4. Details of the PES easement in the Simanjiro Plains of Tanzania.

provided by tourism companies only (i.e., no NGO contributions to the annual, conditional payments).

After the easement contract was signed in 2005, a village-level management board was established, consisting of five villagers elected by the village assembly every 5 years. This board manages communication between the operators and the village and is the village-level institution that oversees the receipt and use of annual payments. In addition, four village game scouts were selected by the village; two permanent scouts and two who rotate every 6 months. These scouts are paid 60,000 Tshs (~US$50) monthly using funds provided by WCS and administered by UCRT. The scouts report to the village easement management board, which in turn reports to the village assembly. The WCS trained the scouts in wildlife population monitoring, which will provide data on local wildlife trends that can be used to assess the impacts of the PES agreement and community conservation measures in Terrat. The village game scouts do not have the authority to arrest perpetrators of observed illegal activities except where they have been given a village mandate to do so. Rather, the game scouts patrol the area and report poaching activity to official wildlife authorities in the Tanzania National Parks or Wildlife Division. The costs of anti-poaching activities undertaken by legal authorities in the area are substantially higher than the costs of the village scout based efforts and include vehicles, government personnel salaries, and communications equipment. The financial support of village scouts is a complement to the PES scheme by providing an additional economic incentive for the community to support anti-poaching activities and assist with wildlife monitoring.

3.3. Results

3.3.1. Ecosystem services

For approximately 6 years the Terrat conservation easement has provided a formal mechanism for community-based protection of approximately 9300 ha of wildlife habitat and wildlife in the area. The agreement formalizes traditional land use patterns and norms, which effectively serve as a barrier to expanding agricultural frontiers. The agreement also places a financial value on the ecosystem service of interest, wildlife tourism, that traditional livestock and land management practices help support through wildlife habitat conservation in Simanjiro. Thus the arrangement helps correct the 'market failures' whereby wildlife that is valuable to the national tourism industry is not equally valuable to the local communities who, effectively bear the costs of managing areas important for wildlife habitat.

3.3.2. Community benefits

Terrat has received 27.6 million Tshs to date (~US$18,000), the bulk of which was invested in the construction of a primary school and a new secondary school in the village center. Although the total annual communal revenues from the easement (approximately US$4500) are relatively small in relation to the total support for social services that the village receives from other sources such as the district council and development NGOs, the easement funds are one of the few sources of discretionary revenues received by the village government. This amount of village revenue, although small, gives community-based institutions greater flexibility to support development projects. It also contributes to the development of local governance institutions and processes as the community must collectively decide how to allocate these revenues. Individual benefits to the four village game scouts, while modest, are significant in this context where typical household cash expenditures are around US$10 per month and employment opportunities are limited.

An equally important outcome of the Terrat easement is the emergence of a new, locally acceptable, and cost effective (approximately US$0.48 per hectare) framework for wildlife conservation on village lands in Simanjiro (Nelson et al., 2010). While the Terrat easement is nearly identical to the framework for village-operator tourism concessions in nearby parts of Simanjiro, the financing of the Terrat agreement is quite different. As a result of the generally good reputation of the easement agreement in Simanjiro, the neighboring village Sukuro agreed in 2010 to adopt a similar arrangement for its portion of the Simanjiro plains, bringing the total area of short-grass plains conserved by voluntary PES measures to around 23,000 ha, or 75% of the total area of the Simanjiro plains. Thus, these PES structured easements can be replicated throughout the region as a realistic framework for reconciling community interests with conservation objectives by creating conditional, local-level incentives for conserving important wildlife areas of the Maasai Steppe. Fig. 4 presents a summary of the defining characteristics and results of the easement.

Fig. 5. Map of the Northern Plains of Cambodia and the protected areas, Kulen Promtep Wildlife Sanctuary and the Preah Vihear Protected Forest, where the villages engaging with the two PES initiatives are located.
Source: From Clements et al. (2008).

