Conservation and livelihood outcomes of payment for ecosystem services in the Ecuadorian Andes: What is the potential for ‘win–win’?

Leah L. Bremer a,b,*, Kathleen A. Farley a, David Lopez-Carr b, José Romero c

a Department of Geography, San Diego State University, San Diego, CA 92182-4493, USA
b Department of Geography, 1832 Ellison Hall, U.C. Santa Barbara, Santa Barbara, CA, 93106-4060, USA
c Naturaleza y Cultura Internacional, Av. Pío Jaramillo A. y Venezuela, Loja, Casilla 1101-332, Ecuador

A R T I C L E   I N F O

Article history:
Received 23 November 2013
Received in revised form
21 March 2014
Accepted 29 March 2014

Keywords:
Payment for Ecosystem Services
Conservation
Poverty alleviation
Ecuador
Páramo
SocioPáramo

A B S T R A C T

Payment for ecosystem services programs are being implemented in a wide variety of settings, but whether and in what contexts such programs present ‘win–win’ scenarios that simultaneously improve human well-being and achieve conservation goals remains poorly understood. Based on semi-structured interviews with early program participants enrolling either collectively- or individually-held land, we evaluated whether and how SocioPáramo, a national-scale PES program targeting Ecuadorian Andean grasslands (páramos), has the potential to contribute to local livelihoods (financial, natural, social, human, and physical capital) and sustainable resource management. Low conservation opportunity costs associated with pre-existing constraints on land use and the existence of alternative livelihood options appeared to facilitate largely positive financial capital outcomes, although we found reduced financial capital among some smaller and medium-sized landholders who were required to eliminate burning and grazing. We found the greatest potential for improved social, financial, and natural capital among well-organized community participants enrolling collective land, while greater attention to building capacity of individual smaller landholders could improve outcomes for those participants. These results help fill a gap in knowledge by drawing on empirical data to demonstrate how divergent outcomes have begun to emerge among different groups of SocioPáramo participants, providing lessons for PES program design.

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1. Introduction

Despite considerable debate surrounding the efficacy of joint conservation and development initiatives to simultaneously meet biophysical and socio-economic goals (Ferraro and Kiss, 2002, Agrawal and Redford, 2006, Roe et al., 2013), payment or compensation for ecosystem services (PES/CES) initiatives are often advocated as ‘win-win’ opportunities for conservation and poverty alleviation (Luck et al., 2009, Muradian et al., 2013, Ingram et al., 2014). As these programs continue to grow, a number of competing conceptualizations of PES to support rural land stewards in areas important for ecosystem services production (Rosa et al., 2003, Rosa et al., 2004). A second conceptualization, particularly prevalent in the developing world, is classified by McAfee and Shapiro (2010: 583) as “pro-market, pro-poor PES”; it strives to combine ecological and social criteria with the goal of creating PES programs that are “win–win mechanisms for both environmental protection and poverty alleviation” (Muradian et al., 2010: 1203). Finally, a third conceptualization, frequently referred to as compensation for ecosystem services, focuses on social inequity as one of the “driving forces of environmental degradation” (Rosa et al., 2003:2) and on the potential of PES to support rural land stewards in areas important for ecosystem services production (Rosa et al., 2003, Rosa et al., 2004). The conservation efficiency conceptualization of PES has been criticized for its limited on-the-ground application (Martin-Ortega et al., 2013, Sattler and Matzdorf, 2013). A number of researchers have called for a broader, more inclusive PES framework that, among other things, explicitly considers the importance of equity and distribution of benefits (Farley and Costanza, 2010, Muradian et al., 2010, Muradian and Rival, 2012). However, researchers have...
also cautioned against “uncritical commitment” to PES, i.e., the assumption that they always present ‘win–win’ scenarios (Muradian et al., 2013). It has been noted that PES remains subject to the same perils as previous efforts to link conservation and development, many of which have failed to show concrete evidence of success for either objective (Agrawal and Redford, 2006, Muradian et al., 2013). Muradian et al. (2013: 7) point out that whether PES can present ‘win–win’ outcomes depends on the “political, socio-cultural, and institutional contexts in which they operate” and that greater attention should be given to understanding the conditions under which these programs are likely to be most effective.

