

Not the same for everyone: Community views of Mexico's payment for environmental services programmes

THEMATIC SECTION
Forest Ecosystem Services

LUCIA ALMEIDA-LEÑERO¹, DANIEL REVOLLO-FERNÁNDEZ^{2,3},
ANGELA CARO-BORRERO¹, ISABEL RUIZ-MALLÉN^{4,5},
ESTEVE CORBERA^{4,6}, MARISA MAZARI-HIRIART² AND
FERNANDA FIGUEROA^{1*}

¹Universidad Nacional Autónoma de México, Facultad de Ciencias – Departamento de Ecología y Recursos Naturales, Mexico City, Mexico, ²Universidad Nacional Autónoma de México, Instituto de Ecología, Mexico City, Mexico, ³CONACYT-Universidad Autónoma Metropolitana, Unidad Azcapotzalco, Mexico City, Mexico, ⁴Universitat Autònoma de Barcelona – Institut de Ciència i Tecnologia Ambientals Bellaterra, Barcelona, Spain, ⁵Internet Interdisciplinary Institute (IN3), Universitat Oberta de Catalunya, Barcelona, Spain and ⁶Universitat Autònoma de Barcelona – Department of Economics and Economic History, Barcelona, Spain
Date submitted: 14 October 2015; Date accepted: 1 December 2016

SUMMARY

Conservation policies have often been designed and implemented assuming that targeted communities are socially and politically homogeneous. Payment for environmental services (PES) programmes have often overlooked intra-community differences, which affect the understanding of implementation requirements and access to benefits, thus underestimating their effects on the programme's legitimacy and impacts. We explore how the views of local communities about the socio-environmental performance and dynamics of Mexico's PES differ within forest communities, considering two groups: local community authorities and the remaining beneficiaries in two different PES programmes. Informed by a nationwide survey, we constructed 35 indicators and found significant differences between these groups for 10 indicators. Local community authorities concentrated knowledge and information, relations with outside actors and control over benefit distribution. We found that community authorities and beneficiaries diverged in their views about the extent to which PES knowledge is shared across community members, how related implementation decisions are pursued and the fairness of benefit distribution, which we argue suggests this is a form of 'elite capture' favoured by PES design and implementation. Efforts should be invested in ensuring that PES programme benefits are equitably distributed in order to avoid widening pre-existing social and political asymmetries.

Keywords: elite capture, equity, forest conservation, Mexico, social heterogeneity

INTRODUCTION

Mexico has approximately 48 million hectares covered by forests, and 50–70% of this area is owned and managed collectively; this is the largest forest area managed as commons in the world (Merino & Martínez 2014). These commons are governed by nearly 8500 *ejidos* (a form of social land tenure that arose from the agrarian reform) and agrarian communities (social land tenure established on land that was historically owned by indigenous communities), which include many indigenous groups living in extreme poverty (Muradian *et al.* 2010; Merino & Martínez 2014). The term 'community' hereafter is used to refer to both types of rural commons.

Decision-making in Mexican communities is organized through a general assembly, which is the legally designated space for negotiating, discussing and deciding aspects of collective community life, such as land distribution and resource use in the commons. The assembly elects community authorities every 3 years, including a president, a treasurer and a secretary of the commons, who manage and legally represent the community in interactions with the state administration. Only formal rights holders (i.e. those with land tenure rights) have full voting rights therein and are thus the exclusive targets of many government programmes. This is the case for the policy programmes analysed in this article. In practice, this means that young men and adult women of all ages are often excluded from decisions or the distribution of benefits (Corbera *et al.* 2007; Caro-Borrero *et al.* 2015).

Successful community-based management of forest resources in Mexico and elsewhere is affected by various factors, such as forest users' ability to cooperate and to respect local rules regulating resource access and use (Ostrom 1990; Klooster 2000; Agrawal 2012). In contrast, factors challenging successful community forest management in tropical and subtropical countries include poverty, contradictory policies subsidizing agriculture and livestock, a lack of state technical and financial support for sustainable forest use, infrastructure development facilitating forest access and use by external parties, poor land-use planning and corruption at the

*Correspondence: Dr. Fernanda Figueroa e-mail: ffigueroa@ciencias.unam.mx

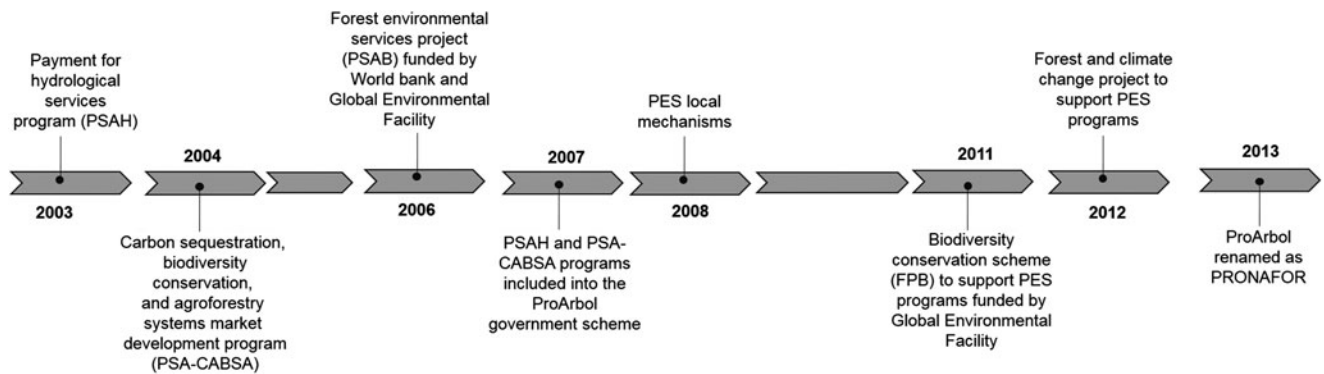


Figure 1 Historical evolution of Mexico's payment for environmental services (PES) programmes.

administrative level (Pagiola *et al.* 2005; Porter-Bolland *et al.* 2013; Neitzel *et al.* 2014; Sloan & Sayer 2015).

