



The role of fairness and benefit distribution in community-based Payment for Environmental Services interventions: A case study from Menabe, Madagascar[☆]

Matthew Sommerville^{a,*}, Julia P.G. Jones^b, Michael Rahajharison^c, E.J. Milner-Gulland^a

^a Department of Life Sciences, Imperial College-London, Silwood Park, Ascot, SL5 7 PY, UK

^b School of the Environment, Natural Resources and Geography, Bangor University, Bangor, Gwynedd, LL57 2UW, Wales, UK

^c Ny Havana, Morondava, Madagascar

ARTICLE INFO

Article history:

Received 6 May 2009

Received in revised form 22 September 2009

Accepted 3 November 2009

Available online 1 December 2009

Keywords:

Biodiversity conservation

Incentives

Fairness

Distribution

Community-based conservation

Payments for environmental services

Ecosystem services

ABSTRACT

Community-based conservation interventions can only be successful in the long term if their aims and activities are accepted by local people. A key determinant of acceptability is the perceived fairness of the distribution of the costs and benefits of the intervention. We examined the opportunities and challenges posed by benefit distribution in community-based Payment for Environmental Services (PES) interventions through a case study from Menabe, Madagascar. The intervention appears to be an overall success, with individuals reporting high levels of perceived fairness of payment distribution and a high proportion of individuals expressing overall net benefit. Nevertheless, a lack of adequate benefits accruing to those individuals facing high agricultural opportunity costs and evidence of sub-groups in the community reaping excessive benefits was noted across communities, and instances of poor governance were observed as a barrier to success in some communities. We present solutions to address these key challenges in the design and implementation of community-based PES interventions.

© 2009 Elsevier B.V. All rights reserved.

1. Introduction

1.1. Background

The international community has widely acknowledged the inequitable distribution of the costs and benefits of biodiversity conservation. For example, the costs of protected areas are born locally, frequently by poor rural communities, while the benefits accrue globally (Balmford and Whitten, 2003; Bawa et al., 2004). As a result, donors increasingly require international conservation programs to consider poverty alleviation (Brockington and Schmidt-Soltau, 2004; World Bank, 2005), although the extent to which conservation and social objectives can be achieved concurrently is still debated (Newmark and Hough, 2000; Adams et al., 2004; Barrett et al., 2005). There are many examples of local people suffering as a consequence of conservation interventions, for example in cases of forced resettlement from protected areas (Colchester, 1997; Schmidt-Soltau, 2003) or inadequate compensation for limitations on natural resource access (Shyamsundar and Kramer, 1996; Peters, 1998). Yet even when local people's needs are integrated into project planning

and implementation, there are challenges to ensuring the fair distribution of benefits. Benefit capture by the elite (Kellert et al., 2000; Thompson and Homewood, 2002; Balint and Mashinya, 2006; Fritzen, 2007), variable opportunity and transaction costs among individuals and communities resulting in the perception of unfair distribution (Kumar, 2002; Adhikari, 2005; Meshack et al., 2006) and the exacerbation of long-standing interpersonal conflicts (Koch, 1997; Agrawal and Gibson, 1999) all highlight the challenges of realizing community-wide social benefits from conservation projects.

As conservation interventions move away from the regulatory-based fences and fines paradigm and towards approaches that focus on positive incentives, such as Payment for Environmental Services (PES) (Ferraro, 2001; Wunder et al., 2008a), consideration of factors influencing individual choice becomes increasingly important (Adams and Hulme, 2001). PES represents a voluntary transaction whereby a service buyer pays a provider contingent on the provision of a well-defined environmental service, or a land use likely to secure the service (Wunder, 2006). Most examples of PES in the literature represent transactions with individual providers or groups of coordinated landowners. However, an increasing number of PES interventions, particularly in the tropics, apply to land that is managed, either legally or informally, by communities. For example there have been efforts towards community conservation concessions in Guyana and Indonesia (Nielsen and Rice, 2004; Wunder et al., 2008b), and payments to communities for managing forest for biodiversity in Mexico (Missrie and Nelson, 2005). Furthermore,

[☆] This article is a contribution to the forthcoming special section "Payments for Ecosystem Services: Alternative approaches from Ecological Economics," edited by Unai Pascual, Esteve Corbera, Roldan Muradian and Nicolas Kosoy.

* Corresponding author. Tel.: +44 20 7594 2509; fax: +44 1344 874 957.

E-mail address: m.sommerville06@imperial.ac.uk (M. Sommerville).

many nationally run programs within an international agreement on payments from Reduced Emissions from Deforestation and Forest Degradation (REDD) will have to consider incentive distribution on community-managed land (Kaimowitz, 2008). These community-based PES schemes offer a particular challenge, as incentives aim to influence individual behaviour, but they pass through community institutions.

Economic considerations with respect to costs and benefits certainly influence individuals' decisions to engage in behaviours (Persky, 1995). However, additional factors including procedural and distributive fairness impact individuals' motivation (Fehr and Falk, 2002, Vatn, 2010-this issue). Perceptions of unfairness can undermine the effectiveness even of incentives that provide apparent net benefits (Thibaut and Walkers, 1978; Folger, 1977; Kanfer et al., 1987). As well as providing tangible benefits, conservation success is therefore contingent on developing positive local attitudes (Struhsaker et al., 2005). Consequently, the perception of fairness and net benefit at the individual scale can have a substantial impact on the participation of the wider community and thus the efficacy of an intervention.

In this study, we examine the role of the distribution of incentives in influencing how individuals within communities perceive benefits and fairness from a community-based PES intervention to better understand the particular opportunities and challenges facing community-based PES. We hypothesize that individuals in powerful positions in the community forest association will receive the greatest benefits and that individuals and communities with high opportunity costs will perceive the lowest levels of net benefit. We also hypothesize that governance of benefit distribution will influence perceptions of fairness. We use self-reports to examine how

individual socio-economic characteristics, as well as community-level differences, relate to individuals' perceptions within 8 communities in the Menabe region of Madagascar. We discuss solutions for addressing issues of inequitable distribution, variable opportunity costs and governance failures in community-based PES.

