



Payments for biodiversity conservation in the context of weak institutions: Comparison of three programs from Cambodia[☆]

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ABSTRACT

Implementing any conservation intervention, including Payments for Ecosystem Services (PES), in the context of weak institutions is challenging. The majority of PES programs have been implemented in situations where the institutional framework and property rights are strong and target the behaviours of private landowners. By contrast, this paper compares three PES programs from a forest landscape in Cambodia, where land and resource rights are poorly defined, governance is poor, species populations are low and threats are high. The programs vary in the extent to which payments are made directly to individuals or to villages and the degree of involvement of local management institutions. The programs were evaluated against three criteria: the institutional arrangements, distribution of costs and benefits, and the conservation results observed. The most direct individual contracts had the simplest institutional arrangements, the lowest administrative costs, disbursed significant payments to individual villagers making a substantial contribution to local livelihoods, and rapidly protected globally significant species. However, this program also failed to build local management organisations or understanding of conservation goals. By contrast the programs that were managed by local organisations were slower to become established but crucially were widely understood and supported by local people, and were more institutionally effective. PES programs may therefore be more sustainable when they act to empower local institutions and reinforce intrinsic motivations.

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1. Introduction

Although the global benefits of conservation and ecosystem services are well recognised (Balmford et al., 2002; Daily, 1997; Stern, 2006), these benefits are often valued differently at the local level (Kremen et al., 2000), and there may be local costs associated with conservation. Payments for ecosystem services (PES) have been proposed as a mechanism for changing incentives for local people and Governments to more accurately reflect global benefits (Ferraro, 2001; Ferraro and Kiss, 2002; Wunder, 2007). PES have been described as voluntary transactions where a well-defined environmental service is bought by a buyer (i.e. someone who is willing to pay for it), if and only if the provider secures the provision of such service (Wunder, 2005). This view of PES is based in Coasean economics,

where transaction costs are assumed to be low and property rights clearly defined. The largest global PES programs are government programs in developed countries, such as conservation easements in the USA or the Common Agricultural Policy in Europe (Ferraro and Kiss, 2002). These programs conform to the Coasean view: land ownership or resource tenure is clearly defined, these rights are protected by law, enforcement agencies are well funded, and there are credible external monitoring systems. Within the past 10–15 years a number of government-financed PES programs have been established in developing countries with similarly well-defined institutional frameworks (Engel et al., 2008), including the Costa Rican payments for environmental services program (Pagiola 2008; Zbinden and Lee, 2004) and Mexico's payments for hydrological environmental services program (Muñoz-Piña et al., 2008). In addition, there are a growing number of user-financed programs, such as payments for watershed services between downstream users and upstream forest owners in Ecuador (Wunder and Albán, 2008) and Bolivia (Asquith et al., 2008), and contracts brokered between organisations and private landowners, communities or governments (Milne and Nieten, 2009). In the vast majority of cases, but not all, these PES programs have been established in situations where property rights

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are clearly defined, although other aspects of the institutional framework may be weaker.

Wunder (2007) suggested that effective implementation of PES may be considerably more difficult where institutions are weak. In many countries land ownership and resource tenure are unclear, with land and resources technically still owned and managed by the state (Agrawal et al., 2008); natural resources have high rents thereby attracting resource grabs and corruption; powerful individuals can often act with impunity; and government agencies have poor capacity and may receive little political support. These are also the conditions known to lead to high rates of habitat destruction and over-exploitation of natural resources (Chomitz et al., 2007; Geist and Lambin, 2003). The high level of threat to species and habitats means that some of these areas are of the highest urgency for conservation. Institutional failure is problematic for implementation of a PES program to protect biodiversity for a number of reasons: poorly defined property rights makes it challenging to determine who to pay, contracts cannot be legally enforced, elite capture is common, and enforcement of laws (e.g. prohibiting land clearance) may be weak. However, institutional failure makes it challenging for any conservation intervention to succeed (Barrett et al., 2001), hence a critical area for research is to understand which approach is most effective given these circumstances.

Muradian et al. (2010–this issue) have proposed a continuum of types of PES as an alternative to Wunder's and Ferraro's original descriptions, ranging from direct payments that conform to the Coase theorem, to collective action problems where property rights may be poorly defined and benefit distribution is unclear. This paper compares three PES programs for biodiversity conservation that were implemented within a weak institutional setting in Cambodia, for wildlife populations and their habitats that were either under open-access or common property regimes. The three programs vary in the extent to which payments were made at the individual or collective level, ranging from direct payments to individuals for bird nest protection; a hybrid program that combines agri-environment payments to farmers with local management by a village authority; and a community-based tourism enterprise based on collective action. All were designed in response to a high level of threat where conservation opportunity costs, at least for conversion of forest lands, were also moderately high. The comparison focuses on the institutional effectiveness of the programs: the institutional arrangements, the distribution of costs and benefits, and the conservation results observed. A full evaluation of program impacts on wildlife or habitats (c.f. Ferraro and Pattanayak, 2006) is beyond the scope of this paper; the programs were initiated only recently and as yet insufficient data exist for comparison of implementation sites with controls.