While theoretical debate about the promise and peril of PES abounds, empirical evidence examining existing programs and their potential contribution to joint social and ecological goals remains limited (Brockington, 2011, Wunder, 2013, Ingram et al., 2014). As stated by Wunder (2013: 9): “Unfortunately, despite… long-term suspicions we still lack solid empirical analyses of real-world PES to move beyond sheer conjectures.” Accordingly, examination of existing PES programs is clearly needed in order to understand the contexts under which these programs have potential to achieve their goals.

Evaluation of the potential of PES to present ‘win–win’ scenarios relies upon empirical evidence of program success in terms of both ecological and social indicators. Measures of social outcomes focus on how accessible and desirable programs are to rural, marginalized landowners and how participation affects livelihoods and social equity among participants (Brown and Corbera, 2003, Kollmair and Rasul, 2010, Krause et al., 2013). Although the degree to which social objectives are prioritized varies, there is widespread agreement that PES programs are unlikely to succeed without obtaining the support of local communities and an equitable distribution of benefits (Landell-Mills and Porras, 2002, Corbera et al., 2007, Corbera and Pascual, 2012, Balderas Torres et al., 2013; Hayes, 2013). At the least, it is widely agreed that PES should represent ‘win-settle’, in that they achieve ecological goals without worsening poverty or other social goals (Barrett et al., 2011, Wunder, 2013).

In this paper, we evaluate social outcomes of SocioPáramo, a national-scale PES program in Ecuador to add empirical evidence to the debate over whether, and under what conditions, PES can contribute to improved livelihoods. Specifically we ask how program participation affects participant livelihoods – in terms of financial, social, human, physical, and natural capital – following enrollment of either collectively-held or privately-held land. We also discuss this in the context of synergies and tradeoffs in achieving conservation goals. We review previous accounts of effects of PES on multiple forms of capital and discuss this in the context of our research with SocioPáramo participants in its first year and a half of operation.

1.1. PES and livelihoods

How participation in PES contributes to human well-being and poverty alleviation among participants depends, in part, upon the extent to which livelihoods change as a result of program participation (Landell-Mills and Porras, 2002, Miranda et al., 2003, Grieg-Gran et al., 2005). Participation can directly affect financial capital in two main ways: through changes in land use or management related to participation and through investment of cash flow from incentive payments. Jack et al. (2008) further suggest that PES is most likely to contribute to poverty alleviation when the poorest landowners have the lowest opportunity costs and also the highest potential for service provision. However, for programs to contribute to enhanced financial capital, they would have to compensate landowners substantially more than they could have earned without participation. Some have argued that PES could potentially “trap” poor landowners if payments are lower than actual or potential earnings from productive land uses (Wunder 2008: 287). Others contend that there is little evidence for this and that, in many cases, whether or not payments strictly match opportunity costs, they are more stable than existing or potential income sources and an important means of income diversification (Grieg-Gran et al., 2005, Wunder et al., 2008, Kollmair and Rasul, 2010). Ferraro and Kiss (2002: 1719) further suggest that direct payments may more effectively contribute to development goals than indirect approaches by allowing land-holders to “decide how to best meet their own goals and aspirations, rather than being subsidized to carry out predetermined activities.”

While financial capital remains perhaps the most obvious way to evaluate PES effects on livelihoods, impacts on non-financial assets, particularly natural capital (shifts in land use or management that affect biodiversity and ecosystem goods and services), human capital (health and basic services, access to education and training), and social capital (land tenure, social organization, community institutions and associations, kinship ties) have been identified as important potential motivators for and outcomes of program participation (Grieg-Gran et al., 2005, Zbinden and Lee, 2005). Participation can have an important non-monetary or “intangible” influence on livelihoods, both positive and negative, through, for example, impacts on land tenure, social organization, and natural capital (Miranda et al., 2003, Grieg-Gran et al., 2005, Kosoy et al., 2007a). The importance of intangible benefits in motivating participation in PES has been highlighted as an explanation for why some landowners participate when opportunity costs exceed incentive payments, underscoring the importance of livelihood outcomes beyond financial capital (Kosoy et al., 2007b, Van Hecken et al., 2012, Bremer et al., 2014). Conversely, in Ecuador and elsewhere, researchers have documented opposition to PES based on rejection of neoliberal policies seen as commodifying nature and threatening indigenous sovereignty, and a general fear of land expropriation (Southgate and Wunder, 2009, Reed, 2011, Balvanera et al., 2012, Bremer et al., 2014).