To confront ongoing deforestation and forest degradation, the Mexican government established in the early 2000s a national suite of programmes of payment for environmental services (PES). They aimed at rewarding communities and private landowners for the conservation and sustainable management of forests, under the presumption that these would provide ecosystem services (ESs). The programme responded to funding from multilateral donors, such as the World Bank, which encouraged the development of incentive-based mechanisms for biodiversity conservation. In 2003, the government's *Comisión Nacional Forestal* (CONAFOR; National Forestry Commission) launched a programme of payment for hydrological services (Spanish acronym: PSAH) and, in 2004, implemented a second programme: payment for carbon sequestration and services derived from biodiversity and agro-forestry systems (joint Spanish acronym: PSA-CABSA). Over time, these programmes evolved through a process of adaptation to the national context, influenced by the country's institutional design and by rural social movements (Shapiro 2013) (Fig. 1).

Besides promoting forest conservation and sustainable management, the PSAH and PSA-CABSA programmes aim to foster local development in marginalized areas; therefore, the criteria for being eligible for participation include ecological and social indicators (DOF 2014). Mexican PES programmes combined comprise the world's largest incentive-based forest conservation programme. By 2015, the federal government had dedicated over US\$51.7 million (MXN\$820 million; MXN\$1 = US\$15.86, January 2016) to supporting the programme. By then, both programmes already covered approximately 4.2 million hectares throughout the country. PES applicants receive an annual payment per hectare that ranges from US\$32 to US\$92, depending on the type of forest targeted and the estimated regional opportunity costs over 5 years. Enrolled communities agree to assign part of the PES funding to conservation and management activities; the remaining resources can be allocated freely to collective assets (schools, medical centres and vehicles) or distributed individually, and supposedly equally, among land rights holders. From 2013 onwards, a fixed 30–50% of the funding

had to be directed to conservation activities (DOF 2014). Moreover, beneficiaries are expected to develop a range of forest management and monitoring activities (CONAFOR 2015). Independent technical forestry advisors counsel communities on the programme's application process and guide them through implementation (enrolment, bureaucratic procedures and reporting results of monitoring), acting as intermediaries between CONAFOR and the programme's participants. Local community authorities act as the legal and political representatives of the community and they are usually in charge of receiving and distributing payments in the communities.

Many public environmental and development programmes have assumed local communities to be small structures that are spatially and socially homogeneous, with shared rules and values; they have also usually ignored the complex environmental, social and political realities that shape these communities' lives (Agrawal & Gibson 1999; Li 2002; Wilshusen 2009; Wilshusen 2010; Barnaud & Van Paassen 2013). However, rural communities are characterized by marked structural differences expressed through wealth, gender, ethnicity, religion or class (Agrawal 2012). Therefore, academic enquiry and policy design should not treat communities as static or idealized human groups, but as associations of individuals or households that have evolved through the interaction of political, socio-economic and cultural processes in contexts of unequal power (Agrawal & Gibson 1999; Li 2002; Barnaud & Van Paassen 2013).

Within communities, social differentiation and power relations foster processes of exclusion, as they hinder the participation and agency of marginalized groups, favouring local 'elite capture' (Agrawal & Gibson 1999; Ishihara & Pascual 2009; Wilshusen 2009; Méndez-López *et al.* 2014). Concentration of knowledge in local elites can foster processes of exclusion (Peterson 2011; Cinner *et al.* 2012), and community heterogeneity and political dynamics can influence the governance of the commons and how national policies and programmes are put into practice (Wilshusen 2009). These processes depend partly on the interactions between communities and governmental institutions, since uneven institutional support may exacerbate pre-existing social differences (Nygren 2005; Figueroa & Durand 2015).

In many Mexican regions, PES schemes have built on pre-existing community-based strategies of forest conservation and sustainable management, which rely on customary rules and norms (Kosoy *et al.* 2008; Alix-García *et al.* 2010; Caro-Borrero *et al.* 2015; Singh 2015). However, there may be wide variation between community members regarding their attitudes towards conservation and their knowledge about PES (Cinner *et al.* 2012; Perevochtchikova & Rojas-Negrete 2015). Evidence suggests that information about PES may be concentrated in local community authorities, while ordinary beneficiaries often lack awareness of the programme's most important implementation principles (Engel *et al.* 2008; Neitzel *et al.* 2014; Caro-Borrero *et al.* 2015). Additionally, the introduction of PES can contribute to the reproduction of hierarchical social structures and relationships within communities. For example, PES programmes only recognize formal land rights holders as potential recipients of payments, which can reinforce the pre-existing exclusion of non-rights holders from decision-making (Corbera *et al.* 2007; Asquith *et al.* 2008; Pagiola 2008; Wunder 2008). Moreover, community authorities might have views that are different from the rest of the beneficiaries because they usually interact more closely with PES programme government officers and intermediaries and they play an important role in defining the internal allocation of PES benefits. These advantages in access and knowledge may lead to community authorities being able to obtain greater social, economic and political benefits from PES.

Previous research on Mexico's PES programmes generally falls into three main clusters: spatially focused assessments of how the programme has contributed to forest conservation (Alix-García *et al.* 2009; Alix-García *et al.* 2012); case studies about its impacts on a community's social organization and wellbeing (Corbera *et al.* 2007; Kosoy *et al.* 2008); and survey-based national assessments of environmental and social outcomes (e.g. PUMA-CONAFOR 2012). This article has its place in the third body of literature, and contributes to it by examining the unequal distribution of outcomes as a result of social intra-community differences. We assess the extent to which the local benefits of Mexico's PES programmes have been fairly or equally distributed between local community authorities and ordinary beneficiaries. We also analyse how these two groups differ in their views about PES performance and dynamics, including: (1) attitudes and knowledge about PES and forests; (2) the level of institutional support for the implementation of PES activities; (3) participation in local decision-making (procedural equity); (4) distribution of benefits (distributive equity); and (5) sustainability of forest conservation.

METHODS

Sampling and data collection

The original study involved the collection of primary quantitative and qualitative data through a questionnaire

survey deployed across 79 land units: 31 corresponding to *ejidos* and rural communities (social tenure) and 48 corresponding to private property lands, all of which had enrolled in either of the two existing national PES programmes in 2010. We used the CONAFOR database of communities and private landowners that joined the programme in 2010 ($n = 409$) to randomly select those located in states with safe fieldwork conditions and where at least five other communities could also be selected in order to allow for time and budget constraints. This process was iterated until we reached a sample size of 79 land units, obtaining a 90% confidence level and a standard error of 6% (Yamane 1967). For this study, only the 31 social tenure land units were selected, which were distributed across eight Mexican states (Fig. 2).

We assumed that PSAH and PSA-CABSA were similar enough to be treated as a single programme in terms of analysing the participants' views of PES performance and dynamics. In each enrolled community, we surveyed five people on average, among which at least one was a local community authority. In total, we conducted 177 surveys (41 involving community authorities and 136 involving ordinary beneficiaries, defined as rights holders who were not community authorities at the time of the survey).