4. PES in the Northern Plains of Cambodia: conditional payments for ecotourism and wildlife friendly agriculture

4.1. Background

In 2002 the Ministry of the Environment and the Ministry of Agriculture, Forestry and Fisheries in Cambodia, instituted several PES pilot projects to support biodiversity conservation in the Northern Plains of Cambodia with support from the WCS. The PES initiatives have been implemented in villages located within two protected areas in the Northern Plains landscape: the Kulen Promtep Wildlife Sanctuary, which was established in 1993 and is managed by the Ministry of the Environment, and the Preah Vihear Protected Forest, which was declared in 2002 and is managed by the Forestry Administration of the Ministry of Agriculture, Forestry and Fisheries (Fig. 5).

The Northern Plains landscape is of global conservation importance due to the largest remaining tracts of deciduous dipterocarp forests found throughout the area. The Northern Plains still support nearly intact wildlife assemblages, albeit at severely reduced densities, including critically endangered species such as the Giant Ibis and the White-shouldered Ibis (*Pseudibis gigantea* and *P. davisonii*). Both protected areas also contain and are used by long-established communities, and most of the residents live in extreme poverty as the Northern Plains represents one of the poorest areas of Cambodia. Here, two different market-based PES approaches were implemented in the same villages within the two Northern Plains protected areas.

Livelihood practices include lowland rain-fed paddy rice cultivation or upland shifting cultivation of rice and other crops, collection of forest products, and fishing (McKenney and Prom, 2002; McKenney et al., 2004). Forest resources are a crucial livelihood safety net and provide cash income (McKenney and Prom, 2002; McKenney et al., 2004). The village-managed PES projects started after an initial participatory land-use planning process that established community management zones and clarified land and natural resource proprietorship (Rock, 2001). The land-use plan has been approved by the relevant government authorities and is managed by an elected village committee. It specifically establishes which areas can be used for agricultural and residential purposes, including future expansion areas that are currently forest. The village organizations and approved land-use plans provided the necessary institutional foundation for PES establishment.

4.2. Project development

4.2.1. Wildlife tourism

The community-based ecotourism initiative was started in 2004 in the village of Tmatboey in the Kulen Promtep Wildlife Sanctuary. The model has since been replicated in other villages in the Northern Plains landscape. Tmatboey is a small village of 236 families (in 2008) located within a large mosaic of deciduous dipterocarp forest, seasonally flooded grasslands, and permanent wetlands. The total village area is about 25,780 ha, of which only a small proportion (620 ha in 2008) is currently used for agriculture. The site fulfills many of the criteria for a successful ecotourism location (Wilkie and Carpenter, 1999): it contains rare species that are high profile targets for international birdwatchers (e.g., the Giant Ibis); rare species sightings are reliable year-round; access is

relatively easy from the major tourism center at Siem Reap, which receives more than two million visitors annually and has an international airport; accommodations meet international standards; and prices are reasonable.

The eco-tourism model requires that every tourist who comes to the village to go bird-watching must pay either US$30 if they see all of the species, including the rare ibis species, or US$15 if they only see a subset of key species. The opportunity to receive a higher payment if a tourist sees all of the species represents an additional, conditional incentive, which has been integrated into the eco-tourism venture. All of the tourist payments go into a community fund that a locally elected committee manages and uses for village activities and projects. Establishment of the village-level ecotourism enterprise was based on a contractual agreement between the protected area authorities, the WCS, and the village, which stipulated that transfer of tourism and associated benefits to the village was conditional on the discontinuation of local hunting of key species and abiding by the agreed land-use plan. A detailed description of this PES-like approach to ecotourism is provided in Clements et al. (2008). Institutionally, four parties are critical to the venture, each of whom plays a key role:

- elected village committees: responsible for on-site management of tourism services, management of local income, local enforcement of hunting bans and land-use plans, and report serious violations to PA authorities;
- PA authorities: responsible for legal approval of tourism agreements and local land rights, and law enforcement;
- Sam Veasna Center (a local civil society partner based in Siem Reap): responsible for marketing and the management and monitoring of tourism bookings on behalf of the village-level enterprises;
- private sector stakeholder: responsible for tourist bookings and revenues.