The extent to which costs and benefits of PES are equitably shared among community members when collective land is enrolled and the effects this has on social organization is another concern in evaluating social outcomes (Krause et al., 2013). Wunder (2013: 1) suggests that, “as a highly adaptive management tool, PES are particularly suited for achieving equitable and flexible conservation outcomes.” However, empirical studies are needed to understand if, and under what conditions, this may be true. Some have pointed to the potential of PES to strengthen community-based organizations, inter-institutional coordination, and forest management efforts (Grieg-Gran et al., 2005, Kollmair and Rasul, 2010), while others have noted the potential of such programs to increase inequality, leading to a decrease in social cohesion, and to “crowd out” local rules and social norms (Grieg-Gran et al., 2005, Clements et al., 2010, Muradian et al., 2010). Nevertheless, it has been noted that “crowding-in” is just as possible an outcome of PES as ‘crowding-out,’” and that conditions prior to the implementation of PES can influence these and other social outcomes” (Wunder, 2013:10). Pre-existing political and social capital, in the form of strong institutions, social organization, and landownership and tenure have been suggested as key determinants of program outcomes (Corbera et al., 2007, Jack et al., 2008, Huber-Stearns et al., 2013).

2. Background

In this paper, we evaluate near-term livelihood outcomes and perceptions of potential long-term outcomes of participation.
during the first 1.5 years of Ecuador’s SocioPáramo program. SocioPáramo forms part of the wider SocioBosque program, established by the Ecuadorian Ministry of the Environment (MEA) in November 2008 with the goal of safeguarding the country’s remaining privately and communally owned forests (de Koning et al., 2011). In July 2009 the MEA launched SocioPáramo by extending SocioBosque to include highland native grasslands (páramos) with the goals of biodiversity, carbon, and water conservation and poverty reduction in 800,000 ha, or 80% of currently unprotected páramos, via direct payments to community and individual landowners (Farley et al., 2011). SocioPáramo is described as a “conservation incentive” program that seeks to balance environmental goals and poverty alleviation, while recognizing the role of rural communities and individuals in protecting valuable ecosystems (de Koning et al., 2011). With poverty alleviation as a central objective, SocioPáramo most closely represents the PES type “pro-market, pro-poor,” (Mcafee and Shapiro, 2010) as it intends to provide “win–win” opportunities for both conservation and poverty alleviation. However, the program also has elements of the compensation for ecosystem services conceptualization (Mcafee and Shapiro, 2010), as it emphasizes the importance of recognizing and supporting rural landowners and communities in protecting lands that provide ecosystem services. The explicit inclusion of socioeconomic goals alongside environmental goals makes it a valuable case study for the assessment of livelihood impacts.

Páramo grasslands are a particularly important venue for PES development, as they are increasingly valued for their extremely high levels of endemic biodiversity (Mena Vásconez and Medina, 2001), large soil carbon stores, and their critical role in regional hydrology (Sklernar and Ramsay, 2001, Buytart et al., 2005, Buytart et al., 2006). At the same time, páramo communities remain among the most marginalized in Ecuador. Cattle and sheep grazing, coupled with burning on 2–5 year cycles, constitute the most common páramo land use (Keating, 2007). When frequent and intensive, this land use has been associated with degradation of páramo diversity and function, leading to conservation policies focused on burn exclusion (Hofstede, 1995, Podwojewski et al., 2002). However, there has been relatively little research on the outcomes of long-term burn exclusion on páramo ecosystem structure and function (Keating, 2007, Farley et al., 2013). SocioPáramo provides an important case of PES in ecosystems characterized by very high levels of ecosystem services production along with high levels of poverty and inequality, and can provide lessons to improve PES programs in Ecuadorian páramos as well as in other locations.