2. Description of the PES Programs

2.1. Background

Cambodia lies within the Indo–Burma hotspot (Myers et al., 2000) and contains four of the Global 200 Ecoregions (Olson and Dinerstein, 1998). The country is of global conservation importance due to the largest remaining examples of habitats that previously spread across much of Indochina and Thailand, which still contain nearly intact species assemblages, albeit at heavily reduced densities (Loucks et al., 2009). These include the deciduous dipterocarp forests that once supported the greatest aggregation of large mammals and waterbirds outside the African savannas (Wharton, 1966). Many of these species are listed on the IUCN (International Conservation Union) Red List (WCS, 2009), including 45 mammals (7 Critically Endangered or Endangered), 46 birds (12 Critically Endangered or Endangered, including the Giant and White-shouldered Ibises, *Pseudibis gigantea* and *P. davisonii*) and 17 reptiles (9 Critically Endangered or Endangered). Conservation strategies are therefore frequently focused

on remnant populations of highly threatened species where there is little room for error. Hunting, habitat destruction and human disturbance—both by residents and immigrants—are the major and urgent threats to biodiversity conservation. National annual deforestation rates were 0.7% during 1973–1997 (DFW, 1998) and 0.5% during 2000–2005 (Forestry Administration, 2008), despite the fact that since 2002 most forest clearance has been illegal. Based on these statistics Cambodia has one of the highest rates of land-use change globally. Deforestation is driven by a variety of processes, including large-scale development projects such as agro-industrial concessions, improved road access, population growth, and smallholder encroachment both by landless in-migrants and established communities (Forestry Administration, 2009). Encroachment is attractive to local people because land is an easily available secure form of wealth which is viewed as an open-access resource and enforcement of laws is rare. Many plots are claimed but not cleared, forcing new farmers to move further into the forest (An, 2008).

Initial conservation strategies in Cambodia focused on protected area (PA) management. The PAs were established from 1993 and have a small number of poorly paid staff with limited capacity or infrastructure, i.e. they are 'paper parks' (Wilkie et al., 2001). PAs usually contain existing human settlements with unclear property rights, as is often observed in other countries (Bruner et al., 2001). The Cambodian PA system was also declared based on relatively little information and consequently excludes many areas of importance for biodiversity conservation, again not an uncommon situation (Brooks et al., 2004), emphasising the importance of working both inside and outside PAs. Under these conditions PA management is not sufficient to achieve biodiversity conservation goals.

The Ministry of Environment and Ministry of Agriculture, Forestry and Fisheries, with the support of the Wildlife Conservation Society (WCS), an international Non-Governmental Organisation (NGO), instituted a series of pilot PES programs as a complement to protected area management in 2002. This paper compares three different programs which were initiated in the same villages within two PAs in the Northern Plains landscape; the 4025 km² Kulen Promtep Wildlife Sanctuary, which was established in 1993 and is managed by the Ministry of Environment, and the 1900 km² Preah Vihear Protected Forest, declared in 2002 and managed by the Forestry Administration of the Ministry of Agriculture, Forestry and Fisheries. Both PAs contain or are used by long-established communities that practice either lowland rain-fed paddy rice cultivation or upland shifting cultivation for 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 particularly from the sale of liquid resins from dipterocarp trees (McKenney and Prom, 2002; McKenney et al., 2004).

For the two village-managed programs, payments were initiated following an initial two-year participatory land-use planning process, which established forest management zones and clarified ownership over land and natural resources (Rock, 2001). The land-use plan is approved by the relevant Government authorities and is managed by an elected village committee of nine people. It specifically sets out which areas can be used for agriculture and residential land, including expansion areas that are currently forest. The village organisations and approved land-use plans provided the necessary institutional foundation for subsequent initiation of the PES programs.

2.2. Community-based Ecotourism

The community-based ecotourism program was initiated in 2004 in the village of Tmatboey in Kulen Promtep Wildlife Sanctuary, following initial awareness-raising in 2002–2003, and has since been replicated in other villages in the landscape. We focus here on Tmatboey, although the program operates in a similar manner at the other village sites. Tmatboey is a small village of 236 families, located in a large mosaic of

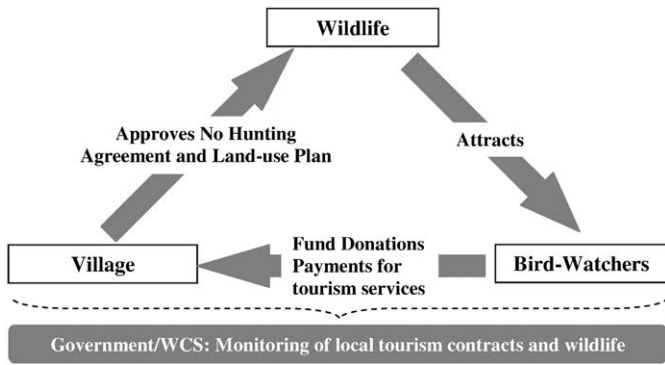


Fig. 1. Design of the community-based ecotourism program.

deciduous dipterocarp forest, seasonally flooded grasslands and wetlands. The total village area is about 25,780 ha, of which only a small proportion (620 ha) is currently used for agriculture. The site fulfils 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); sightings are reliable year-round; access is relatively easy from the major tourism centre at Siem Reap, which receives more than 2 million visitors annually and has an international airport; accommodation standards have improved as village capacity has increased; and prices are moderately inexpensive. The ecotourism program aims to conserve the globally threatened wildlife through establishing local village-level tourism enterprises that directly link revenue received to long-term species conservation (Fig. 1). This link is provided by the agreement between the PA authorities, WCS and the village, which stipulates that tourism revenue is subject to the villagers stopping hunting of key species and abiding by the land-use plan. This is reinforced by fees that are paid by all visitors: \$30 per person if all key species are seen and \$15 if only a subset are. A detailed description is given in Clements et al. (2008).