1.2. Local Context

The forests of the Central Menabe region of Madagascar are an international conservation priority. They provide the sole habitat for four endangered endemic vertebrate species, including the flat-tailed tortoise (*Pyxis planicauda*) and the giant jumping rat (*Hypogeomys antimena*), and critical habitat for numerous other endangered species. Despite widespread immigration into the region over the past 40 years, the development of expansive sisal and sugar plantations, and oil exploration, approximately 100,000 ha of contiguous forest remains in this rural region, which is sparsely populated (Fig. 1). In the wake of community-based forest management transfer legislation in the late 1990s, government and NGOs began helping communities acquire local forest management rights. As a result, communities have established rights over clearly defined areas of forest and have divided these areas into strict conservation and multi-use forests. In order to encourage community forest associations to actively manage these forest areas for biodiversity and sustainable benefits, rather than for agriculture, Durrell Wildlife Conservation Trust (Durrell) has implemented a habitat management competition between communities in the Menabe since 2003. Community forest associations are responsible for local enforcement of the management rules, granting permits for activities in multi-use forests and for distributing annual awards within the

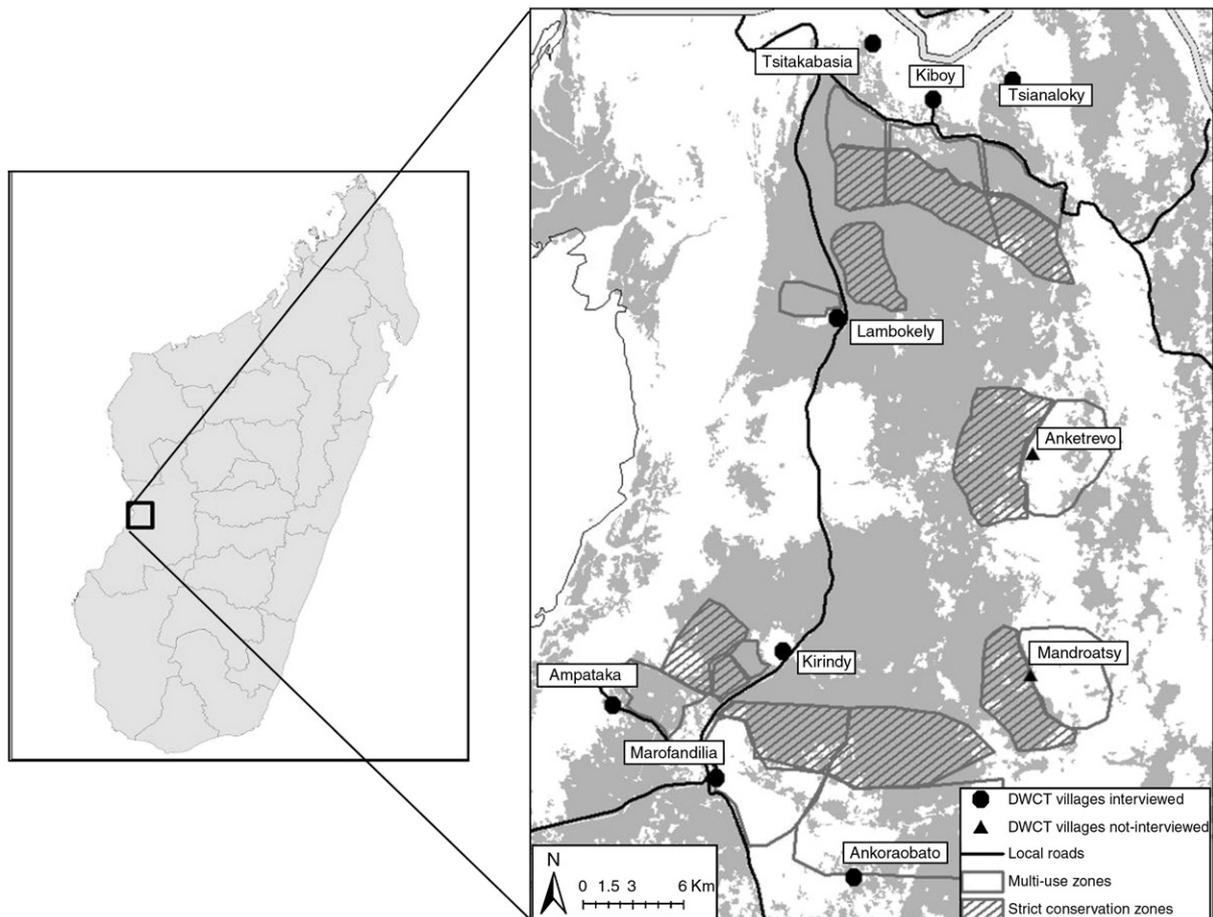


Fig. 1. Map of the Menabe region, showing the locations of the communities surveyed and the relative size of community protected forests and their distance from communities.

communities. Management rules in the strictly protected forest include prohibition of hunting lemurs, cutting timber, creating new paths and clearing forest for agriculture or grazing. In practice this also limits the collection of honey, as it typically involves cutting large trees.

Payments to communities in this scheme are contingent on both the state of the system (the number and abundance of species of interest) and on actions that impact the system (forest governance indicators and monitored threats), following an annual forest transect and governance assessment. On the annual transect, Durrell and community members record species of interest and threats. Local governance indicators are also scored based on forest association activities. The indicators were established by Durrell and though community members are aware of the link between indicator abundance, governance and awards, they have limited knowledge of the scoring process. Monitoring is generally perceived to be fair, however some concern was raised in communities with smaller forests that the size of their forest is a disadvantage in scoring (MS, unpublished data). Payments are subsequently distributed to each community based on performance relative to the other communities in the region and the size of each community's forest.

The initial pilot programme has grown from three communities to the current ten and ~\$8500 is distributed among the communities annually. The overall size of the payment distributed does not change significantly from year to year, however the distribution of payments among communities does. For example, the community of Kiboy's payments have ranged in value from \$370 to \$2230, whereas the value of the payments to Kirindy village, with a small community-managed forest area and poor biodiversity, has not exceeded \$250 (Table 1).

Though the monetary value of the payment to each community is announced annually, it is not distributed in cash, but instead used to purchase in-kind incentives. The board members of each community forest association, with the permission of at least 80% of the association, decide what they would like to purchase with the Durrell payment. Communities have purchased electric generators, building materials, cooking supplies, bicycles and cows. The subsequent distribution of these items differs between communities. In some communities, direct access to the items purchased is open to the entire community; while in others, they are only available to association members or for the facilitation of community-wide events. The share of the annual award money distributed to each forest association is henceforth called "the payment," and the in-kind items and services purchased for community use is called "the incentive."

The assumption of PES is that within a local management framework, the incentive will motivate individuals to attempt to ensure the provision of the defined environmental service. This case study's management system fulfils the criteria for a PES, in that there are voluntary agreements between a buyer (Durrell) and sellers (each community) where payments (annual incentives) are made contingent on the provision of an ecological service (biodiversity performance based on annual monitoring) (Wunder, 2006). Despite

fulfilling the criteria for a PES, the system was not established explicitly as a PES. While its structure, as a community-based PES system, is increasingly common, basing payment size on relative performance, rather than absolute criteria, is not.

In addition to the payment, communities receive additional tangential benefits from the PES management system. Durrell holds an annual party in each community to discuss the score and announce the payment amount. This party includes music, dance and a community meal. Durrell performs environmental outreach programs, forest association capacity building workshops and biodiversity monitoring programs throughout the year. There are also occasional opportunities for individuals to receive paid work with Durrell as a forest guide or monitor.