The survey was designed to evaluate local views, experiences and knowledge about various aspects of the PES programmes. We identified five attributes, namely: (1) participants' attitudes towards PES from an environmental perspective and their knowledge about it (attitudes and knowledge (AK)); (2) the institutional support available for developing PES activities (institutional support (IS)); (3) beneficiaries' participation in PES decision-making and on-site implementation (procedural equity (PE)) (*sensu* Pascual *et al.* 2010); (4) distribution of benefits (distributive equity (DE)) (*sensu* Pascual *et al.* 2010); and (5) efforts towards meeting environmental goals (sustainability of forest conservation (SFC)).

The AK attribute was designed to reflect knowledge about the programmes, illustrating how information is disseminated from CONAFOR to community authorities first and to ordinary beneficiaries later. The IS attribute concerns the impact of PES on the community's organization and capacity to use and manage forest resources through the training and technical assistance provided by the programme (Table 1). The PE attribute reflects community participation in deciding upon the management and allocation of PES funding and the management of land plots allocated under the programme. The DE attribute reflects people's views on how the benefits from PES are distributed and their impact on individual and social welfare (Table 2). Finally, the SFC attribute concerns local organization for the protection and management of natural resources, how it is influenced by PES and the intention of beneficiaries to change land use at the end of the programme (Table 3).

The design of the attributes and indicators was based on the published literature (e.g. Corbera *et al.* 2007; Alix-García *et al.* 2010; Pascual *et al.* 2010). The indicators

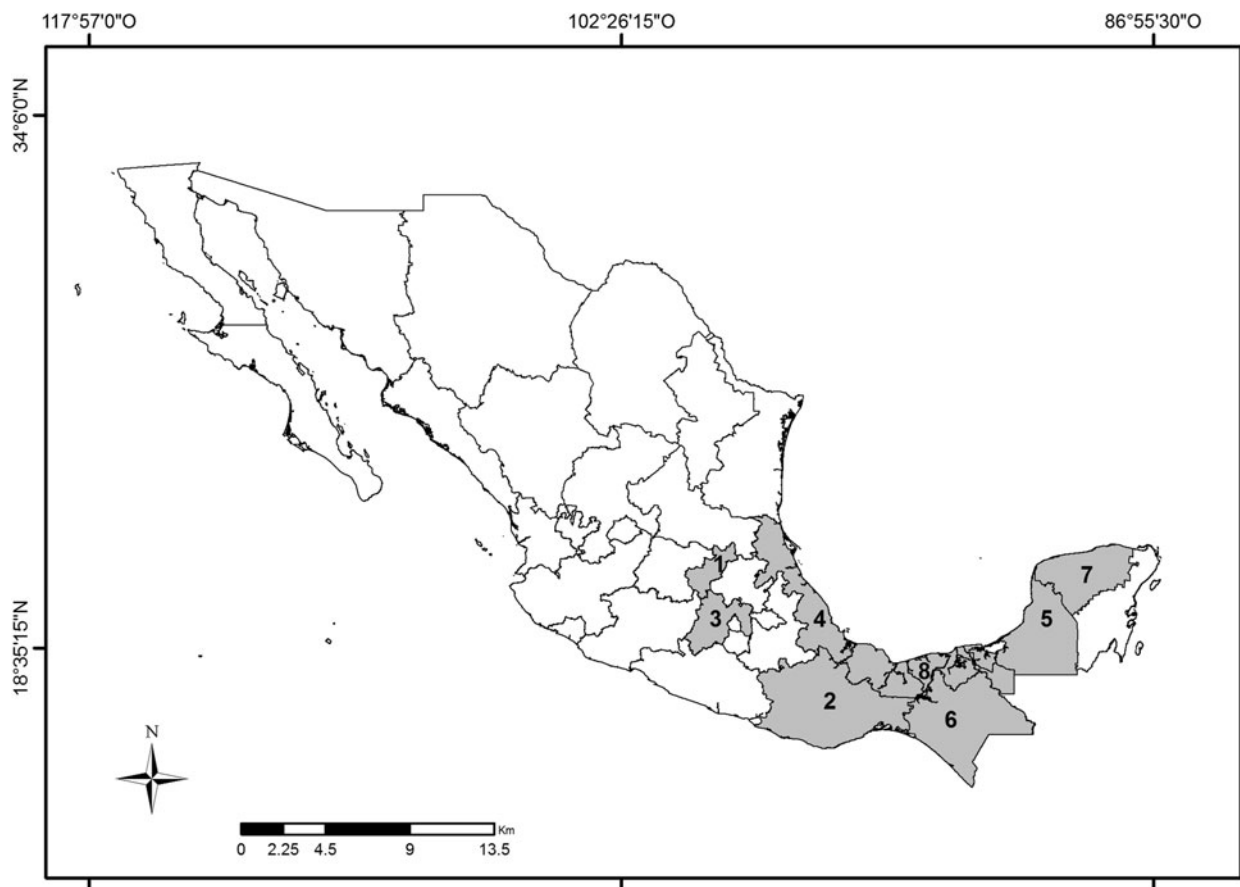


Figure 2 Location of the Mexican states harbouring social land tenure units enrolled in payment for environmental services programmes where the survey was conducted. 1: Querétaro; 2: Oaxaca; 3: Estado de México; 4: Veracruz; 5: Campeche; 6: Chiapas; 7: Yucatán; and 8: Tabasco.

were then refined in two workshops with the participation of a multidisciplinary expert team on Mexican community forestry (PUMA-CONAFOR 2012). While conducting the survey, we recorded in writing some quotations from the beneficiaries that complemented or clarified their responses to the survey.

Data analysis

We used the survey data to calculate the indicators' individual scores (Table 4), expressed as the percentage of a given response. In some cases, indicators were constructed from the frequency of a given response in non-exclusive, multiple-choice questions (e.g. AK1). Indicators were tested in order to avoid multi-collinearity through a series of pair-wise Pearson correlations. To examine the effect of social status on the respondents' experiences of PES, we then ran a z-test to assess for significant differences between the proportion values of community authorities and the other respondents. Non-response data (1.9% for ordinary beneficiaries and 1.6% for authorities) were excluded from the analysis.

The identification of beneficiaries for surveying was done through snowball sampling: their names were selected by the

communities' authorities or by technical forestry advisors. This means that individuals who were not close to community authorities or forest technicians are under-represented, and thus other views and perspectives of PES design and implementation were not captured in this study.