4.2.2. Wildlife friendly agricultural products

As tourism has limited potential for replication locally because all villages support a similar species mix and the international bird-watching market is relatively small, the WCS started a wildlife-friendly agriculture project in 2007, which served as a community-based PES scheme that could be replicated more widely than tourism and also support the conservation of rare bird species. Under the project, farmers that abide by their land-use plan and no-hunting rules are allowed to sell their rice to a marketing association at premium prices. The association is able to offer preferential prices to the farmers through direct sales to national market centers, by-passing intermediaries who previously monopolized village trade, and through direct sales to tourist hotels under a new global 'Wildlife Friendly' certification system. The association also provides start-up capital, advice on high-market value crop varieties, and training in new agricultural techniques and post harvest quality management. All profits are shared among the farmers and the village organizations after deducting the operating costs of the association. Payments to individual farmers are conditional in that they are linked to their compliance with the land-use plan and hunting bans, and external verification by the marketing association. Compliance is monitored by the village committee.

4.3. Results

4.3.1. Ecosystem services

For local villages, the ecotourism venture has helped demonstrate the global importance of rare bird species and their economic value to international tourists. Villages have developed and locally enforced their own rules about which species are protected and have agreements about the conservation of nesting and feeding sites. Substantial increases in wildlife numbers have been observed at the first village site, Tmatboey. For example the local population of White-shouldered Ibis, one of the rarest birds in the world (Hirschfield, 2009), had increased from one nest and a single pair of birds in 2002 to at least six nests and 23 individuals in August 2008 (Clements et al., 2010). Local people have also begun to enforce the land-use plan regulations by reducing immigration and controlling deforestation (WCS, unpublished data).

Local enforcement of land-use plan regulations also occurs in the four villages where the agricultural PES project has been established. Over 90% of the resident families are compliant with the land-use plans and three of the four villages have refused to allow immigration (the fourth is remote and so far no immigrants have settled there). As with the ecotourism venture, local enforcement is based on verbal or written agreements between farmers and the committees to stop illegal activities or relocate rice fields according to land-use plans rather than through meting out punishment for infractions. At least eight families in two of the villages have relocated their agricultural activities in response to the contracts (Clements et al., 2010).

4.3.2. Community benefits

Tourist numbers at Tmatboey have increased by an average of 36% annually between 2005 and 2008 (to ~120 people per year). Revenue increased by an average of 100% annually over the same period because the villagers improved service quality allowing them to raise prices and diversified the range of services provided allowing them to capture more revenue from tourism-based income generating opportunities. As a consequence average per tourist expenditures increased from US$10 in 2004 to US$67 in 2008 and the percentage of tourism revenue spent locally rose from 11% to 24%. By the 2007–2008 season the village earned ~US$12,000 in annual revenue, of which ~US$3500 went into the village fund and nearly US$8500 was used to pay for services provided by villagers. In that season, 25 individuals were employed on a part-time permanent basis as guides, cooks and guesthouse managers, receiving on average US$20–40 per month each during the tourism season (annual average income of US$160, maximum US$400). These sums are significant for families that depend on subsistence agriculture and forest products, where average annual household income ranges US$350–500 (in 2008). Another 65 individuals benefited through some form of temporary employment (e.g., occasional guides, guesthouse maintenance, carrying water), or providing goods used by tourists within the village, mainly food. Around 40% of resident families were involved to some extent. Payments to the village fund have been used to help pay for the construction of a new school, a road, fish ponds, for repairing water-pumps, and for excavating wells. Some of the revenue was used by the committees to pay villagers for local patrols and the protection of nesting birds.