In addition to forgoing agricultural expansion, participation in SocioPáramo requires that landowners not burn, and, in most cases reduce or eliminate grazing, under the assumption that this is the most effective way to conserve the páramo (Farley et al., 2011). The program aims to accomplish its stated goals through incentives of up to $30 USD per hectare annually to communities and individuals entering into 20-year conservation agreements (de Koning et al., 2011). Payments are equal across ecosystem types, but decrease as the area enrolled increases, with the goal of attracting small landowners (Farley et al., 2011).

Several studies have evaluated the SocioBosque program generally, as well as in the context of indigenous views of Reducing Emissions from Deforestation and Degradation (REDD+) programs and in terms of equity implications of the program in Amazon communities (de Koning et al., 2011, Farley et al., 2011, Reed, 2011, Krause et al., 2013, Krause and Loft, 2013). However, no study of which we are aware has addressed the effects of the program in the páramo region through a detailed study of participant perspectives of actual and perceived long-term potential changes in local livelihoods and resource management among participants, including individual and collective landowners. Our study responds to the call for empirical evidence on the social outcomes of PES, contributing to a better understanding of whether PES can be effective in meeting socioeconomic goals, and under what conditions ‘win–win’ scenarios for conservation and human well-being may emerge. While this program is young, evaluation of programs at early stages is essential to gauge participant perceptions of program risks and benefits, which are critical determinants of enduring program acceptance (Sommerville et al., 2010a). Likewise, early program evaluation provides indicators of the program’s potential to improve livelihoods, contributes early data to longitudinal livelihood evaluations, and allows for adaptive management.

2.1. SocioPáramo participants

Community participants are primarily rural indigenous or peasant cooperatives or associations who have collective land title over páramo and forest lands. Communities reported agriculture as their primary livelihood, which they generally concentrated at lower elevation than the area enrolled in SocioPáramo (Table 1). Individual landowners are more diverse in livelihood sources and socio-economic characteristics than community participants. Smaller landholders (defined as enrolling <50 ha; median¼24 ha) have agricultural-based livelihoods and live in rural communities with similar socio-economic characteristics to community participants. We classify participants enrolling less than 50 ha as smaller landholders as this was SocioPáramo’s smallest land size category in their incentive payment structure at the time of our study. However, it is important to note that even those participants classified as smaller landholders, an average landholding size of 24 ha is relatively quite large given that Andean farms often consist 5 ha or less (Jokisch, 2002). The remaining 25 individual landowners are classified as larger landowners (owning >50 ha; median¼236 ha) and can be divided into medium-sized farmers and urban landowners (Table 1). Medium-sized farmers (n¼11) also rely on agricultural production as their primary income source, but have larger farms than smaller landholders (Table 1). The second group of larger landowners, urban landowners (n¼14), comprise those who live full- or part-time in urban areas and have off-farm livelihoods (Bremer et al., 2014). As a program requirement, all participants have land tenure. In addition, all participants have off-farm livelihoods or focus agricultural production in areas outside of the area enrolled in SocioPáramo (for a detailed discussion of characteristics of participants and factors facilitating and constraining participation, see Bremer et al., 2014).

3. Methods

3.1. Data collection

We integrated semi-structured interviews of program participants with document analysis to evaluate recently observed and perceived long-term livelihood outcomes during the initial 1.5 years of SocioPáramo. We interviewed all community participants (18 of 18) who enrolled by May 2011 and the majority of individual landowner participants (45 of 59) who enrolled in SocioPáramo by October 2010, (Table 1). Community participants refer to communities who enroll collectively held land; in these cases the decision to enroll and the incentives gained are at the
community level. Accordingly, with this group, we conducted interviews with one or more community leaders. Our objective was to gain an extensive understanding of the perspectives of all participant SocioPáramo communities, conducting a full census of all participant communities to date, but we also discussed the program with several households in four of these communities. Individual landowners enroll privately held land; in these cases we conducted household interviews with the head of household, or groups of household members.