Institutionally, the program relies on four parties, each of whom plays a key role:

- Elected village committees: site management of tourism services, management of income received and fund disbursements, local enforcement following no-hunting agreements and land-use plans, report serious violations to PA authorities;
- PA authorities: legally approve tourism agreements and local land rights, law enforcement;
- Sam Veasna Center: a local civil society partner based in Siem Reap that is responsible for marketing, site promotions, tourism bookings management and monitoring on behalf of the village-level enterprises;
- Private sector: tourist bookings provide revenue.

WCS plays a general support role to all parties, and monitors the agreements.

2.3. Agri-environment Payments: Wildlife-Friendly Products

Tourism has limited potential for replication because all villages support a similar species mix, and the international birdwatching market is of restricted size. The agri-environmental payment program was therefore initiated in 2007 as an alternative community-based payment program that could be replicated widely. Under the program, farmers that keep to the land-use plan and no-hunting rules are allowed to sell their rice through the village committee responsible for management of the land-use plan to a marketing association (Fig. 2). The association offers preferential prices to the farmers, which are supported by directly selling the rice to national market centres, bypassing middlemen who previously monopolised village trade, and through selling to tourist hotels under the ‘Wildlife-Friendly’ certification system, a new global brand. The association also provides start-up capital and training in new agricultural techniques. All profits are shared between the farmers and the village organisations, after deducting the costs of the association. Payments to individual farmers are linked to monitoring by the village committee of their compliance with the land-use plan and no-hunting rules and external verification by the marketing association. The payment value was set based on the market premium available for the products, not based on assessment of the opportunity costs to farmers of further encroachment. For farmers with sufficient labour or access to machinery these opportunity costs are likely to be high, since alternative forms of employment are limited. The committee also receives a share of the profits, which provides added motivation (and income) for their work.

2.4. Direct Contracts for Bird Nest Protection

The globally threatened large birds found in the Northern Plains are heavily threatened by human disturbance and particularly the collection of nests for eggs and chicks, some of which can fetch prices of >US\$100 in the national and international wildlife trade. The collection is mostly done by local communities, who then re-sell the eggs and chicks to middlemen. The Bird Nest Protection program was initiated in 2002 in order to locate, monitor and protect the remaining nesting sites. Under the program, local people are offered a reward of up to US\$5 for reporting nests, and are then employed to monitor and protect the birds until the chicks successfully fledge. Protectors receive \$1/day for their work and an extra \$1/day worked upon completion if the chicks successfully fledge. The full payment is made if it can be verified that nests failed due to natural causes, including predation. The total payment of \$2/day was judged an acceptable daily wage based on initial village consultations. The protection teams are regularly visited every 1–2 weeks by village rangers employed by WCS and by WCS monitoring staff to check on the status of the nests and for the purposes of research and data collection. The program operates year-round, as some species nest in the dry season and others during the wet season. It started in four pilot villages in 2002 in Kulen Promtep Wildlife Sanctuary and was extended to Preah Vihear Protected Forest in 2004. By 2007 it

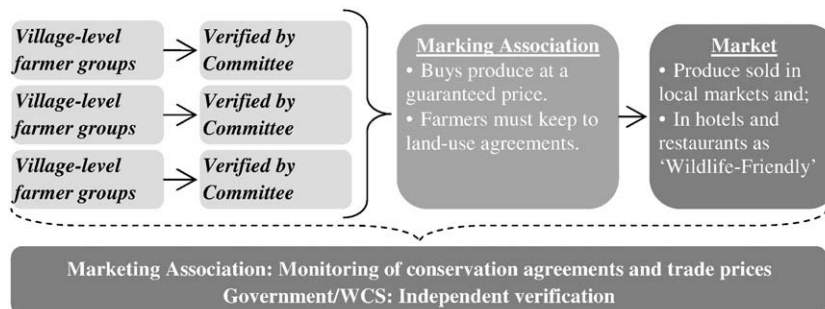


Fig. 2. Design of the agri-environment program.

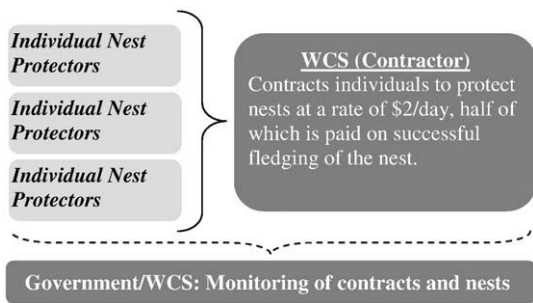


Fig. 3. Design of bird nest payments.

was operating in >15 villages. Unlike the previous two examples the bird nest protection program works entirely through individual contracts; it is not community-based (Fig. 3).