In 2008, the first full year of the Wildlife Friendly agriculture initiative, farmers were offered approximately US$0.25 per kilogram of rice plus profit-sharing, representing an initial premium of 200% over the standard price offered by middlemen. However, in response to this competition the middlemen raised their price to US$0.22 per kilogram and in addition offered to use the village's scales, since the middlemen's scale was widely suspected to be biased. Despite this counteroffer, the villagers still preferred to sell their products through the village committee. Farmers interviewed indicated that they preferred to sell to 'their own people' rather than outsider middlemen, because: they trusted the village committee, they were treated with respect, the process was

	Community-based ecotourism	Wildlife friendly agriculture
Governance		
Organization arragement	4 actors village - management national PA authority - enforcement external agency - certification and marketing private sector - sales	4 actors village - management national PA authority - enforcement external agency - certification and marketing private sector - sales
Property rights	Co-management - village and PA authority	
Contracts	Tourists and village committee	Buyer - village committee - residents
Monitoring	NGO (certification) and PA authority	NGO (certification) and PA authority
Costs and benefits		
Start-up costs	High - $50,000/village	High - $50,000/village
Revenue		
community funds	$1,000/village - max $4,000	>$300/village
villagers	>$1,200/village - max $6,000 10% of families employed ~$160/year/HH many families receive some benefit	$2,500/village 5-10% of families $255/year/HH potentially all farmers could benefit
% revenue captured locally	24% and increasing as capacity improves	55-69%
financial sustainability	Yes	Yes
Conservation results		
Willdlife conservation	Yes - White-shoulder Ibis increase 1 to 25 indvs	Some
Habitat conservation	Some	Yes - 10 to 50,000 ha protected
Exclude immigration	Yes	Yes

Fig. 6. Details of the two PES schemes in Cambodia.
Source: Adapted from Clements et al. (2008, 2010).

transparent, they had control over their own future, and they liked the idea that profits would return to the village in the future (A. John, unpublished data). There was considerable variation among farmers, since some produce greater quantities of acceptable quality rice than others. The average and median payments were US$255 and US$160 respectively, and one farmer earned US$908. The actual premium in all cases was much lower because the middlemen's offer was sufficiently competitive. The villages captured ~55–65% of the total rice sale revenues, with the remainder spent on transport, processing, marketing and certification costs. A very large number of families expressed interest in joining the program, but only 38 produced acceptable rice to do so. This is expected to increase rapidly in future years as farmers adopt standardized production and quality control practices. Fig. 6 presents a summary of the defining characteristics and results of the two PES approaches implemented in Cambodia.

5. Discussion

Given that relatively few examples of biodiversity-based PES schemes exist (Wunder and Kanounnikoff, 2009) and the concerns that integrating livelihoods into the PES concept may risk compromising the ecological outcomes for which PES was designed, it is noteworthy that the four approaches in the three locations reviewed here have successfully generated both measurable ecological and livelihood benefits. In fact, all four initiatives demonstrated that PES schemes can result in both improved condition of biodiversity-based ecosystem services, and locally meaningful economic contributions to impoverished rural families and communities, even in nations with relatively weak institutions and low governance capacity. Some of the common factors among these successful projects include: (1) a primary focus on ecosystem service enhancement; (2) the provision of significant local support to the participating communities; and (3) inclusive community-based governance models. It should also be noted that in all cases, a distinguishing feature of these initiatives are the conditional payments that were made by the buyer only if the service of interest is provided by the “sellers”.

5.1. Focusing PES on ecosystem services

In each of these cases the conservation of wildlife and wildlife habitat was the original motivation for the development of these PES schemes. While supporting local livelihoods was an important means towards conserving ecosystem services, it was not the primary focus of the projects. Each PES scheme very clearly focused on achieving the improved condition of an ecosystem service as a result of the incentive payments, something that can be harder to do when conservation and livelihoods are viewed as equal and competing priorities (Fisher, 2012). A possible explanation is that the payments were user-financed, or privately financed, rather than government-financed. User-financed PES mechanisms can be more efficient because they focus on delivering the service of interest to a specific user rather than attempting to meet multiple social or political objectives, which a government financed mechanism may be more obliged to meet, in addition to restoring or protecting an ecosystem service of interest (Fisher, 2012; Wunder et al., 2008). Ensuring that each PES scheme focused on generating the desired ecological benefits is important because without sufficient stocks and flows of the services of interest – turkeys for hunting, ibises for tourism and Wildlife Friendly rice, and grasslands to support wildlife for tourism – there would be little for willing buyers to purchase and, thus the sellers and stewards of these services could not economically benefit from them. In all of the cases, the services of interest appear to be stable or increasing since the establishment of the PES mechanism. Furthermore, the payments in all of the cases are conditional upon the buyer being able to benefit from the service, either directly (i.e., through hunting, bird watching or rice consumption) or indirectly (i.e., through the protection of habitat and/or wildlife for tourism). Thus, these case studies suggest that community-based, user-financed PES schemes, that have ecosystem service enhancement as the primary objective, can be effective tools for conserving aspects of biodiversity and, if the incentives are