Interviews were designed to examine (1) participant characteristics and reasons for joining SocioPáramo; (2) land-use history and páramo land use/management before and after joining SocioPáramo; and (3) use of SocioPáramo funds and perceived benefits and drawbacks of the program (Appendices A and B). Interviews included both closed- and open-ended questions and typically lasted between one and four hours. Results of interviews were used to analyze actual and perceived potential changes in livelihoods and land-use and management (Appendices A and B; Table 2). Additionally, we included questions focused landowner characteristics, including demographics, access to basic services and education, community organization and social networks, and primary livelihood source (Appendices A and B). These questions can be used as a baseline to assess future changes in these characteristics.

Community and individual interview templates were similar, but adapted to focus on collective versus individual land. We obtained information on the actual and perceived changes in each form of capital through several key questions (Table 2), as well as through elaborations on other questions and tangential conversations. Annual incentive payments received per participant were obtained through SocioPáramo program representatives. Changes in financial capital with incentive payments were assessed by asking participants about their use of incentive payments (and, in the case of community participants, what they included in their current investment plans and what might be included in future plans) (Table 2). We asked specifically about whether payments were sufficient to cover opportunity costs for any land-use change or avoidance of land-use change required (Appendices A and B). As noted in previous PES studies (Kosoy et al., 2007b, Garcia-Amadó et al., 2011), this was a difficult question as most participants said payments were too low regardless of whether any land-use changes were required. Yet, it served as another way to evaluate whether the incentives were seen as a replacement of lost income or as an additional resource.

While we followed the same order of questions in our interviews, we encouraged participants to elaborate and discuss issues important to them and their experience with the program. Some of the most illuminating results and insights came from these tangential conversations, an important benefit of qualitative methods. The property or community map provided a visual device for discussing land use of the enrolled páramo in the context of land use of surrounding areas. This often led to discussions of páramo land use and value in ways we did not initially anticipate and provided for a more in-depth understanding of páramo land use.

Additionally, we conducted semi-structured interviews with SocioPáramo program representatives, including the program director and four regional program promoters who are responsible for implementing the program on the ground, and with five nongovernmental organizations (NGOs) who had openly opposed the program (n=1) or were working with (n=4) the program to facilitate program enrollment (Appendices C and D). Finally, we examined community investment plans, a requirement of SocioPáramo, in which communities create a budget and describe how they plan to use program incentives. Communities are required to submit investment plans detailing how they plan to utilize their incentive payments in a way that benefits the entire community. We talked with representatives from all 18 communities about the process of organizing and completing their community’s or association’s investment plan and were able to review 13 investment plans and attend several workshops sponsored by a local NGO on developing investment plans and budgets.

3.2. Data analysis

To analyze data collected both from interviews and document analysis, we classified information, including direct quotes where available, into perceived actual or potential changes in financial, social and political, natural, human, and physical capital related to participation in SocioPáramo. Relevant information for each form of capital came primarily from a subset of questions (Table 2); however, additional insight came through conversations prompted by other interview questions. For community participants, we also included information from our review of investment plans, which complemented questions asked about what activities were included in community investment plans. We noted the types of projects planned along with the allocation of resources for each project. During this analysis we were aware that these were the communities’ first investment plans and some communities were in the process of revising plans. These data were combined and compared with information collected during interviews. Finally, we utilized information from semi-structured interviews with program extension agents and NGOs, as well as experiences at investment plan workshops, to contextualize and interpret the information.

Our analysis focuses on understanding how PES influences local livelihoods within the wider socio-economic, political, environmental, and cultural contexts. According to Scoones (2009: 175), "a livelihood is sustainable: “when it can cope with and recover from stresses and shocks, maintain or enhance its capabilities and assets, while not undermining the natural resource base.” While it is beyond the scope of this paper to evaluate the long-term sustainability of livelihoods among SocioPáramo participants, we
evaluate how participation in PES changes land use and strengthens or diminishes multiple forms of capital, underpinning livelihoods strategies (Chambers and Conway, 1992; Scoones, 2009). Given that SocioPáramo remains an incipient PES program, evaluating changes in livelihoods is based on a combination of short-term changes and perceptions of likely long-term dynamics.