3. Outcomes of the PES Programs

3.1. Community-based Ecotourism

Table 1 shows the growth of the ecotourism program in Tmatboey. At the village scale the ecotourism program has helped to educate the local people about the importance of the bird species and their potential value. Villages have developed and locally enforce their own rules about which species are protected and have agreements about the conservation of nesting and feeding sites (A. John, pers. obs.). Substantial increases in wildlife numbers have been seen at the first village site, Tmatboey. For example the population of White-shouldered Ibis, one of the rarest birds in the world (Hirschfeld, 2009), has increased from one nest and a single pair in 2002 to at least six nests and 23 individuals in August 2008 (Fig. 4). In addition, local people have begun to enforce the land-use plan regulations, for example by refusing to accept in-migrants and controlling where new forest is cleared (A. John, unpublished data). Tmatboey, for example, refused 69 in-migrant families that tried to settle in 2007 alone. Self-enforcement is usually based on local verbal or written contracts between individuals and the committee to stop illegal activities or relocate agricultural plots within land-use plans, rather than levying strong punishments. Significant challenges remain, particularly as escalating national land prices have dramatically increased incentives for land-grabbing both by villagers and in-migrants.

Tourism numbers at Tmatboey have increased by an average of 36% annually since 2005 (Table 1). Revenue, however, increased by an average of 100%/annum over the same period, as the villagers have improved service quality, allowing them to raise prices, and diversified the range of services provided so that they capture a greater proportion of the value chain. As a consequence the average per tourist payment for services increased from \$10 in 2004 to \$67 in 2008 and the percentage of tourism revenue spent locally has risen from 11% to 24%. Costs not captured by the village include transportation, hotel bookings before and after the visit and English-speaking tour leaders. By the 2007–2008 season the village received >\$12,000 in revenue, of

which >\$3500 was contributions to the village fund and nearly \$8500 used to pay for services provided by villagers. Not all service payments are retained locally, since the villagers have to import goods not available in the village. In 2007–2008 25 individuals (from 236 families) were employed on a part-time permanent basis as guides, cooks and guesthouse managers, receiving on average \$20–40/month each during the tourism season (average of \$160/year, maximum \$400). These sums are significant for families that depend on subsistence agriculture and forest products, where average cash incomes per family are \$350–\$500/year. A further 65 individuals benefited in some manner through temporary employment (e.g. occasional guides, guesthouse maintenance, carrying water), or through local trade within the village mainly for food. In total, therefore, around 40% of families were involved to some extent in the program. Donations to the village fund have been used to help pay for a new school, building a road, fish ponds, repairing waterpumps and digging of new wells. Some of the profits were used by the committee to pay villagers for local patrols and guarding of nesting birds.

3.2. Agri-environment Payments

Table 2 shows the results from the first full year of the agri-environment payment program in 2008. Farmers were offered an average price of \$0.25/kg of rice plus profit-sharing, representing an initial premium of 200% over the standard price offered by the middlemen. However, in response to the competition the middlemen raised their price to \$0.22/kg and in addition offered to use the village's scales, since the middlemen's was widely suspected to be biased. Despite this the villagers still preferred to sell through the village committee. Farmer interviews indicated that they preferred to sell to 'their own people' rather than outside middlemen, because they trusted the village committee, were treated with respect, the process was transparent, they had control over their own future, and they liked the idea that profits would come back to the village in the future (A. John, unpublished data). There was considerable variation between farmers, since some had more rice of appropriate quality than others, so the median payment was \$160, with one farmer earning \$908. The actual premium in all cases was much lower, given that the middlemen had raised their prices to be competitive. In total, the villages captured about 55–65% of the total revenue from the rice sale, with the remainder being transport, processing, marketing and certification costs. A very large number of families expressed interest in joining the program, but only 38 had rice of the appropriate type to sell through the program; this is expected to increase rapidly in future years as farmers adopt standardised techniques.

Local enforcement of land-use plan regulations has also been observed in the four agri-environment program villages. The percentage of families that have been recorded breaking land-use plans in each village is <8%, whilst three of the four villages have refused to accept in-migrants (the fourth is remote and no in-migrants tried to settle there). The effect of the agri-environment program in protecting species is unclear, but the program has only been in operation since late 2007 and it is probably too early to draw conclusions. As with the ecotourism program, local self-enforcement is based on verbal or written contracts

Table 1
Tourism revenue in Tmatboey, 2003–2008.

Year	Visitors	Total	Fund	Services	% of overall revenue captured by the village	Average service payment/tourist	Payments to villagers	Regular employees	Total beneficiaries
2003–4	13	\$498	\$370	\$128	11.4%	\$10	\$128	n/a	n/a
2004–5	51	\$2588	\$1530	\$1058	14.1%	\$21	\$ 820	n/a	n/a
2005–6	72	\$3553	\$2100	\$1453	14.1%	\$21	\$1158	12	35
2006–7	78	\$5521	\$2220	\$3301	19.9%	\$42	\$1997	13	51
2007–8	125	\$12,807	\$4295 ^a	\$8512	23.9%	\$68	\$5846	25	90

^a Tmatboey also received the United Nations Development Programme Equator Prize in 2008, which contributed a further \$5000 to the fund.