The costs of engaging in the intervention vary by individual and by community. Individual costs vary to the extent that individuals had previously been involved in controlled activities. Each community association has an annual membership fee, ranging from \$0.30 to \$7, as well as a one-time joining fee between \$0.50 and \$2. Membership gives individuals the right to apply for permits to use resources in local multi-use managed forest and in some communities, membership is a prerequisite for taking advantage of incentives. Though Durrell did not directly introduce new rules or laws into the community forest management system, their independent species monitoring programs throughout the region that has no impact on the PES have created a perception of enforcement of existing laws that was not previously present, thus placing an increased perceived cost on non-compliance.

2. Methods

2.1. Interviews

Interviews were carried out from December 2007 to April 2008 in 8 of the 10 communities participating in the Durrell scheme. These included 656 structured interviews with individuals and 55 semi-structured interviews with small focus groups (Table 1). Structured interviews were performed by MR, MS and three local research assistants following training. These assistants and two authors (MS and MR) had been present sporadically in each of the communities during the six months prior to the start of the questionnaires. As a result, the group's work was known throughout the region and local trust had been established. Nevertheless, there is inevitable concern that some responses are based on a desire to please the interviewers. MS, MR and JPGJ are fluent in spoken Malagasy. Interviews were trialed and revised over the course of two weeks in one community and these responses were not included in the final sample. Individuals were selected opportunistically by walking through each community and neighboring fields with local guides to ensure that only one individual per household, though not necessarily the head of the family, was interviewed. Men were interviewed preferentially as they participate in forest-use behaviours in the strictly protected forest to a greater extent than women, due to its distance and the difficulty of

Table 1
Description of the key features of the 8 Menabe communities that were surveyed in this study.

Village	Ethnicity	Intervention	Age of village	Individuals interviewed	Estimated population	Percent interviewed	Award 2007
Tsitakabasia	Sakalava, Korao	5 years	100+	72	266	27%	\$778
Kiboy	Sakalava, Korao	5 years	100+	81	516	16%	\$2227
Tsianaloky	Sakalava	5 years	100+	82	381	22%	\$727
Marofandilia	Korao, Tandroy, Sakalava	3 years	~50	82	193	42%	\$910
Ankoraobato	Korao, Tandroy	3 years	~50	83	271	31%	\$1790
Lambokely	Tandroy	2 years	15	97	272	36%	\$1638
Kirindy	Tandroy	2 years	25	63	74	85%	\$136
Ampataka	Sakalava, Tandroy	2 years	100+	84	366	23%	\$172

access. Approximately half of the interviews were performed in the community centre and half were performed in agricultural fields.

Individuals were asked to evaluate the impact of the incentive by weighing the benefits from the incentive against the costs from limitations on forest resource use at the family and community levels (interview questionnaire in the [Appendix](#)). Individuals responded with their perception of whether their family and the community had benefited, stayed the same or lost out. Costs and benefits were not disassociated from each other in the questions, but rather individuals' impressions of net benefit or loss at the family and community level were solicited. Individuals were then questioned regarding their perception of the fairness of the distribution of the incentive. Individuals were asked about their knowledge of Durrell's work in the region. We also investigated whether individuals understood that the payment amount received by the community was based upon meeting forest management criteria.

To reflect the opportunity costs of engaging in the PES system, respondents were asked to self-report their forest-use behaviours, now and in the past. These include expanding agricultural lands, hunting lemurs, collecting honey and/or tenrecs, and building canoes. Women were not asked all of the forest-use behaviour questions, as they do not typically engage in these forest activities. No reference was made to the legality of forest resource use before or during these questions, to avoid influencing responses, though some respondents may have perceived legal implications of the questions. Subsequently, individuals were asked if they would like to engage in each of the behaviours in the absence of legal consequences.

Additional background socio-economic characteristics and whether individuals were members of the forest management association were also recorded. Relative wealth estimates were based on self-reports of the relative size of three field types owned by each household and the self-reported adequacy of harvest. Each of the field types, flood plain fields, rice fields and dry slash/burn fields, are important for food security and income.

Semi-structured interviews ($n=55$) were performed with individual forest association board members from each community, and focus groups of 2–3 members of forest patrols within each forest association. The structure of the forest association, monitoring regimes, local politics and the size and distribution of the payment and the incentive were discussed. The semi-structured interviews were all carried out by MS and MR.

2.2. Analysis

In order to understand how socio-economic characteristics ([Table 2](#)) relate to the perceived fairness and perceived net benefit from the PES system for each respondent's family and community, we used generalized linear models with a logistic link function ([Crawley, 2005](#)). For the purpose of logistic analysis, perception of net benefit was simplified and grouped into a binary response variable (those who benefited vs. those who lost or were unchanged). Correlations between variables were checked. Community was used as a fixed effect, to test for an influence of community-level dynamics on perceptions of fairness and net benefit. Interactions between variables were not included in order to avoid over-parameterization of the models. A backwards stepwise approach was used iteratively to eliminate non-significant explanatory variables. Following each iteration, models were compared using an ANOVA to evaluate whether the simplified model was significantly worse than the previous model ([Crawley, 2005](#)). The minimum model was selected when removing the next least significant explanatory variable led to a poorer model. The desire to engage in forest activities was only asked of males, thus limiting the sample size of models that included forest behaviours. The significance of fixed effects was assessed with a Wald statistic ([Pinheiro and Bates, 2000](#)). Minimal models only are presented in the results. Overall model fit values were represented by the values of Area Under the ROC (Receiver Operator Characteristic) Curve (AUC). Values greater than 0.7 were considered reasonable fits, though, the utility of particular AUC values is context dependent ([Pearce and Ferrier, 2000](#); [Fielding and Bell, 1997](#)).

3. Results

3.1. To What Extent Do Incentives Benefit the Community and Individual Families?

3.1.1. Perceptions of Net Benefits at the Community and Family Levels

The majority of individuals reported that the community as a whole benefited positively from the intervention ([Fig. 2](#)). Individuals perceived the community to have benefitted more often than they perceived their family to have benefitted ($\chi^2=210.9$, $df=2$, $p<0.001$). Board members of the forest management association were less likely to perceive a community-level net benefit than the

Table 2

List and summary of the variables used in models of each individual's perceived family net benefit, community net benefit and perceptions of fairness. All of the variables were included in each maximal model. Percentages give the percentage of respondents in each category of the variable. For continuous variables means are given unless otherwise stated.