RESULTS

Regarding the socio-demographic characteristics of the sample, we found a higher level of reading/writing ability (95% vs. 88%) among community authorities than among other beneficiaries. Authorities also had a slightly higher education level (69% vs. 65% finished elementary school) and mean age (52 vs. 50 years old).

Attitudes and knowledge

Only 25% of respondents stated that their participation in the PES programme was motivated by a desire to conserve their forests (indicator AK1). More than 70% of respondents acknowledged local and extra-local environmental benefits of forest conservation (AK6 and AK7). Over 60% of them knew about PES application criteria (AK3) and their rights

Table 1 Indicators developed to characterize perceptions about the attributes of attitudes and knowledge of payment for environmental services (PES) and institutional support.

<i>Indicator acronym and description</i>	<i>Indicator assessment</i>
Attitudes and knowledge (AK)	
AK1 ^a . Environmental attitudes leading to participation in the PES programme. It refers to the reasons for participation in PES	(Frequency of each selected motive linked to forest conservation/No. of total responses) × 100
AK2. Knowledge about the PES programme objectives	(No. of people who knew the programme's objectives/Surveyed people) × 100
AK3. Understanding of the PES programme application criteria	(No. of people who understood the programme's criteria for landholding selection/Surveyed people) × 100
AK4. Knowledge about their rights as PES beneficiaries	(No. of people who were aware of their rights as PES beneficiaries/Surveyed people) × 100
AK5. Knowledge about their duties as PES beneficiaries	(No. of people who were aware of their duties as PES beneficiaries/Surveyed people) × 100
AK6. Knowledge about the on-site environmental benefits of conservation	(No. of people who were aware of the on-site environmental benefits of forest conservation/Surveyed people) × 100
AK7. Knowledge about the off-site environmental benefits of conservation	(No. of people who were aware of the off-site environmental benefits of forest conservation/Surveyed people) × 100
Institutional support (IS)	
IS1. Establishment of organized groups promoted by <i>Comisión Nacional Forestal</i> (CONAFOR; e.g. fire brigades and forest management) as a result of PES activities	(No. of people who asserted the establishment of working groups derived from PES/Surveyed people) × 100
IS2. Strengthening of organized groups promoted by CONAFOR (e.g. fire brigades and forest management) as a result of PES activities	(No. of people who asserted strengthening of working groups derived from PES/Surveyed people) × 100
IS3. Capacity building via training by CONAFOR	(No. of people who received training by CONAFOR about PES/Surveyed people) × 100
IS4. Utility of training about PES received	(No. of people who considered that the training received was useful/Surveyed people) × 100
IS5. Capacity building via technical assistance by technical advisors	(No. of people who received technical assistance and considered it useful/Surveyed people) × 100

^aThese were non-exclusive, multiple-choice questions. Therefore, they were analysed through the frequency of selection for each possible answer, related to the sum of the frequency of all possible answers.

as beneficiaries (AK4), and nearly 80% understood the objectives of the programme and their obligations (AK2 and AK5). The two study groups differed significantly in relation to knowledge about the objectives of the programme, beneficiaries' rights and local and extra-local environmental benefits derived from forest conservation. Community authorities scored significantly higher than other beneficiaries across all of these indicators (Table 4).

Institutional support

Approximately 60% of respondents reported that the PES programme had led to the organization of working groups for forest management and conservation (IS1), whereas more than 65% perceived a strengthening of already existing groups (IS2). But only approximately 40% of respondents had received training about PES by CONAFOR (IS3), and of those who did, almost all (96%) found it useful (IS4). Besides, nearly 80% of respondents had received technical assistance and considered it useful (IS5). For this attribute's indicators, we found no significant differences

between community authorities and other beneficiaries (Table 4).

Procedural equity

During 2010, there was a high level of participation in the general assemblies (77%; PE7). PES included a high percentage of indigenous people (69%; PE1), but women's participation was lower than 10% (PE2). Nearly 80% of respondents participated in decisions about the management of the forest plots targeted by PES (PE4), but most respondents required assistance to understand the PES programme's operation rules (87%, PE8). Regarding PES funds, c.72% of the respondents knew about the amount of financial resources received from PES (PE3), 85% participated in deciding on the use and allocation of these resources (PE6) and 92% agreed with such decisions (PE5). Significant differences were observed in two indicators: (a) people's knowledge about how much money the community had already received through PES, with community authorities being more informed than the rest

Table 2 Indicators developed to characterize perceptions about the attributes of procedural and distributive equity of payment for environmental services (PES).

<i>Indicator acronym and description</i>	<i>Indicator assessment</i>
Procedural equity (PE)	
PE1. Indigenous people's participation in the PES programme	(No. of people who considered themselves indigenous/Surveyed people) × 100
PE2. Women's participation in the PES programme	(No. of women surveyed/Surveyed people) × 100
PE3. Knowledge about the economic payments received by the community through the PES programme	(No. of people informed about the amount of PES financial resources received by the community/Surveyed people) × 100
PE4. Participatory decision-making in land use management	(No. of people who participated in decision-making about the use and management of PES areas/Surveyed people) × 100
PE5. Agreement on the use and allocation of PES funding	(No. of people who agreed on the use and allocation of PES funding/Surveyed people) × 100
PE6. Participation in deciding on the use and allocation of PES funding	(No. of people who participated in deciding on the use and allocation of PES funding/Surveyed people) × 100
PE7. Assistance to assemblies	Mean percentage of assistance to general assemblies acknowledged by respondents
PE8. The need for external assistance to understand the PES programme's operation rules	(No. of people who required assistance to understand the PES programme rules/Surveyed people) × 100
Distributive equity (DE)	
DE1. Income change resulting from PES	(No. of people who perceived an increase in income as a result of the PES programme/Surveyed people) × 100
DE2. Perceived change in household wellbeing as a result of the PES programme	(No. of people who perceived positive changes in wellbeing as a result of participating in PES/Surveyed people) × 100
DE3. Perceived negative effects of PES on part of the community	(No. of people who stated that some people were negatively affected by the programme/Surveyed people) × 100
DE4. Collective allocation of PES benefits	(No. of people who stated that PES benefits were only allocated to collective assets/Surveyed people) × 100
DE5. Individual allocation of PES benefits	(No. of people who stated that PES benefits were only allocated individually/Surveyed people) × 100

Table 3 Indicators developed to characterize perceptions about the attribute of sustainability of forest conservation.