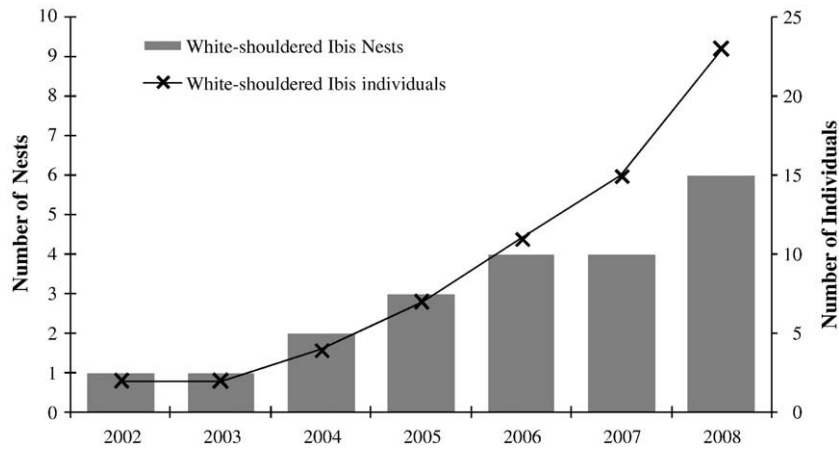


Fig. 4. White-shouldered Ibis populations at Tmatboey, 2002–2008.

between farmers and the committee to stop illegal activities or relocate ricefields within land-use plans, rather than strong punishments. At least eight families in two of the villages have relocated agricultural the agri-environment program contracts.

3.3. Bird Nest Protection Program

The bird nest program has been extremely successful at protecting nesting sites (Table 3), safeguarding over 1200 nests of globally threatened or near-threatened species since 2002, including 416 nests in 2007–2008. Very few protected nests have been collected by hunters, although it is not uncommon to find unprotected nests that have been collected. The numbers of nests monitored and protected has increased by 36% on average each year since 2004. Most of this increase is due to greater numbers of Sarus Crane *Grus antigone*, Vultures (*Sarcogyps calvus* and *Gyps bengalensis*), Oriental Darter *Anhinga melanogaster* and Lesser Adjutant *Leptoptilus javanicus* nests being found, suggesting that persecution and nest collection were the main factors limiting populations of these species. By contrast, Giant Ibis numbers have remained constant despite a high rate of breeding success (Keo et al., 2009), implying that other factors such as conversion of feeding habitats to agriculture and human disturbance

are the primary threats to this species, as other studies have shown (An, 2008; Keo, 2008). The bird nest program does not directly target habitat protection, and interviews suggest that bird nest protectors are not able to protect breeding sites or feeding areas from other villagers or outsiders (A. John, pers. obs.). Villages with only the bird nest payments, but no ecotourism or agri-environment payments, regularly accept in-migrants who then contribute to deforestation and habitat loss. For example, in 2008 the nesting trees used by Greater Adjutant *Leptoptilus dubius* were cleared by in-migrants near the village of Antil. This is one of only two colonies recorded in Southeast Asia for this species.

A detailed breakdown of the bird nest payments made in the 2005–2006, 2006–2007 and 2007–2008 seasons is given in Table 4. The total cost to WCS of the program is around \$25,000/year, with an average cost of \$65–\$120 per nest protected. The average cost has declined as the number of nests has increased, partly because monitoring costs can be shared between adjacent sites and also due to a greater number of nests at colonial sites. 71–78% of the spending went directly to local people, either protectors or village rangers, with the remaining expenditure being monitoring costs incurred by WCS. Average payments per family are around \$100/year, with considerable variation depending upon how long people are employed. Some individuals are specialist protectors,

Table 2
Payments from agri-environment scheme 2008.

	Villages	Rice bought	Total rice payments	Profit-sharing	Total payments to village	% revenue captured by village	Families involved	Average (median) family payment
Total	4	35,534 kg	\$8740	\$1890	\$10,631	55–69%	38	\$255 (\$160)
Village average	1	8884 kg	\$2185	\$473	\$2658			

Table 3
Bird nest protection program: nests protected, 2002–2008. In some cases nests were protected but there is no data available. ‘-’ indicates species that were probably present, but were not protected in that year. Initially the program started at one site and operated in two sites from 2004. Numbers found have grown by 36%/year since 2004.