Variables	Summary
Community	8 level factor
Ethnicity	Sakalava – 43%, Tandroy – 29%, Korao – 20%, Other – 8%
Gender	Male – 67%, female – 33%
Age	38 years
Household number	5 individuals
Years in community	22 years
Married	Yes – 80%, no – 20%
Expanded land, hunted lemurs, collected honey/tenrecs, built canoes prior to Durrell interventions	Land – 78%, lemurs – 14%, honey – 60%, tenrecs – 53%, canoes – 22%
Wants to expand land, hunt lemurs, collect honey/tenrec, build canoes in future	Land – 72%, lemurs – 15%, honey – 54%, tenrec – 65%, canoes – 21%
Desire to use a diversity of forest products (sum of behaviours)	2.33 products
Agricultural wealth (dry, wet and rice fields: perceived adequacy on scale of 1–12)	Dry fields – 3.31, wet fields – 2.43, rice fields – 2.25
Has land next to forest	Yes – 30%, no – 70%
Dry season forest use	Never – 70%, seasonally – 3%, monthly – 7%, weekly – 14%, daily – 6%
Rainy season forest use	Never – 48%, seasonally – 4%, monthly – 14%, weekly – 23%, daily – 11%
Forest association member	Member – 30%, board – 10%, non-member – 60%
Knowledge of the work of Durrell	Yes – 80%, no – 20%
Knowledge of the PES relationship between actions and incentives	Yes – 79%, no – 21%
How has PES incentive impacted community?	Benefit – 77%, loss – 7%, unchanged – 6%, don't know – 9%
How has PES incentive impacted family?	Benefit – 47%, loss – 9%, unchanged – 40%, don't know – 3%
Is the distribution of incentives fair?	Fair – 60%, unfair – 11%, don't know – 29%

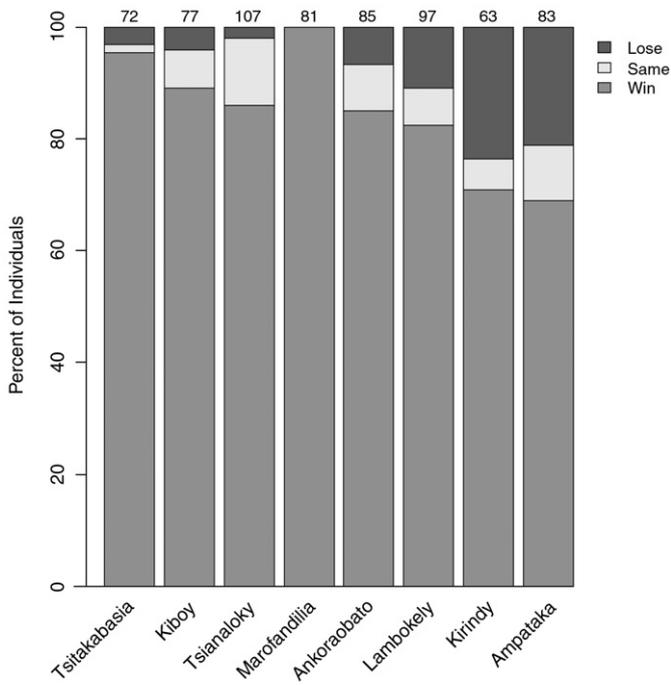


Fig. 2. The percentage of respondents in each community who perceived the community to have benefitted, stayed the same or lost out overall with regards to the intervention benefits and the forest access constraints. The total sample size for each community is presented above the figure. Communities are presented in order of the length of time that Durrell has been active in them.

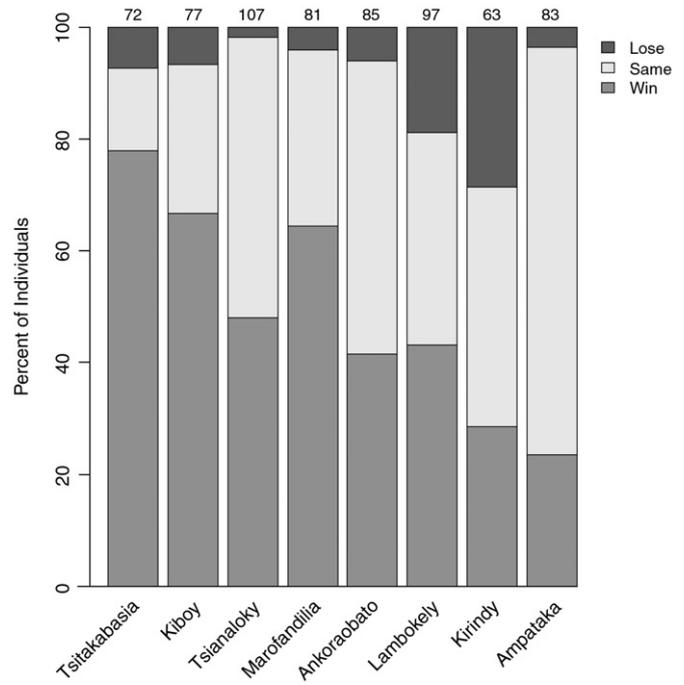


Fig. 3. The percentage of respondents in each community who perceived their family to have benefitted, stayed the same or lost out overall with regards to the benefits from the intervention and the forest access constraints. The total sample size for each community is presented above the figure. Communities are presented in order of the length of time that Durrell has been active in them.

rest of the population (Table 3, column a). The communities of Ampataka and Kirindy had the lowest proportion of individuals reporting a community-level net benefit, though each still had a majority of individuals reporting a net community benefit.

Relatively few individuals reported their family to have explicitly lost out from the conservation intervention (Fig. 3). Individuals' perceptions of whether their family had benefitted or stayed the same/lost were related to their position in the forest management association, with board members more likely to report having received a net benefit than regular association members, and regular members more likely to report receiving a net benefit than non-members (Table 3, column b). This supports the hypothesis that

association members and those in power receive the highest level of net benefits.

Individuals with land next to the forest, as well as individuals, who would like to expand their agricultural land, were less likely to perceive their family as benefitting overall supporting the hypothesis that those with high opportunity costs would experience lower levels of net benefit. However, this was not supported universally in the case study. Though individuals who use the forest heavily for timber, honey and meat would be expected to have high opportunity costs from a PES intervention, the fact that they were actually more likely than others to report a net benefit suggests a recognition of benefits from forest management.

Table 3
A summary of the coefficients on the explanatory variables in the minimal models of net community and family benefits and fairness of distribution. Generalized linear models were used with a log-link function, and with a binary response variable, where 1 = fair or beneficial and 0 = unfair or no/negative benefit. Positive and negative signs represent the direction of the association between explanatory and response variables, where binary explanatory variables are coded such that 1 is a positive response. * significant at $p < 0.05$, ** significant at $p < 0.01$; and *** significant at $p < 0.001$. Standard errors are given in parentheses. The full set of explanatory variables that were considered is presented in Table 2. AUC is a discrimination index that measures the predictive power of the model based on the probability that the predictions and the outcomes are in agreement with values > 0.8 representing a reasonable fit.

	a. Community net benefit	b. Family net benefit	c. Fair Distribution
Membership: board member/non-members	-1.45*** (0.39)		
Membership: board member		1.05** (0.38)	-1.20* (0.56)
Membership: not member		-0.65* (0.26)	-1.57*** (0.49)
Knowledge of the PES system			2.12*** (0.62)
Knowledge of Durrell system		1.16** (0.38)	
Want to expand dry fields		-1.08*** (0.32)	-0.89 (0.51)
Want to use forest		0.38*** (0.09)	
Land next to forest		-0.77** (0.25)	-1.81*** (0.45)
Dry field wealth		0.17** (0.06)	0.21* (0.09)
Wet field wealth			-0.28** (0.09)
Dry season forest use: never/seasonally			1.53* (0.76)
Rainy season forest use: never/seasonally		-1.41* (0.61)	-1.05* (0.42)
Community: Ankoraobato/Kiboy			-2.56*** (0.43)
Community: Ampataka/Ankoraobato/Kirindy		-1.07*** (0.32)	
Community: Ampataka/Kirindy	-2.00*** (0.36)		
AUC	0.78	0.79	0.89
Sample size	586	426	457

This active interest in the results of forest management was also noted in the semi-structured interviews with some members of the association board. Those board members who relied on forest products for their livelihoods, expressed a desire to control the access of outsiders to the strictly managed forest and were frequently the community forest guardians. Their interest in forest management contrasted with that of board members from the community economic elite who were more interested in managing incentives. These forest guardians thus, encouragingly, appear to be local advocates for forest conservation.