<i>Indicator acronym and description</i>	<i>Indicator assessment</i>
Sustainability of forest conservation (SFC)	
SFC1. Forest use and management organization	(No. of people who participated in organized groups for use and management of forests/Surveyed people) × 100
SFC2. Perception of payment for environmental services (PES) capacity to deter threats to forests	(No. of people who stated that PES was useful for deterring threats to the forest/Surveyed people) × 100
SFC3. Community participation in organized groups to deter forest threats	(No. of people who acknowledged their participation in organized groups to deter forest threats/Surveyed people) × 100
SFC4. Existence of a forestry management plan	(No. of people who recognized the existence of a community forestry management plan in their community/Surveyed people) × 100
SFC5. Existence of activities funded by PES to protect water bodies and soil	(No. of people who recognized that the community implemented activities funded by PES to protect water bodies and soil/Surveyed people) × 100
SFC6. Existence of activities funded by PES to protect and manage the forest	(No. of people who recognized that the community implemented activities funded by PES to protect forests/Surveyed people) × 100
SFC7. Simultaneous existence of PES and other governmental conservation programmes	(No. of people who recognized the operation in their communities of other governmental conservation programmes/Surveyed people) × 100
SFC8. Existence of local forest use and management rules and sanctions	(No. of people who acknowledged the existence of local sanctions and rules for forest use and management/Surveyed people) × 100
SFC9. Land use change intention at the end of the programme	(No. of people who expressed the intention of changing land use at the end of the programme/Surveyed people) × 100

Table 4 Differences of means in payment for environmental services performance indicators, comparing community authorities with other participants. * $p \leq 0.05$.

<i>Indicator</i>	<i>Mean values</i>			<i>Difference</i>	<i>Test of means</i> <i>z value</i>
	<i>Total</i>	<i>Beneficiaries</i>	<i>Authorities</i>		
AK1	23.8	22.6	28.0	5.4	0.4740
AK2	76.8	73.5	87.8	14.3	0.0575*
AK3	63.8	61.0	73.2	12.1	0.1561
AK4	64.4	60.3	78.0	17.8	0.0374*
AK5	79.6	80.9	75.6	-5.3	0.4622
AK6	73.4	66.9	95.1	28.2	0.0003*
AK7	75.7	72.8	85.4	12.6	0.0999*
IS1	58.8	61.8	48.8	-13.0	0.1388
IS2	65.6	64.7	68.3	3.6	0.1388
IS3	42.9	42.6	43.9	1.3	0.8868
IS4	96.2	95.0	100.0	5.0	0.3333
IS5	79.6	78.7	82.9	4.3	0.5534
PE1	68.8	71.3	61.0	-10.3	0.2130
PE2	9.7	11.1	4.9	93.3	0.2413
PE3	71.7	66.9	87.8	20.9	0.0092*
PE4	77.9	78.7	75.6	-3.1	0.6779
PE5	72.1	91.2	95.1	4.0	0.4119
PE6	84.7	84.6	85.4	0.8	0.8897
PE7	77.3	76.6	79.8	3.2	0.6680
PE8	87.0	83.8	97.6	13.7	0.0218*
DE1	45.8	41.9	58.5	16.6	0.0611*
DE2	76.8	74.3	85.4	11.1	0.1397
DE3	15.8	16.2	14.6	-1.5	0.8125
DE4	23.6	24.7	20.0	-4.7	0.5340
DE5	12.5	12.2	13.7	1.5	0.8055
SFC1	48.6	39.0	80.5	41.5	0*
SFC2	83.6	82.4	87.8	5.5	0.4084
SFC3	91.0	91.2	90.2	-0.9	0.8552
SFC4	30.5	31.6	26.8	-4.8	0.5594
SFC5	27.1	22.8	41.5	18.7	0.0184*
SFC6	96.0	94.9	100.0	5.2	0.1383
SFC7	64.9	67.6	56.1	-11.6	0.1742
SFC8	65.5	65.4	65.9	-5.8	0.9611
SFC9	32.2	36.8	17.1	-19.7	0.0180*

of the beneficiaries; and (b) the need for external assistance to understand the programme's operation rules, with a higher percentage of community authorities acknowledging this need (Table 4).

Distributive equity

Nearly 80% of respondents perceived an improvement in their wellbeing as a result of PES (DE2), but only 50% reported an increase in their income (DE1). Nearly 16% of respondents acknowledged the existence of people who were negatively affected by PES implementation in their community (DE3). PES funds may be allocated as follows: for financing PES activities and forest management; for investing in community collective assets; or for individual distribution among beneficiaries. Regarding this issue, 43% of respondents indicated that PES funds had been allocated to both community assets and distributed among beneficiaries, whereas 24% stated that they had been solely invested in

collective assets (DE4) and 13% stated that they had been distributed individually (DE5). Only one indicator showed significant differences between beneficiaries: a significantly higher percentage of community authorities perceived that their income had increased due to PES (Table 4).

Sustainability of forest conservation

Prior to the PES programme's implementation, most communities were organized to carry out activities aimed at reducing threats to forests, such as fire monitoring and brigades, pest control and illegal logging surveillance (SFC3; *c.* 91%). However, only approximately 50% of the respondents stated that they personally participated in organized groups for forest use and management (SFC1), and only 30% recognized that their community had a forest management plan in place (SFC4). Approximately 65% of respondents mentioned the existence of sanctions and compliance with local rules for forest management (SFC8).

PES was perceived as a useful tool for local forest conservation and management by a high percentage of respondents (SFC2; *c.*84%). For example, 96% of respondents perceived that enrolment in the PES programme had supported their community's organized groups for forest conservation (SFC6), although only 27% reported that these groups had been aimed at protecting water bodies and soils (SFC5). The simultaneous operation of PES with other environmental programmes was acknowledged by approximately 65% of respondents (SFC7). Almost 32% of respondents expressed their intention to change land use at the end of the programme (SFC9). Community authorities were significantly more aware of the existence of organized groups for the use and management of forests and of activities funded by the PES programme to protect water bodies and soils, and were less likely to express a desire to change land use practices at the end of the programme (Table 4).

DISCUSSION AND CONCLUSIONS

Our results partly confirm our hypothesis that community authorities have greater access to information and possibilities of action within the PES programme's operational settings. Uneven perceptions between community authorities and other beneficiaries have been identified, even if our data were biased towards beneficiaries who may be personally close to community authorities. If this research incorporated a more representative sample of the beneficiaries involved in PES, including other dimensions of social heterogeneity, such as gender, age or ethnic differences, more profound differences would probably be detected.