Species	Global status	2002–3	2003–4	2004–5	2005–6	2006–7	2007–8
		(1 site only)	(1 site only)	(2 sites)	(2 sites)	(2 sites)	(2 sites)
		Nests (colonies)	Nests (colonies)	Nests (colonies)	Nests (colonies)	Nests (colonies)	Nests (colonies)
Giant Ibis	Critical	-	5	27	28	28	29
Sarus Crane	Vulnerable	-	6	19	29	37	54
Vultures	Critical	-	-	1	4	5	5
Black-necked Stork ^a	Near-threatened	-	-	-	2	3	2
Oriental Darter	Near-threatened	13	-	-	-	26 (1)	33(1)
Greater Adjutant	Endangered	-	(Present)	21(2)	17(2)	18 (2)	10(2)
Lesser Adjutant	Vulnerable	-	34(5)	97(16)	134(15)	221(22)	277(27)
Totals		13	45+	164	216	338	410

^a *Ephippiorhynchus asiaticus*.

Table 4
Bird nest protection program: costs, 2005–2008.

	2005–6	2006–7	2007–8
Local payments	\$19,850	\$19,119	\$19,236
(%)	(78%)	(74%)	(71%)
Nest protection payments	\$12,597	\$11,248	\$11,588
Community rangers	\$7253	\$7871	\$7648
WCS monitoring	\$5603	\$6800	\$7747
(%)	(22%)	(26%)	(29%)
Expenses	\$2506	\$3640	\$4192
Salaries	\$3098	\$3160	\$3555
Total	\$25,453	\$25,918	\$26,986
Nests protected	216	342	416
Average cost/nest	\$118	\$77	\$66
Villages	13	17	16
Average total payments/village	\$1527	\$1125	\$1202
Maximum total payments/village ^a	\$3713	\$3775	\$3449

^a Antil village received the greatest total payments in each year.

switching species depending on the season and receiving continual employment for several months. The amounts paid, sometimes >\$400/individual, are substantial in comparison with other cash income options. Payments per village average \$1100–\$1500, depending on the year, but some villages earn considerably more due to the presence of a large number of key species, or species with particularly long breeding periods. Antil village made the greatest amount, totalling nearly \$11,000 of payments over the three seasons, mainly due to the presence of the Greater Adjutant colony which requires at least 6 months of protection each year.

4. Comparison of the Different PES Programs

4.1. Institutional Arrangements

Institutions are defined by North (1990) as: “the rules of the game in a society or, more formally, ... the humanly derived constraints that shape human interaction”. Organisations are groupings of individuals that operate within the institutional framework. This framework

includes property rights, monitoring, enforcement, governance and contracting arrangements (Table 5). Of the three PES programs described the bird nests program has the simplest institutional arrangements, since it relies on a direct contract between the individual and the conservation NGO to protect biodiversity. It is assumed that individuals can temporarily control a breeding site even if they do not own it. Regular monitoring by the conservation NGO ensures compliance. Simple contracting can fail however if not adequately supported by the institutional framework. For example, the Monarch Butterfly project in Mexico purchased logging rights from forest-dwellers to protect butterfly habitat; however most illegal logging was performed by powerful outsiders, which local people were incapable of preventing (Missrie and Nelson, 2005). Similarly, Cambodian bird nest protectors were unable to stop others from clearing breeding sites.

Both the ecotourism and agri-environment programs have more complex institutional arrangements. The ecotourism contract is made directly with a village organisation, which has been approved by the Government to develop local land-use regulations, whilst the agri-environment program is a hybrid program; the village organisation then sub-contracts to individual farmers. The village institutions—the local rules governing natural resource management—are nested in a multi-layered framework that includes:

- an external agency that provides rewards by connecting the villages to national and international markets, certifies compliance, and helps to mediate conflicts;
- PA authorities, who can enforce environmental and forestry laws, supporting village institutions to resolve cases they are unable to solve internally or to remove outsiders; and
- external organisations, including private sector companies and NGOs, that reinforce rules and can assist with resolving conflicts or other problems (such as talking to donors and higher Government authorities).

Monitoring of compliance (Keane et al., 2008) is conducted at all levels: local monitoring by village institutions, certification by the external agency, and enforcement of national laws by the PA.

Table 5
Summary comparison of the three direct payment programs.

	Community-based ecotourism	Agri-environment payments	Bird nest protection
Institutionality			
–Organisational arrangements	Four actors: Village: management PA: enforcement External agency: certification & marketing Private sector: sales	Four actors: Village: management PA: enforcement External agency: certification & marketing Private sector: sales	Two actors: Individuals: protection WCS: monitoring and making payments
–Property rights	Forest: common property co-managed by the village and the PA	Forest: common property co-managed by the village and PA; individually owned fields	Nests: <i>de facto</i> individual control
–Contracts	Tourists → village committee	Purchaser → village committee → villagers	NGO → villagers
–Local governance	Yes (local management)	Yes (local management)	No (NGO management)
–Monitoring	External agency (certification) and PA	External agency (certification) and PA	WCS
Distribution of costs and benefits			
–Initial investment	High (\$50,000/village)	High (\$50,000/village)	Low
–Income			
• Community funds	\$1000/village (maximum \$4000)	>\$300/village	None
• Individuals	>\$1200/village (maximum \$6000) 10% of families employed, \$160/year Many families receive some benefit	\$2500/village 5–10% of families, median \$160/year Potentially all farmers could benefit	\$1200/village (maximum \$4000) 5% of families employed, \$120/year
–Efficiency (% of overall cost paid locally)	24% (increasing, as capacity improves)	55–60%	71–78%
–Financial sustainability?	Yes (both for community business & certification and marketing costs)	Yes (both for community business & certification and marketing costs)	No (WCS pays \$25,000/year)
Conservation results			
–Conservation of			
• Key wildlife	20–100 individuals/village	20–100 individuals/village	>1000 individuals
• Habitat	10–50, ha (village area)	10–50,000 ha (village area)	0
–Targeting	Wildlife: yes Habitat: some	Wildlife: some Habitat: yes	Wildlife: yes Habitat: no