3.1.2. Reasons for Differences in Perceptions of Net Benefit among Communities

A number of potential explanations for the relatively low levels of benefits experienced by Ampataka and Kirindy emerged in the interviews, including high joining fees, low payment sizes and high opportunity costs. In Ampataka, 39% ($n = 82$) of respondents and 42% ($n = 60$) in Kirindy suggested that individuals did not join the association because of insufficient time or money. Ampataka is the only community in the system in which households had marine fishing as a complementary primary livelihood alongside farming. In interviews, Ampataka's board members expressed ambivalence towards the conservation intervention, mirroring the high proportion of respondents who perceived there to be no change for their families due to the intervention (59%, $n = 80$). The high association entrance fee (\$7 per year) was a frequent complaint for members of the association in Kirindy. Finally, the structure of the PES system was criticised frequently in both Ampataka and Kirindy. Board members in the two communities frequently complained that their consistently low annual payments were due to the poor biogeography of their forests (west of the central forest block) and small area of locally managed forest.

Kirindy and Lambokely arguably experience the highest opportunity costs of not expanding their agricultural land into the forest and thus their relatively high level of individuals reporting a net loss supports the hypothesis of the impact of opportunity cost on perceptions of benefit at the community level. Each of these communities is composed of a clearing surrounded by primary forest. While only a portion of this forest is managed locally, and thus within the payment scheme, the forest management associations assert *de facto* management and enforcement of rules on the forest immediately surrounding the communities. Unlike the other six communities, Kirindy and Lambokely do not have a stream or river to grow crops next to outside of the wet season, and so their alternatives are limited.

3.2. To What Extent is the Distribution of Incentives Considered Fair?

3.2.1. Perceptions of Fairness of Distribution within Communities

Most respondents appear to perceive the distribution of the incentive at the community level to be fair, with over 85% of individuals reporting a fair distribution. Nevertheless, board members of the forest associations were more likely than regular members to perceive the distribution of the incentive as unfair (Table 3, column c). Non-members were also more likely than regular members to perceive the distribution as unfair. Those with agricultural land next to the forest and individuals who wanted to expand their agricultural land were each more likely than the rest of the population to perceive the distribution to be unfair. The respondent's community was also a significant determinant of perceived fairness, with individuals from Ankoraobato and Kiboy more likely to perceive the system to be unfair (Fig. 4). New communities to the scheme, like Ampataka and Kirindy, had a relatively high percentage of respondents reporting that they did not know if the incentive distribution was fair or unfair.

3.2.2. Reasons for Differences in Perceived Fairness among Communities

Supporting the hypothesis of the importance of governance on perceptions of fairness, the issue of political leadership emerged often

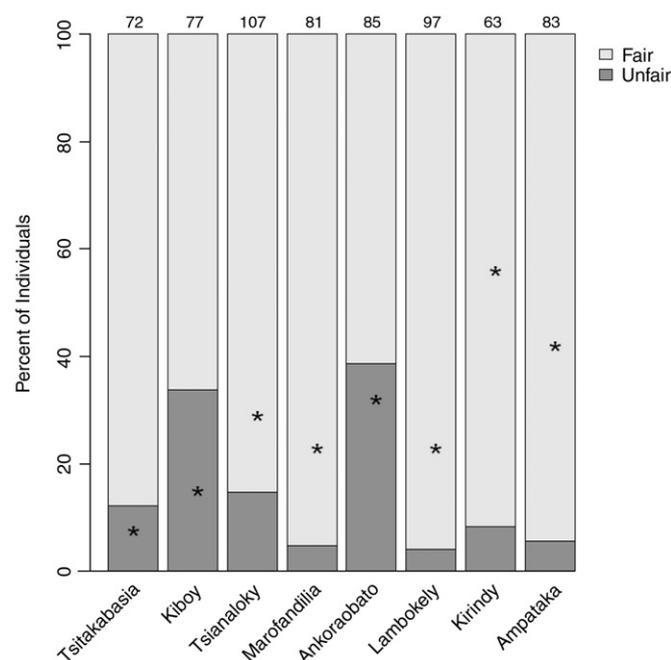


Fig. 4. The percentage of respondents in each community who perceived the distribution of the incentives from the forest association to be fair or unfair at the community level. "" indicates the percentage of "don't know" offered as a response, out of the total sample size for each community, which is presented above the figure. Communities are presented in order of the length of time that Durrell has been active in them.

in discussions in Ankoraobato and Kiboy. Indeed, 28% ($n = 60$) of respondents in Kiboy and 23% ($n = 53$) in Ankoraobato suggested that a dislike of their association's politics or leadership was responsible for individuals not joining the forest association, far higher than the other communities. In these two communities, board members mentioned their dissatisfaction with the association presidents because the presidents reaped excessive personal benefit from the scheme, with accusations in both communities that the presidents had failed to distribute seeds from a conservation and development intervention, that they mismanaged funds from forest entry fees and multi-use forest permits, and that they used community goods such as bicycles and cooking materials for non-official business. In Ankoraobato, there were reports that the president arranged for a logging company to harvest in the forest. In Kiboy, the association was beginning to address this problem by establishing a committee of individuals outside the sphere of the president to control access to the payment and to incentive distribution. In Ankoraobato, board members suggested that they would like to have a vote for a new forest president. In both these communities, the associations have lost members over recent years. These two communities also had the highest absolute payment values in the year prior to the survey. Despite criticism regarding the fairness of distribution of incentives in Kiboy, the majority of individuals in Kiboy perceived that their family had benefitted overall from the intervention.

4. Discussion

4.1. Opportunities and Challenges for Community-based PES

Where communities have legal or *de facto* control over the quality or quantity of an ecosystem service of value to other communities, but lack an incentive to manage it; community-based PES is a logical approach to ensure service provision. It has the potential to contribute to development objectives and build management capacity at the community level. These benefits were observed throughout the communities, particularly in the widespread belief that the PES intervention has an overall positive impact at the community level.

Nevertheless, significant challenges remain for community-based PES. Principle among these is that community-based PES does not necessarily address individual opportunity costs, and may thus have difficulty in incentivising individual behaviours. Similarly, given the challenges of managing the distribution of incentives, there is danger of cooption of benefits by sub-groups within the community that leads to widespread disillusionment. Alternatively, those who benefit within a community may use command and control tactics to ensure compliance from the wider community, thus subverting the principles of PES, as a positive incentive, at the level of the individual (Sommerville et al., *in press*).