Social status and differential access to assets, information, relations and means characterizes the division between community authorities and the rest of the beneficiaries when perceiving PES performance, partly reflecting the complexity of each community's social fabric, which is characterized by asymmetric power relations (Agrawal & Gibson 1999; Barnaud & Van Paassen 2013). These differences may favour forms of elite capture and exacerbate existing power asymmetries, which in turn could influence the programme's performance on the ground by demotivating and excluding participants, thus diminishing its social impact (Corbera *et al.* 2007; Wilshusen 2009; Caro-Borrero *et al.* 2015).

One beneficiary who was not a community authority illustrated very neatly how people had often misunderstood and mistrusted PES aims and objectives: "We do not understand why they [CONAFOR] support us, they want to take away our lands, we do not trust them, and we do not know who is hidden behind. . . ." (Beneficiary, Querétaro, 2012). This reflects the fact that information about the objectives of PES programmes has been concentrated in community authorities who have closer contact with the institution, and that information has not adequately reached other participants. Therefore, community authorities can make more informed decisions regarding PES participation or benefit sharing than other members of the community, and

thus favour their own personal or group interests, fostering a form of elite capture (Wilshusen 2009; Caro-Borrero *et al.* 2015) and processes of exclusion (Peterson 2011; Barnaud & Van Paassen 2013).

Regarding institutional support, nearly a third of respondents did not know about the existence of PES-driven organized groups for forest management (IS1). People may not be conscious of the influence of PES in supporting those groups, particularly if they existed prior to the programme's implementation. However, this could also reflect beneficiaries' relative lack of access to information as regards PES implementation and capacity building. In fact, many respondents called for more locally situated capacity building, given the deficiency of information transfer, participants' difficulties in using technical language, idiomatic differences and the centralization of information by community authorities, which are all factors producing processes of exclusion (Nygren 2005; Corbera *et al.* 2009; Peterson 2011; Durand *et al.* 2014). These concerns were reflected in statements such as: "There should be more continuity, more conferences, especially in Chontal language [indigenous language]" (Beneficiary, Tabasco, 2012); and "We do not understand the activities that we are supposed to do, because they are in Spanish. We would like that someone would give us talks in Maya [indigenous language], so that we can understand what they are doing" (Beneficiary, Yucatán, 2012).

We also observed that some of the independent technical forestry advisors worked closely with their communities, while others did not. Central to this problem is the fact that even though these advisors are 'certified' by CONAFOR, the latter does not monitor their work with communities. As one beneficiary stated: "The performance of the forestry technician was so-so, because they do not have all the knowledge, they cannot give one hundred per cent of their time, and they just come rushing by" (Beneficiary, Estado de México, 2012). PES programmes should thus ideally provide equally regular and committed training to all beneficiaries, adapting such efforts to local cultural, social and environmental conditions. The programmes might also consider developing more rigorous regulation of the performance of technical forestry advisors in order to avoid the emergence of a new technical elite capturing part of the PES rents, and foster the instruction of local technical forestry advisors.

Regarding procedural equity, participation in decision-making highly depends on people's access to information, but also on their understanding of the rules and concepts related to the PES programmes (Corbera *et al.* 2007; Caro-Borrero *et al.* 2015). In this sense, most PES beneficiaries, including community authorities, required external assistance in order to understand PES principles and the concept of ESs, which weakens local people's ability to negotiate the terms of PES implementation at local level. Within communities, social interactions, interests and power relations are expressed in general assemblies, which are spaces that are usually

dominated by elected community authorities and tenure rights holders. Decisions about joining the PES programme are made following the majority principle in voting exercises. However, this legal procedure excludes other possible dissenting voices not represented in voting, such as those who are non-rights holders (Méndez-López *et al.* 2014).

In particular, we observed that women's inclusion in PES activities and benefits was limited by the customary social organization of rural communities, which favours men in the inheritance of land rights and constrains women's access to authority positions (Asquith *et al.* 2008; Pagiola 2008; Caro-Borrero *et al.* 2015). Notwithstanding this point, it is also worth noting that, in addition to these rights-based and gendered axes of discrimination in PES, those who were present at general assemblies also voted for or against joining a previously defined national PES programme with 'one-size-fits-all' forest management prescriptions that are not subject to negotiation.

PES programmes could incorporate communities' views in their design and define locally suitable forest managing and monitoring activities in order to improve governance and encourage the legitimacy of these schemes (Hejnowicz *et al.* 2014). Calls for considering the social and political dimensions of communities in the design and implementation of conservation policies extend beyond Mexico's borders and PES programmes to international forest conservation strategies, including both protected and co-managed areas (Brechin *et al.* 2002; Porter-Bolland *et al.* 2012).

Even though our results demonstrate that a high percentage of respondents knew of, participated in and accepted the allocation of PES funding, community authorities manage PES funds and should be accountable for such management. Differences in knowledge about this issue may result from a lack of accountability and transparency, which in turn may undermine social trust and conservation, at present or in the future (Kerr *et al.* 2012; Caro-Borrero *et al.* 2015; Hendrickson & Corbera 2015). As two of our respondents stated: "The community has not been informed about the use of the money from PES; this has produced conflicts between *ejidatarios* [ordinary beneficiaries] and the *comisariado* [community authority]" (Beneficiary, Querétaro, 2012); and "Not everyone is working equally and the money is lost, there is no trust in the community authorities" (Beneficiary, Querétaro, 2012).

As for distributive equity, most respondents considered that PES was improving their wellbeing, partly through an increase in household income, but also through investment in collective goods and improvements in social organization for forest conservation and resource management. However, PES benefits are not always homogeneously distributed among beneficiaries, as there are negative consequences for some community inhabitants (e.g. non-covered opportunity costs, non-voluntary participation or restrictions on activities that sustain their livelihoods) that generate tensions inside communities (Perevochtchikova & Rojas-Negrete, 2015). Therefore, and according to our results, considering

communities as homogeneous units and assuming that costs and benefits are evenly distributed are problematic.

Regarding the sustainability of forest conservation, respondents perceived that PES had been effective at supporting social institutions related to forests, water bodies and soil conservation. This impact is recognized significantly more often by community authorities, probably because of their greater knowledge about PES goals. The closer relationship between community authorities, intermediaries and CONAFOR may explain why authorities were positive about the future of forest conservation through PES, while a significantly higher percentage of other beneficiaries were inclined to change land use at the end of the programme, thus compromising the environmental objectives and long-term viability of PES. This perspective may stem from the minimal support of PES programmes for developing sustainable use of forests, affecting people's perspectives about making a living from forest activities (Caro-Borrero *et al.* 2015). PES should be capable of fostering the development of sustainable economic activities for communities in the future, such that conservation and management sustain and improve livelihoods, and should not become policy programmes that impose costs and sacrifices on forest owners (Singh 2015).