In summary, institutional arrangements under the most direct contracts program are considerably simpler than the other two examples, but this is not necessarily an advantage. The more complex institutional arrangements are multi-layered, with redundancy and reinforcement provided by different organisations (for example external monitoring by WCS, the PA and marketing or tourism agencies). These arrangements build resilience and checks in the system that ultimately may make the programs more effective and sustainable (Berkes, 2007).

4.2. Distribution of Costs and Benefits

The simplified institutional arrangements of the bird nest program lead to lower administrative costs: 71–79% of payments are disbursed at the local level (Table 5). This was predicted by Ferraro and Kiss (2002), who suggested that direct payment programs would have administrative costs of only 5–25%, far lower than indirect conservation interventions. The bird nest program was also inexpensive to establish. By contrast, the more complex ecotourism and agri-environment programs are much less efficient at disbursing revenue locally, mainly due to marketing and monitoring costs incurred by the external agencies. They are also expensive to establish, requiring substantial investments over approximately 2 years to build the capacity of the village organisations.

All three programs deliver approximately the same levels of individual income to villagers (Table 5): around \$120–\$160 per family participating, and an average of \$1200 or a maximum of \$4000–\$6000 per village. Significant payments are made only to a minority of families under each program: the number of nest protectors and tourism employees is necessarily limited, and agri-environment payments are approximately proportional to the size of land holdings, meaning that wealthier individuals with larger fields will benefit the most (as suggested by Börner et al., 2010-this issue). However, in the village-managed programs decisions over who benefits are made locally rather than by an external NGO, and additional mechanisms ensure that benefits are shared more widely. For example, under the tourism a large number of villagers receive some income, whilst the agri-environment program will benefit more families as it grows. Communal development funds, managed by the village organisations, provide benefits to the entire village. These funds are extremely important because they are the only source of development assistance to the village that is entirely under local control; most other assistance is provided by NGOs or government authorities from outside the village and is driven by external priorities. All three programs are therefore inequitable to some extent, but the most direct (bird nests) benefits the least number of people and does not incorporate mechanisms for wider benefit-sharing. In Madagascar, a village-managed program was perceived to be fair by the majority of participants, despite apparent inequalities, and communal benefits were ranked highly (Sommerville et al., 2010-this issue). The same was found in the ecotourism and agri-environment payment examples described in this paper.

Direct payment programs for biodiversity conservation have been criticised as being unsustainable because they are reliant on continual funding (Swart, 2003). The bird nest program is entirely dependent on \$25,000 made annually available by WCS. By contrast, both the ecotourism and agri-environment programs, once established, have the potential to be sustained through market sales.

4.3. Observed Conservation Results

All three programs target protection of wildlife, and the agri-environment and ecotourism programs also explicitly include habitat (Table 5). The bird nest program in particular provided very rapid protection for many species that were at risk of local extinction within the first few months of operation, and probably contributed to in-

creases in these populations (Clements et al., 2009). By contrast, the village-based programs became institutionally effective only after a few years of operation and are more long-term and indirect in their conservation effect, aiming to reduce both habitat loss and over-harvesting of species. Understanding whether these programs are effective at delivering conservation will require a counterfactual comparison once they have been in operation for several years, as suggested by Ferraro and Pattanayak (2006). However, the substantial increases in species populations observed for both the bird nest and ecotourism programs are very promising, given the context of a general ongoing decline in species abundance in Cambodia (Loucks et al., 2009). The rejection of in-migrants by villages with the ecotourism and agri-environment programs is also significant, given that in-migration is known to lead to greater deforestation (An, 2008). Although rejected in-migrants might settle in other remote forest areas, displacing deforestation to another site, available information suggests that they have instead chosen to settle near major population centres outside the PAs.

Despite positive results in terms of species status, direct payments to individuals may fail to build broad local support for conservation. Villagers in Antil received \$7488 during 2005–2007, much of it to protect two Greater Adjutant nesting sites. Over the same period, Tmatboey received \$7475 in tourism payments, of which only \$3155 was used to pay individual villagers. In both cases only a subset of the community benefited. During this period the population of White-shouldered Ibis doubled around Tmatboey due to a reduction in hunting pressure and improved protection of nesting and feeding areas, the village refused 69 families permission to settle, and undertook various other activities to curb land clearance. In Antil, however, forest encroachment and in-migration were widespread, culminating in the clearance of the Greater Adjutant colony in 2008. Villagers in Antil were not sufficiently motivated to protect this species, despite the high level of payments. Payments were widely perceived as being unfair, because only a few individuals benefited and no local institution existed to mediate conflicts.