4.2. *The Impact of Incentives within Communities*

While a net benefit was widely perceived at the community level, individuals, particularly those experiencing high opportunity costs and non-members of the forest association, were less likely to perceive a benefit at the family level, while board members of the association were more likely to perceive a family-level benefit. This suggests an inequitable benefit distribution and the potential presence of elite capture, as is common in many conservation and development projects (Kellert et al., 2000; Thompson and Homewood, 2002). This highlights the design question in community-based PES of whether those paying for the service provision wish to target a specific group within a community, such as the poor, or those experiencing opportunity costs of the community engagement, or whether they are content to let community associations govern incentive distribution.

Techniques such as offering in-kind, non-rival and non-excludable incentives may avert benefit capture by a small group and ensure access to the poor, whereas targeting incentives more precisely within communities may offer potential solutions to address variable opportunity costs. In many rural communities, it may not be possible explicitly to direct incentives to the relative poor without upsetting local social structures (Agrawal, 2001; Thompson and Homewood, 2002). This distributional issue is addressed in the Menabe through the use of in-kind incentives that are decided upon and shared by the community, such as bicycles, generators and public buildings. In-kind incentives accrue coarsely at the community level while costs are experienced at the individual and family level. Thus, though this approach offers equal access to all members of the community in principle, it does not easily address variable opportunity costs. Furthermore, in practice, the distribution of and access to these easily appropriated items have been criticised in some Menabe communities.

A focus on non-rival and non-excludable benefits, such as parties and community infrastructure would potentially ensure that the entire community has the opportunity to access the benefits. Indeed, community members expressed a preference for an annual community party offered by Durrell over the in-kind incentives (MS, unpublished data). However, many forms of community infrastructure that are commonly distributed as non-rival or non-excludable benefits from conservation interventions, such as educational and medical facilities, may be seen as human rights, which should not be contingent on local resource management.

In cases when meeting individual opportunity costs is deemed important, targeting may be an approach to improve the efficiency of the intervention. However particularly in developing countries, targeting may be limited in practice due to the difficulty of extracting private information from individuals seeking to receive benefits (Akerlof, 1970). Techniques such as auctions and screening contracts can be used to induce individuals to share their true preferences and to complement publically available information on opportunity costs (Ferraro, 2008). Alternatively, spatial targeting has been explored for the distribution of incentives and may be appropriate for those with land directly adjacent to forest (Wätzold and Drechsler, 2005; Wünscher et al., 2008). However, such forms of targeting typically involve relatively high transaction costs, particularly when dealing

with large numbers of smallholders, thus reducing gains in efficiency. These approaches also generally signify a shift away from community-based PES to a more individualized PES.

4.3. *Differences among Communities*

Qualitative evidence from observations and semi-structured interviews suggests that differences in the perceptions of benefit between communities appeared to be influenced by economic issues, whereas failures in governance dominated differences in perceptions of fairness.

Given the high agricultural opportunity cost of communities surrounded by protected forest, it is not surprising that Lambokely and Kirindy reported the highest proportion of individuals expressing a net loss from the PES scheme, mirroring the primary costs of conservation in other interventions (Archabald and Naughton-Treves, 2002; Adams and Infield, 2003). In Kirindy we also demonstrated that high monetary cost of entering the association can also be a substantial barrier, as individuals are uncertain whether they will receive adequate benefits from participation (Gong et al., 2010–this issue). This raises concern regarding the absolute size of payments for each community. In the Menabe scheme, payments are based on the state of the system and management actions, relative to their forest size and the scores of neighboring communities, rather than being based on opportunity costs. In Kirindy this lack of adequate compensation has led to discussion of dropping out of the management scheme entirely. There is thus a need for more research on the merits of basing payments on a competitive approach among individuals or communities. Nevertheless, it is clear that while the structure of the Menabe scheme may motivate communities to compete with their neighbors, strong monetary incentives are still necessary to encourage continued participation.

In contrast to the economic drivers of perception of net benefit, perceptions of fairness appeared to be related to poor governance. Kiboy and Ankoraobato received the highest payment in the year prior to the study and some of the issues around fairness may result from the conflicts over the spending of the large payment and distribution of the incentive. However, the balance of evidence suggests that chronically poor governance on the part of community presidents has led to a collapse of trust. Indeed breakdowns in the perception of fairness and subsequent collapse of interventions are frequently caused by local-level leadership failures (Barrett et al., 2001; Thompson and Homewood, 2002; Smith and Walpole, 2005).

This demonstrates the importance of perceptions of fairness (Fehr and Falk, 2002) and governance (Antona et al., 2004) as key issues affecting the impact of payments and incentives in community-based management transfers, regardless of the tangible benefits received by individuals. Organizations that help to develop capacity in local institutions can address failed leadership by promoting clear democratic processes for electing board members at regular intervals and by trying to ensure that members have a voice in the association's actions (Thompson and Homewood, 2002). Such approaches may be considered paternalistic, but may give communities the perception that they are not constrained to a single local leadership paradigm. While this type of engagement offers promise, it also increases transaction costs, requires frequent on the ground presence and is contingent on effective ground-level personalities.

4.4. *Implications for the Future*

The creation of sustained positive social benefits has been acknowledged as a prerequisite for long-term intervention success within the community-based natural resource management literature (Berkes, 2004). The observation that a higher proportion of individuals perceived a net benefit at the community level (85%, $n = 545$) than at the family level (58%, $n = 545$) may present some cause for concern. Evidence from Tanzania suggests that communities initially engage in conservation programs based on perceptions of future benefits, but will

eventually drop out if realized family benefits are inadequate over time (Songorwa, 1999). Within the Menabe system it is not clear if this discord between the perception of community and family-level benefits is a precursor to future weakness in the system, but the low proportion of individuals explicitly expressing loss due to the system (9%, $n = 545$) is encouraging. Furthermore, there is some hope that a temporal component plays a role in community-wide perceptions of positive net benefit. Ampataka and Kirindy are the newest communities to participate in the competition and were the most likely to report community-level losses. Similarly, they had the highest percent of individuals reporting that they did not know if their incentives were fairly distributed. As their experience with the system grows, the annual payments and incentives may help to develop trust and demonstrate cumulative benefits so that positive perceptions of the PES system may grow (Salafsky et al., 2001). However, this is far from conclusive, as these two communities have also gained the lowest average annual payment of all the participating communities.

4.5. Monitoring Social Impacts

In community-based conservation schemes, where local institutions control the distribution of incentives, the distribution structure and ultimate fairness may not be clear a priori (Adhikari, 2005). Monitoring social indicators is thus a critical, if rarely performed, component of conservation and development projects (Newmark and Hough, 2000; Pomeroy et al., 2004). Failure to consider distributional and fairness issues can undermine the impact of a PES or the long-term success of conservation interventions. Given the ethical and practical obligations to understand how interventions impact local people, studies of the distribution of positive and negative incentives should increasingly accompany and inform conservation interventions.