designed well, they can also support rural livelihoods, even if that is not the primary goal of the project.

It is important to note that because the PES initiatives are highly demand driven, the financial sustainability and long-term revenues for these projects are dependent on the markets that exist for sport hunting, ecotourism, and certified rice. However, any market that brings substantial financial returns will also be subject to risks, too, although the degree and nature of those risks will vary across market types. In the case of these PES schemes, if demand drops, the income PES generates for local communities will also decrease. In fact, the global economic crisis of 2008 resulted in a significant decrease of turkey hunters in Guatemala, which has interrupted the program.

Certain safeguards can be implemented to reduce market risks and consequential impacts on communities and ecosystem services. For example, as more tour operators join the agreement in Tanzania, the amount that any one tour operator has to pay into the fund decreases. Thus, minor to moderate drops in the tourism industry may not have a major effect on the ability of tour operators to pay what is already a relatively small amount for the PES agreement. In addition, bundling and stacking of ecosystem services, as demonstrated in Cambodia, may help reduce the social, economic, and ecological risks of volatile markets on communities and ecosystems (Ingram, 2012). Similarly, diversification of natural resource based revenue sources, as demonstrated in the Guatemalan case study, may also help relieve the social and ecological impacts of a decline in revenues associated with a downturn in any single market. These approaches can help ensure that multiple revenue streams and conservation incentives exist to help maintain ecosystem services and support communities dependent upon them, even when market fluctuations affect the income and other benefits associated with any single ecosystem service market or PES revenue stream.

5.2. Enhancing livelihoods: balancing opportunity costs and benefits associated with PES

A key barrier to implementing PES in poor, rural communities is the opportunity costs that a community may bear and the risk that communities may be underpaid for the service they are delivering if knowledge or power asymmetries exist. Thus, in these cases, it is important to understand how the buyer and seller negotiated the price for the service, and the role that information and power asymmetries played in those negotiations (Ferraro, 2008; Kosoy and Corbera, 2010) to assess the nature of the benefits the communities receive.

In the Guatemala case, trophy hunters were likely aware of the range of costs associated with sport hunting of ocellated turkeys either through personal experience, websites and/or publications that advertise outfitter rates. Residents of Uaxactún and Carmelita were, however, unlikely to be familiar with the market value of ocellated turkey trophy hunting. In this particular case, the stakeholders assisting with negotiations were able to combine the interests of conservation and local communities to reach a value that is attractive to sport hunters and also sufficient to make the project attractive to local residents. The asymmetry in information between buyer and seller in the sport hunting market is evidenced by the informal (and mostly illegal) sport hunts undertaken in other areas of the Maya Biosphere Reserve, where local community members accompany sport hunters as guides, earning tips and wages far below the amounts accrued by the Project Pavo. However, all hunters appear satisfied by the Project Pavo experience as evidenced by consistent, increasing numbers for most of the project's history. In terms of opportunity costs, the costs to local residents of not hunting turkeys for food was low, as other sources of protein are readily substituted for turkeys, and any economic loss is overwhelmingly compensated by the approximately 200 fold increase in the value of turkeys as trophies for US hunters compared to the value of turkeys on the local market. Local participants in the community-based hunts were required to learn new skills in order to deliver the level of the sport hunting quality required to compete in the market, however, the project's private stakeholders ensured that they were well compensated for their efforts during the developmental years of the project.