The above example also illustrates the problem with highly targeted conservation interventions; a program's designer assumes the risk that the correct targets have been chosen to ensure success and that no perverse incentives will be created (Bowles, 2008). Under conditions of high uncertainty over threats and potential impacts of interventions, less specific payment programs that reward a set of outcomes (habitat protection and no-hunting agreements in the tourism and agri-environment cases) may be much more effective than a tightly targeted program (Kosoy and Corbera, 2010-this issue).

5. Conclusion

Institutional frameworks in tropical forest countries, many of which are undergoing a rapid rate of forest loss or erosion of biodiversity, are often weak and uncertain (Barrett et al., 2001). Designing PES programs in the context of weak institutions is challenging, particularly if property rights are not clearly defined. This comparison of three programs from Cambodia has highlighted two different approaches. The first is direct payments to individuals who can temporarily control a biodiversity resource, modelled on the approach proposed by Ferraro and Kiss (Ferraro, 2001; Ferraro and Kiss, 2002). The second approach is longer-term and requires investing in clarifying property rights and building local institutions for management of wildlife and habitats in addition to provision of incentives. The comparison suggests that the first approach can be very effective initially: the bird nest program rapidly protected several hundred pairs of globally threatened bird species, was inexpensive to implement and had low administrative costs with most money disbursed locally. However, this comparison has also suggested two significant problems with the approach.

Firstly, direct payments require strong institutional frameworks that support contracting, particularly enforcement of property rights (Börner et al., 2010–this issue; Muradian et al., 2010–this issue; Vatn, 2010–this issue). The Cambodian bird nest protectors had weak ownership rights over breeding sites, and were unable to protect them in the longer term from clearance by others. In the absence of strong existing institutional frameworks, payment programs need to invest in building appropriate institutions both at the village and higher levels. Increasing the diversity of institutions creates checks, improves resilience and sustainability in the system (Berkes, 2007) but imposes its own costs. In the two Cambodian cases (ecotourism and agri-environment programs) the increased institutional diversity led to a more sustainable outcome at the cost of reducing the proportion of payments that were made to local people, because revenue was also required to fund the other organisations for their monitoring, enforcement and supporting roles.

Secondly, direct payments to some individuals, but not to others, may fail to generate support for conservation, which is very necessary when the institutional framework is weak. Unlike the bird nest example, the two Cambodian village-managed programs successfully built local support for and understanding of rules and regulations for protected species and land-use plans. These rules and regulations were developed locally and approved by the entire village. This is an example of empowerment, defined by Chambers (1983) as “the process through which people, and especially poorer people, are enabled to take more control over their own lives, and secure a better livelihood, with ownership of productive assets as one key element”. The importance of intrinsic motivation at determining behaviour has been recognised by psychologists since the 1980s (DeCaro and Stokes, 2008; Deci and Ryan, 1985). Endogenous rules are far more likely to be respected and understood by local people (Berkes, 2003; Ostrom, 1990), in comparison with externally-imposed rules (Cardenas et al., 2000), and would probably be sustained for a period if payments ceased. By contrast, bird nests are valued only because WCS chooses to pay for their protection, not through any particular recognition of the birds' importance, and if payments by WCS stopped, even temporarily, collection of bird nests would probably resume. Externally-imposed rules and incentives may even ‘crowd-out’ locally-developed rules and social norms (Bowles, 2008; Cardenas et al., 2000; Vatn, 2010–this issue), or lead to perceptions that incentives are unfair (Fehr and Falk, 2002), as may have occurred in the bird nests case. Payment programs that are structured to facilitate intrinsic motivations are therefore far more likely to be successful.

PES programs are best viewed as a tool in a broader process of strengthening institutions for conservation of biodiversity (Agrawal and Gibson, 1999; Barrett et al., 2001). The conditions under which institutions for collective management of common-pool resources are likely to be formed have been well articulated through several decades of research (Agrawal, 2001; National Research Council, 2002; Ostrom, 1990). However, few settings in the world are characterised by all these conditions (Dietz et al., 2003). The challenge therefore is to devise institutional arrangements that help to establish such conditions or meet the main challenges of governance in the absence of ideal conditions (Dietz et al., 2003). PES programs can address two critical constraints, firstly by providing an incentive to reform institutional arrangements (for example clarification of property rights), and secondly by increasing the financial returns from collective management through provision of additional payments under conditions where sustainable extraction alone would not be profitable. At the village-level, the combination of a stronger institutional framework and payments leads to a greater local incentive for collective action, i.e. the village moves closer towards fulfilling the design principles articulated by Ostrom and others (Agrawal, 2001). In the Cambodian cases the payments are critical for three main reasons. Firstly, they increase the value of the biodiversity resource to local people, both directly through individual payments and indirectly by providing funds for village development. Secondly, the payments

fund the costs of management of common-pool resources by village institutions, a system which is itself a public good (Ostrom's ‘second-order social dilemma’ (1990)). Thirdly, the payments fund monitoring and sanctioning by the village institutions (Ostrom's ‘third-order social dilemma’). The structure of the payments—providing revenue at both the individual and village-level scale—ensures that these outcomes are possible.

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