5. Conclusion

From a social perspective, the Menabe community-based PES appears to be an overall success due to high levels of perceived fairness of payment distribution and a low proportion of individuals expressing a sense of family-level and community-level loss. However, numerous pitfalls were observed in the scheme. There was a lack of net benefit accruing to those bearing high opportunity costs from not expanding their agricultural land. Poor governance of benefit distribution by local leaders also threatened to undermine the effectiveness of incentives in a few communities. As conservation interventions increasingly rely on positive incentives at the community level to motivate individual behaviours, these challenges, and others, need to be considered in the project planning stages and through monitoring social indicators throughout the intervention's lifetime.

Acknowledgements

Thanks to Madagascar's Ministry of Water and Forests and Durrell Wildlife Conservation Trust's Madagascar Team including Richard Lewis, Herizo Andrianandrasana, Joanna Durbin and Francisco Rakotombolona. Thanks also to Fidelisse Ben, Romeo Ratsimbazafy and Landy Befitaky. This work was funded by the Leverhulme Trust. EJMG acknowledges support from a Royal Society Wolfson Research Merit Award.

Appendix A. Study Questionnaire

Background information

1. Date:
2. Village name:
3. Location of interview: Village/Field
4. Interviewer:
5. Others present:

6. Household number (from community map):
7. Name:
8. Sex:
9. Age:
10. Ethnicity:
11. Married:
12. Children: Number:
13. Household size:
14. Born in village:
 - a. If not, where:
 - b. How many years here:

Association background

1. Are you/have you been a member of the community forest management association?
 - a. If so, are you a member of the board?
2. Reasons for membership:
 - a. If member, why are you a member of the association?
 - b. If not member, why do you think others have decided to join the association?
3. Reasons against membership:
 - a. If member, why do you think others choose not to join the association?
 - b. If not member, why have you chosen not to join the association?

Knowledge of incentives

1. Do you know of:
 - a. Durrell?
 - b. The staff of Durrell?
 - c. The vehicle used by Durrell?
 - d. The competition?
 - e. The award from the competition? (give example)
2. (if relevant) What was the award last year ____?
 - a. What place were you last year ____?
3. What actions could the village take to get a higher award next year?
4. Has the distribution of the award within the community been fair?
 - a. Why?
5. In relation to what your family has had to give up through the village's engagement with the Durrell management competition, have you (benefited, lost out, stayed the same) from the Durrell competition in the area?
 - a. What specific benefits have your family received?
 - b. What has your family had to give up?
6. In relation to what the village has had to give up through the village's engagement with the Durrell management competition, has the village (benefited, lost out, stayed the same) from the Durrell competition in the area?
 - a. What specific benefits has the village received?
 - b. What has the village had to give up?

Perceptions of organizations

1. What is good about *Durrell's* work in the area?
2. What is bad about *Durrell's* work in the area?
3. What is your opinion overall of *Durrell's* work in the area (very good, good, normal, bad, very bad)

Same as above with *Forest Service*; then another local NGO, *Fanamby*.
Knowledge of spatial location of managed forest boundaries

1. Where is the strictly protected forest?
2. Where is the multi-use forest?

Forest behaviour questions

1. How often do you use the forest in the rainy season?
2. How often do you use the forest in the dry season?
3. Did you harvest honey in the past?

4. Do you collect honey now?
5. Would you like to (continue to) collect in the future?
6. Do you sell honey? Do you consume it at home? Do you give it away? (proportions)
7. (if relevant) Did you collect (a description of area of the strict forest) during or before the year of the eclipse (reference point)?
 - a. If no, why not?
8. (if relevant) Do you collect (a description of area of the strict forest) now?
 - a. If no, why not?
9. (if relevant) Why did you change?
10. (if relevant) Why haven't you collected?
11. (if relevant) If there were no forest management rules, would you collect?
12. (if relevant) If there were no forest management rules, would you collect in the (a description of area of the strict forest)?

Agricultural wealth

1. Do you have any dry fields?
 - a. Relative to others in the village, do you have (less, more or same amount) of dry fields?
 - b. Does it produce (more than enough, adequate, or not enough) for your family's needs?
2. Do you have any fields next to the forest?
3. Do you have any rice fields?
 - a. Relative to others in the village, do you have (less, more or same amount) of rice fields?
 - b. Does it produce (more than enough, adequate, or not enough) for your family's needs?
4. Do you have any wet fields?
 - a. Relative to others in the village, do you have (less, more or same amount) of wet fields?
 - b. Does it produce (more than enough, adequate, or not enough) for your family's needs?