In Cambodia farmers have participated in the rice market for years and are aware of current farm-gate prices. WCS wanted to create a high income incentive for farmers and, therefore was transparent about the price that could be offered to farmers by selling through a local cooperative rather than outsider traders. In this case the information available to both buyers and sellers was symmetrical and willingness-to-pay and willingness-to-accept largely were in balance. Farmers were already engaged in the production and sale of rice, so the opportunity cost of the project was also low, as there was no need to adopt a new livelihood practice in order to participate. As farmers increasingly market their rice using the Wildlife Friendly certification scheme to qualify for the price premium it generates above the value of traditional rice prices, any benefit of expanding agricultural activities into ibis breeding habitat now seems lower than cultivating rice that can be sold as a Wildlife-Friendly certified product.

Though bird watching tourism generates modest revenues, it can offer a significant contribution to annual household incomes that average ~US$300. In addition, the tourism project generates substantial revenue for the community fund, which represents a new revenue stream that was not formerly available. Furthermore, the market value of ibis species for consumption was extremely low relative to the income generated for ibis from tourism, so, the opportunity costs of abandoning hunting were also low, making local participation attractive. In recent years the amount of community-based revenue generated by the project has been substantial when compared to what the government provides to the commune each year and has been important for financing community development projects.

In the Tanzania case villagers were willing to maintain their rangelands that are occupied by wildlife migrating out of Tarangire National Park during the wet season for a relatively low amount (US$4,500 a year in total), but it was sufficient for several reasons. While the government and donors spend more than this amount in the community on an annual basis, the PES revenue is the only source of discretionary funding available for the village to invest in development efforts of their choosing. The opportunity costs associated with this PES scheme were also low as the payments facilitated traditional land-use practices that support both wildlife and livestock, and protection from hunting by outsiders on their lands. These represented activities in which the community was already engaged or willing to support, so the opportunity costs of compliance were low. Thus, similar to the Wildlife-Friendly agriculture example from Cambodia, the payments from the tour operators did not require the sellers (community members) to acquire new skills or livelihood means.

Though a small and non-random sample, in all cases, the sellers' opportunity costs were low, which was an important factor in determining their willingness to participate and accept the prices that buyers were offering. Information asymmetries, which can result in unbalanced exchanges between buyers and sellers, were addressed by third parties (private stakeholders and WCS in Guatemala, UCRT in Tanzania, and WCS in Cambodia), who played mediating roles between the buyers and sellers (communities). Thus, in these cases information asymmetries were not a major issue in setting prices and did not disadvantage sellers or influence their willingness to accept the PES terms. Thus, as may be common in user-financed PES initiatives, the payments were negotiated

rather than based on an academic evaluation of "willingness to pay" or "willingness to accept" (Ferraro, 2008). In all cases the costs associated with negotiations and other start-up expenses were covered by the buyer and/ or intermediaries, which helped keep transaction costs low for communities.

It is also important to note that the relative value of the revenue within local contexts, in addition to the amount, may be extremely important for determining sellers' willingness to participate in PES schemes. For example, payments resulting from contracts or fixed payment schemes, such as in the Guatemalan and Tanzanian cases, may be appealing to low income, rural communities because the amount of revenue generated from these arrangements is more predictable and/or stable from year-to-year than fluctuating commodity market values. In addition, in Tanzania, revenue generated from the easement payments was the only discretionary source of money available for the community to use for village-level projects. Thus, the contextual importance of revenue should be considered alongside the amount of revenue when determining if/why a seller is willing to accept payments for conserving or improving ecosystem services.

Participation in user-financed PES schemes, particularly those in which the service is being sold directly to the consumer, can also help communities understand how businesses function and how to increase revenue capture. In Guatemala and Cambodia the PES schemes have helped professionalize community-based natural resource enterprises, helping sellers to better understand demand, and modify their services accordingly. This drive towards improving quality and responding to demand is manifest in the gradual and significant improvements in the guiding and hospitality services provided by community partners in the Guatemalan PES project, the improved accommodation, food, and guiding for ibis tourists, and the greater adoption of the high value rice varieties preferred by consumers in Cambodia. Thus, PES schemes can provide opportunities for creating and maintaining profitable enterprises – lessons that transfer easily to other market opportunities that already exist or may arise in the future.