In conclusion, by addressing one aspect of intra-community heterogeneity, we have shown in this study how community views of Mexico's PES programmes diverge by the simple fact of holding or not an authority position, which in turn influences perceptions about PES goals, performance and dynamics. We have provided evidence of significant differences between community authorities and other beneficiaries regarding access to and control of knowledge, decision-making processes, views about benefits distribution and the sustainability of forest management in PES programmes. In doing so, we have used a set of attributes and indicators that may be useful for further evaluation in other geographical contexts and, driven by our findings, we have provided insights for the improvement of PES and other environmental programmes worldwide. Our suggestions might help PES programmes to become more sensitive and responsive to the social heterogeneity, asymmetric power relations, elite capture and exclusion processes that they may unintentionally reinforce or set in motion.

ACKNOWLEDGEMENTS

We thank communities and *ejidos* included in this study for sharing their experiences and knowledge with us, and CONAFOR technicians and professionals for their support in fieldwork. We also thank the Environment University Programme at the Universidad Nacional Autónoma de México (PUMA-UNAM) for their support. Dulce María Espinosa, Georgina Vences, Linda García and Gabriel Torrales participated in the fieldwork. Verónica Aguilar Zamora elaborated the figures. We thank the anonymous reviewers for their comments, which considerably enhanced our manuscript, and to Pablo Brauer for the review of

a preliminary version of our manuscript, improving it substantially.

FINANCIAL SUPPORT

Biodiversa Framework Project INVALUABLE: Values, Markets, and Policies for Biodiversity and Ecosystem Services: PRI-PIMBDV-2011-1072. Comisión Nacional Forestal. PASPA-DGAPA-UNAM. Ramón y Cajal research fellowship: RYC-2010-07183.

References

- Agrawal, A. (2012) Local institutions and governance of forest commons. In: *Comparative Environmental Politics: Theory, Practice, and Prospects*, eds. P.F. Steinberg & S.D. VanDeveer, pp. 313–340. Cambridge, UK: The MIT Press.
- Agrawal, A. & Gibson, C.C. (1999) Enchantment and disenchantment: The role of community in natural resource conservation. *World Development* 27(4): 629–649.
- Alix-García, J., De Janvry, A., Sadoulet, E. & Torres, J.M. (2009) Lessons learned from Mexico's payment for ecosystem services program. In: *Payment for Environmental Services in Agricultural Landscapes: Economic Policies and Poverty Reduction in Developing Countries*, eds. L. Lipper, T. Sakuyama, R. Stringer & D. Zilberman, pp. 163–188. London, UK: FAO & Springer.
- Alix-García, J., Shapiro, E.N. & Sims, K.R.E. (2010) The environmental effectiveness of payments for ecosystem services in Mexico: Preliminary lessons for REDD [www document]. URL <http://www.aae.wisc.edu/events/papers/DevEcon/2010/alix-garcia.05.06.pdf>
- Alix-García, J., Shapiro-Garza, E. & Sims, K. (2012) Forest conservation and slippage: Evidence from Mexico's National Payments for Ecosystem Services Program. *Land Economics* 88(4): 613–638.
- Asquith, N.M., Vargas, M.T. & Wunder, S. (2008) Selling two environmental services: In-kind payments for bird habitat and watershed protection in Los Negros, Bolivia. *Ecological Economics* 65: 675–684.
- Barnaud, C. & Van Paassen, A. (2013) Equity, power games, and legitimacy: Dilemmas of participatory natural resource management. *Ecology and Society* 18(2): 21.
- Brechin, S.R., Wilshusen, P.R., Fortwangler, C.L. & West, P.C. (2002) Beyond the square wheel: Toward a more comprehensive understanding of biodiversity conservation as social and political process. *Society and Natural Resources* 15: 41–64.
- Caro-Borrero, A., Corbera, E., Neitzel, K.C. & Almeida, L. (2015) "We are the city lungs": Payments for ecosystem services in the outskirts of Mexico City. *Land Use Policy* 43: 138–148.
- Cinner, J.E., McClanahan, T.R., MacNeil, M.A., Graham, N.A.J., Daw, T.M., Mukminin, A., Feary, D.A., Rabearisoa, A.L., Wamukota, A., Jiddawi, N., Campbell, S.J., Baird, A.H., Januchowski-Hartley, F.A., Hamed, S., Lahari, R., Morove, T. & Kuange, J. (2012) Co-management of coral reef social-ecological systems. *Proceedings of the National Academy of Sciences U S A* 109(14): 5219–5222.
- CONAFOR (2015) *Programa Anual del Trabajo 2015, Gerencia de Servicios Ambientales del Bosque*. Mexico City, Mexico: CONAFOR & SEMARNAT.
- Corbera, E., Kosoy, N. & Martínez-Tuna, M. (2007) Equity implications of marketing ecosystem services in protect areas and rural communities: Case studies from Meso-America. *Global Environmental Change* 17: 365–380.
- Corbera, E., González-Soberanis, C. & Brown, K. (2009) Institutional dimensions of payments for ecosystem services: An analysis of Mexico's carbon forestry programme. *Ecological Economics* 68: 743–761.
- Diario Oficial de la Federación (DOF) (2014) ACUERDO por el que se emiten las Reglas de Operación del Programa Nacional Forestal 2015 [www document]. URL http://www.dof.gob.mx/nota_detalle.php?codigo=5377547&fecha=28/12/2014
- Durand, L., Figueroa, F. & Trench, T. (2014) Inclusion and exclusion in participation strategies in the Montes Azules Biosphere Reserve, Chiapas, Mexico. *Conservation and Society* 12(2): 175–189.
- Engel, S., Pagiola, S. & Wunder, S. (2008) Designing payments for environmental services in theory and practice: An overview of the issues. *Ecological Economics* 64(4): 663–674.
- Figueroa, F. & Durand, L. (2015) Poder, élites locales y gobernanza ambiental. In: *Gobernanza Económica y Ambiental: Políticas y Prácticas Socio-territoriales*, eds. R. Rosales-Ortega & L. Brenner, pp. 231–249. Mexico City, Mexico: Universidad Autónoma Metropolitana – Iztapalapa.
- Hejnowicz, A.P., Raffaelli, D.G., Rudd, M.A. & White, P.C.L. (2014) Evaluating the outcomes of payments for ecosystem services programmes using a capital asset framework *Ecosystem Services* 9: 83–97.
- Hendrickson, C.Y. & Corbera, E. (2015) Participation dynamics and institutional change in the Scolet Té carbon forestry project, Chiapas, Mexico. *Geoforum* 59: 63–72.
- Ishihara, H. & Pascual, U. (2009) Social capital in community level environmental governance: A critique. *Ecological Economics* 68: 1549–1562.
- Kerr, J., Vardhan, M. & Jindal, R. (2012) Prosocial behaviour and incentives: Evidence from field experiments in rural Mexico and Tanzania. *Ecological Economics* 73: 220–227.
- Klooster, D. (2000) Institutional choice, community, and struggle: A case study of forest co-management in Mexico. *World Development* 28: 1–20.
- Kosoy, N., Corbera, E. & Brown, K. (2008) Participation in payments for ecosystem services: Case studies from the Lacandon rainforest, Mexico. *Geoforum* 39(6): 2073–2083.
- Li, T.M. (2002) Engaging simplifications: Community-based resource management, market processes and state agendas in upland Southeast Asia. *World Development* 30(2): 265–283.
- Méndez-López, M.E., García-Frapolli, E., Pritchard, D.J., Sánchez-González, M.C., Ruíz-Mallén, I., Porter-Bolland, L. & Reyes-García, V. (2014) Local participation in biodiversity conservation initiatives: A comparative analysis of different models in South East Mexico. *Journal of Environmental Management* 145: 321–329.
- Merino, L. & Martínez, A.E. (2014) *A Vuelo de Pájaro. Las Condiciones de las Comunidades con Bosques Templados en México*. Mexico City, Mexico: Comisión Nacional para el Conocimiento y Uso de la Biodiversidad.
- Muradian, R., Corbera, E., Pascual, U., Kosoy, N. & May, P.H. (2010) Reconciling theory and practice: An alternative conceptual framework for understanding payments for environmental services. *Ecological Economics* 69: 1202–1208.