References

- Adams, W.M., Hulme, D., 2001. If community conservation is the answer in Africa, what is the question? *Oryx* 35 (3), 193–200.
- Adams, W.M., Infield, M., 2003. Who is on the gorilla's payroll? Claims on tourist revenue from a Ugandan national park. *World Development* 31 (1), 177–190.
- Adams, W.M., Aveling, R., et al., 2004. Biodiversity conservation and the eradication of poverty. *Science* 306 (5699), 1146–1149.
- Ahdikari, B., 2005. Poverty, property rights and collective action: understanding the distributive aspects of common property resource management. *Environment and Development Economics* 10 (1), 7–31.
- Agrawal, A., 2001. Common property institutions and sustainable governance of resources. *World Development* 29 (10), 1649–1672.
- Agrawal, A., Gibson, C.C., 1999. Enchantment and disenchantment: the role of community in natural resource conservation. *World Development* 27 (4), 629–649.
- Akerlof, G., 1970. The market for lemons: qualitative uncertainty and the market mechanism. *The Quarterly Journal of Economics* 84 (3), 488–500.
- Antona, M., Bienabe, E.M., et al., 2004. Rights transfers in Madagascar biodiversity policies: achievements and significance. *Environment and Development Economics* 9 (6), 825–847.
- Archabal, K., Naughton-Treves, L., 2002. Tourism revenue-sharing around national parks in Western Uganda: early efforts to identify and reward local communities. *Environmental Conservation* 28 (2), 135–149.
- Balint, P.J., Mashinya, J., 2006. The decline of a model community-based conservation project: governance, capacity, and devolution in Mahenye, Zimbabwe. *Geoforum* 37 (5), 805–815.
- Balmford, A., Whitten, T., 2003. Who should pay for tropical conservation, and how could the costs be met? *Oryx* 37 (2), 238–250.
- Barrett, C.B., Brandon, K., et al., 2001. Conserving tropical biodiversity amid weak institutions. *BioScience* 51 (6), 497–502.
- Barrett, C.B., Lee, D.R., et al., 2005. Institutional arrangements for rural poverty reduction and resource conservation. *World Development* 33 (2), 193–197.
- Bawa, K.S., Seidler, R., et al., 2004. Reconciling conservation paradigms. *Conservation Biology* 18 (4), 859–860.
- Berkes, F., 2004. Rethinking community based conservation. *Conservation Biology* 18 (3), 621–630.
- Brockington, D., Schmidt-Soltau, K., 2004. The social and environmental impacts of wilderness and development. *Oryx* 38 (2), 140–142.
- Colchester, M., 1997. Salvaging nature: indigenous peoples and protected areas. In: Ghimire, K., Pimbert, M. (Eds.), *Social Change and Conservation*. Earthscan, London, pp. 97–130.
- Crawley, M.J., 2005. *Statistics: An Introduction Using R*. John Wiley and Sons, Ltd., New York.
- Fehr, E., Falk, A., 2002. Psychological foundations of incentives. *European Economic Review* 46 (4), 687–724.
- Ferraro, P.J., 2001. Global habitat protection: limitations of development interventions and a role for conservation performance payments. *Conservation Biology* 15 (4), 990–1000.
- Ferraro, P.J., 2008. Asymmetric information and contract design for payments for environmental services. *Ecological Economics* 65 (4), 810–821.
- Fielding, A.H., Bell, J., 1997. A review of methods for the assessment of prediction errors in conservation presence/absence models. *Environmental Conservation* 24 (1), 38–49.
- Folger, R., 1977. Distributive and procedural justice: combined impact of "voice" and improvement on experienced inequity. *Journal of Personality and Social Psychology* 35, 108–119.
- Fritzen, S.A., 2007. Can the design of community-driven development reduce the risk of elite capture? Evidence from Indonesia. *World Development* 35 (8), 1359–1379.
- Gong, Y., Bull, G., Baylis, K., 2010. Participation in the World's First Clean Development Mechanism Forest Project: The Role of Property Rights, Social Capital and Contractual Rules. *Ecological Economics* 69 (6), 1292–1302 (this issue).
- Kaimowitz, D., 2008. The prospects for Reduced Emissions from Deforestation and Degradation (REDD) in Mesoamerica. *International Forestry Review* 10 (3), 485–495.
- Kanfer, R., Sawyer, J., et al., 1987. Fairness and participation in evaluation procedures: effects on task attitudes and performance. *Social Justice Research* 1 (2), 235–249.
- Kellert, S.R., Mehta, J.N., et al., 2000. Community natural resource management: promise, rhetoric, and reality. *Society & Natural Resources* 13 (8), 705–715.
- Koch, E., 1997. Ecotourism and rural reconstruction in South Africa: reality or rhetoric. In: Pimbert, M., Ghimire, L. (Eds.), *Social Change and Conservation*. Earthscan, London, pp. 214–238.
- Kumar, S., 2002. Does "participation" in common pool resource management help the poor? A social cost–benefit analysis of joint forest management in Jharkhand, India. *World Development* 30 (5), 763–782.
- Meshack, C.K., Ahdikari, B., et al., 2006. Transaction costs of community-based management: empirical evidence from Tanzania. *African Journal of Ecology* 44, 468–477.
- Missrie, M., Nelson, K., 2005. Direct Payments for Conservation: Lessons from the Monarch Butterfly Conservation Fund. College of Natural Resources Research Summary Paper No.8. University of Minnesota, Minneapolis.
- Newmark, W.D., Hough, J., 2000. Conserving wildlife in Africa: integrated conservation and development projects and beyond. *BioScience* 50 (7), 585–592.
- Nielsen, E., Rice, R., 2004. Sustainable forest management and conservation incentive agreements. *International Forestry Review* 6 (1), 56–60.
- Pearce, J., Ferrier, S., 2000. Evaluating the predictive performance of habitat models developed using logistic regression. *Ecological Modelling* 133, 225–245.
- Persky, J., 1995. Retrospectives: the ethology of Homo economicus. *The Journal of Economic Perspectives* 9 (2), 221–232.
- Peters, J., 1998. Transforming the integrated conservation and development project (ICDP) approach: observations from the Ranomafana National Park Project, Madagascar. *Journal of Agricultural and Environmental Ethics* 11 (1), 17–47.
- Pinheiro, J.C., Bates, D.M., 2000. *Mixed-Effects Models in S and S-Plus*. Statistics and Computing. Springer Science, New York City.
- Pomeroy, J.S., Parks, J., et al., 2004. How is Your MPA Doing? A Guidebook to Natural and Social Indicators for Evaluating Marine Protected Area Management Effectiveness. IUCN.
- Salafsky, N., Cauley, H., et al., 2001. A systematic test of an enterprise strategy for community-based biodiversity conservation. *Conservation Biology* 15 (6), 1585–1595.
- Schmidt-Soltau, K., 2003. Conservation related resettlement in Central Africa: environmental and social risks. *Development and Change* 34 (3), 525–551.
- Shyamsundar, P., Kramer, R.A., 1996. Tropical forest protection: an empirical analysis of the costs borne by local people. *Journal of Environmental Economics and Management* 31 (2), 129–144.
- Smith, R.J., Walpole, M., 2005. Should conservationists pay more attention to corruption? *Oryx* 39 (3), 251–256.
- Sommerville, M., Jones, J.P.G. and Milner-Gulland, E.J., in press. A revised conceptual framework for payments for environmental services. *Ecology and Society*.
- Songorwa, A.N., 1999. Community-based wildlife management in Tanzania: are communities interested? *World Development* 27 (12), 2061–2079.
- Struhsaker, T.T., Struhsaker, P.J., et al., 2005. Conserving Africa's rain forests: problems in protected areas and possible solutions. *Biological Conservation* 123 (45–54).
- Thibaut, J., Walkers, L., 1978. A theory of procedure. *California Law Review* 66 (3), 541–566.
- Thompson, M., Homewood, K., 2002. Entrepreneurs, elites and exclusion in Maasailand: trends in wildlife conservation and pastoralist development. *Human Ecology* 30 (1), 107–138.
- Vatn, A., 2010. An Institutional Analysis of Payments for Environmental Services. *Ecological Economics* 69 (6), 1245–1252 (this issue).
- Wätzold, F., Drechsler, M., 2005. Spatially uniform versus spatially heterogeneous compensation payments for biodiversity-enhancing land-use measures. *Environmental & Resource Economics* 31 (1), 73–93.
- World Bank, 2005. *Indigenous Peoples. The World Bank Operational Manual: Operational Policies*.

- Wunder, S., 2006. The efficiency of payments for environmental services in tropical conservation. *Conservation Biology* 32 (1), 48–58.
- Wunder, S., Engel, S., et al., 2008a. Taking stock: a comparative analysis of payments for environmental services programs in developed and developing countries. *Ecological Economics* 65 (4), 834–852.
- Wunder, S., Campbell, B., Frost, P.G.H., Sayer, J.A., Iwan, R., Wollenberg, L., 2008b. When donors get cold feet: the community conservation concession in Setulang (Kalimantan, Indonesia) that never happened. *Ecology and Society* 13 (1), 12.
- Wünscher, T., Engel, S., et al., 2008. Spatial targeting of payments for environmental services: a tool for boosting conservation benefits. *Ecological Economics* 65 (4), 822–833.