5.3. Governance and community-based PES

Community-based PES schemes can be difficult to establish in places where the rule of law is weak and where people have little experience making decisions at political levels outside of the household. Ensuring that appropriate governance systems are in place for PES to work in common-resource settings in particular, depends upon the preexisting governance and natural resource management systems within participating communities.

In Terrat private sector partners were able to rely on existing and effective grazing management systems that had been in place for generations within the Maasai community. To secure community acceptance, discussions and contract negotiations were conducted transparently with broad community participation and facilitated by a local, well-trusted organization, UCRT. It was also helpful that the tour operator who led the implementation of the project with UCRT was well-known and respected. The village-level management board established by the project has helped minimize the risk of elite capture of PES income and managed communications between the operators and the village, and the receipt and application of annual payments.

In Guatemala the long-term presence of WCS staff and their ability to act as trusted interlocutors between village residents and the project's private sector stakeholders and North American hunter clients remains an important element of the success of the enterprise. The participating communities had prior experience in managing community-based enterprises (timber and xate), and had created a community organization to represent local interests and manage traditional enterprises and revenue. Project Pavo has gone to great lengths to ensure that employment from the turkey hunting enterprise is distributed in ways that community members perceive as fair and that the benefits of the enterprise are communicated to local stakeholders. The communities have faced challenges, as any new enterprise might, so it has been helpful to have third-party partners that have been willing to help the organizations work through the "growing pains" of establishing and managing a new business (Baur et al., 2008).

The two examples from Cambodia also show that in the context of weak institutions and poor governance, it is important to invest in building institutions at the village level. For example, the locally elected committee that manages and uses the tourism revenue for village activities and projects has encouraged democratic processes and transparency in decision making with respect to how the income will be used (Clements et al., 2008). It was also important to have multiple actors, such as WCS in this case, to reinforce the institutional arrangements that are being created or enhanced through the project.

Across all of the cases, three things stand out with respect to the importance of local-scale governance for implementing functional, community-based PES mechanisms. The long-term and continued presence of a trusted interlocutor was important for helping buyers and sellers agree to transact a particular ecosystem service. Second, locally developed appropriate and transparent governance mechanisms are necessary to ensure that the benefits of community-based PES are distributed throughout participating communities, especially if the desired ecosystem service is affected by communal management. Lastly, participation in PES schemes may be a community's first experience in establishing and running a democratic enterprise, and thus PES may constitute an important entry point for reinforcing and/or building good governance mechanisms in places where democratic institutions are weak or non-existent. This outcome provides an important example of one of the valuable social co-benefits that can emerge from PES (Greiner and Stanley, 2013).

6. Conclusions

Community-based PES projects can be difficult to establish for a variety of ecological, social, and political reasons, but can be important mechanisms for conserving or enhancing ecosystem services, and may also benefit rural livelihoods as an additional benefit. User-financed PES approaches can be effective because the primary goal is to increase or stabilize an ecosystem service of interest. Given the interest in PES in developing countries and efforts to understand the conditions under which these approaches deliver both ecological and social benefits, we reviewed evidence from community-based, user-financed PES initiatives focused on conserving wildlife and wildlife habitat and explored how they have been developed and implemented. The results from these case studies support the findings of other research efforts (Wunder et al., 2008) by demonstrating that when ecosystem services are the primary goal of PES, they are likely to deliver upon ecological goals and, thus, may also generate considerable benefits for local livelihoods as well. As additional outcomes, as these cases demonstrate, community-based PES schemes may also enhance local experience in managing natural resource use, encourage the equitable sharing of benefits among a community, build expertise in managing natural resource enterprises, and support profitable community engagement in national and international markets.

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