- Muradian, R., Arsel, M., Pellegrini, L., Adaman, F., Aguilar, B., Agarwal, B., Corbera, E., Ezzine de Blas, D., Farley, J., Froger, G., Garcia-Frapolli, E., Gómez-Baggethun, E., Gowdy, J., Kosoy, N., Le Coq, J.F., Leroy, P., May, P., Méral, P., Mibielli, P., Norgaard, R., Ozkaynak, B., Pascual, U., Pengue, W., Perez, M., Pesche, D., Pirard, R., Ramos-Martin, J., Rival, L., Saenz, F., Van Hecken, G., Vatn, A., Vira, B. & Urama, K. (2013) Payments for ecosystem services and the fatal attraction of win-win solutions. *Conservation Letters* 6(4): 274–279.
- Neitzel, K.C., Caro-Borrero, A.P., Revollo-Fernández, D., Ramos Ramos-Elorduy, A., Aguilar-Ibarra, A. & Almeida-Leñero, L. (2014) Paying for environmental services: Determining recognized participation under common property in a peri-urban context. *Forest Policy and Economics* 38: 46–55.
- Nygren, A. (2005) Community-based forest management within the context of institutional decentralization in Honduras. *World Development* 33(4): 639–655.
- Ostrom, E. (1990) *Governing the Commons: The Evolution of Institutions for Collective Action*. Cambridge, UK: Cambridge University Press.
- Pagiola, S. (2008) Payments for environmental services in Costa Rica. *Ecological Economics* 65: 712–724.
- Pagiola, S., Arcenas, A. & Platais, G. (2005) Can payments for environmental services help reduce poverty? An exploration of the issues and evidence to date from Latin America. *World Development* 33: 237–253.
- Pascual, U., Muradian, R., Rodríguez, L.C. & Duraiappah, A. (2010) Exploring the links between equity and efficiency in payments for environmental services: A conceptual approach. *Ecological Economics* 69: 1237–1244.
- Perevochtchikova, M. & Rojo-Negrete, I.A. (2015) The perceptions about payments schemes for ecosystem services: Study case of the San Miguel and Santo Tomás Ajusco community, Mexico. *Ecosystem Services* 14: 27–36.
- Peterson, N.D. (2011) Excluding to include: (Non) participation in Mexican natural resource management. *Agriculture and Human Values* 28: 99–107.
- Porter-Bolland, L., Ellis, E.A., Guariguata, M., Ruiz-Mallén, I., Negrete-Yankelevich, S. & Reyes-García, V. (2012) Working forests and protected areas: An assessment of their effect for tropical conservation. *Forest Ecology and Management* 268: 6–17.
- Porter-Bolland, L., Ruiz-Mallén, I., Camacho-Benavides, C.I. & McCandless, S. (2013) *Community Action for Conservation: Mexican Experiences*. New York, NY: Springer.
- PUMA (Programa Universitario de Medio Ambiente)-CONAFOR (2012) *Evaluación Complementaria del Ejercicio de los Programas Pago por Servicios Ambientales Hidrológicos S-110 y Pago por Servicios Ambientales derivados de la Biodiversidad S-136. Ejercicio Fiscal 2010*. Technical report. Mexico City, Mexico: Universidad Nacional Autónoma de México.
- Shapiro, E.N. (2013) Contesting the market-based nature of Mexico's national payments for ecosystem services programs: Four sites of articulation and hybridization. *Geoforum* 46: 5–15.
- Singh, N.M. (2015) Payments for ecosystem services and the gift paradigm: Sharing the burden and joy of environmental care. *Ecological Economics* 117: 53–61.
- Sloan, S. & Sayer, J.A. (2015). Forest Resources Assessment of 2015 shows positive global trends but forest loss and degradation persist in poor tropical countries. *Forest Ecology and Management* 352: 134–145.
- Wilshusen, P.R. (2009). Shades of social capital: Elite persistence and the everyday politics of community forestry in southeastern Mexico. *Environment and Planning* 41: 389.
- Wilshusen, P.R. (2010) The receiving end of reform: everyday responses to neoliberalisation in south-eastern Mexico. *Antipode* 42: 767–799.
- Wunder, S. (2008) Necessary Conditions for Ecosystem Service Payments, Economics and Conservations in the Tropics: A Strategic Dialogue [www document]. URL http://www.rff.org/Documents/08_Tropics_Conference/Tropics_Conference_Papers/Tropics_Conference_Wunder_PES_markets.pdf
- Yamane, T. (1967) *Statistics, an Introductory Analysis*. New York, NY: Harper and Row.