4. Results

Annual incentive payments varied among participant groups as a result of varying amounts of land enrolled (Table 1). Individual incentive payments ranged from $118 to $1200 for smaller landholders (n = 20; mean ± SD = $697 ± $221) and from $1540 to $24,820 (n = 25; mean ± SD = $5138 ± $4958) for larger landowners. Incentives to communities enrolling collective land ranged from $2661 to $39,415 (n = 18; mean ± SD = $11,431 ± $10,551) (Table 1). While community payments are, on average, greater than individual payments, these incentives are meant to replace any lost income (IQ. 43b/CQ. 41c) perceived advantages and disadvantages of the program (IQ. 35–36/CQ. 43–44)

Table 2

<table>
<thead>
<tr>
<th>Form of capital</th>
<th>Indicators (key associated questions)</th>
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| Financial       | ● Collective and individual páramo use and management and associated employment and livelihood benefits (IQ. 12–22/CQ. 16–29)  
● Actual and future land-management changes associated with SocioPáramo and perceived impacts on employment and livelihoods (IQ. 25–32/CQ. 32–39)  
● Investment plan activities (IQ. 34a/CQ. 41a–b)  
● Perception of whether funds were sufficient to replace any lost income (IQ. 43b/CQ. 41c)  
● Perceived advantages and disadvantages of the program (IQ. 35–36/CQ. 43–44) |
| Natural         | ● Collective and individual páramo use and management (IQ. 12–22/CQ. 16–29)  
● Actual and future land-management changes associated with SocioPáramo (IQ. 25–32/CQ. 32–39)  
● Knowledge, importance of, and opinion of SocioPáramo land-use regulations (IQ. 27–29/CQ. 34–36)  
● Perceived outcomes of enrolling land in SocioPáramo after 20 years (IQ. 30/CQ. 37)  
● Perceptions of costs/benefits of conservation and páramo land management (IQ. 11, 14, 21–22/CQ. 14, 19, 28–29)  
● Investment plan activities (IQ. 34a/CQ. 41a–b)  
● Perceived advantages and disadvantages of the program (IQ. 35–36/CQ. 43–44) |
| Social          | ● Involvement with NGOs, government organizations, or any conservation or development program (IQ. 9–12/CQ. 12–13)  
● Process of enrolling in program (IQ. 25/CQ. 31)  
● Process of completing investment plan and required paper work (IQ. 34/CQ. 41–42)  
● Investment plan activities (IQ. 34a/CQ. 41a–b)  
● Perceived advantages and disadvantages of the program (IQ. 35–36/CQ. 43–44)  
● Perceived benefit in terms of strengthened community organization (CQ. 41a) |
| Human           | ● Investment plan activities (IQ. 34a/CQ. 41a–b)  
● Perceived advantages and disadvantages of the program (IQ. 35–36/CQ. 43–44) |
| Physical        | ● Investment plan activities (IQ. 34a/Q. 41a–b)  
● Perceived advantages and disadvantages of the program (IQ. 35–36/CQ. 43–44) |

on participant groups in terms of financial, social, human, natural, and physical capital important for participant livelihoods.

4.1. Financial capital

The majority of participants (100% of communities; 80% of smallholders; 96% of larger landowners) reported positive impacts on financial capital, either through increased (or more stable) income from incentive payments or through potential long-term income benefits from investment in agriculture or other productive activities (Table 3; Fig. 1). For smaller landholder individual participants with few land-use change requirements, SocioPáramo incentives are providing substantial income supplements (in relation to overall cash income), which are being used for food, healthcare, education, and other basic needs. A regional program promoter explained that, “participants cannot live on incentive payments, but they are important in the most difficult times of the year,” while smaller landholder participants viewed incentives as a “small, but important support.” In one case, however, a smaller landowner indicated that SocioPáramo payments constituted 47% of the household’s cash income.

Larger landowner individuals generally viewed incentive payments as a way to make money from their land where production options were constrained by access, topography, labor, or legal barriers. With the exception of two larger landowners with salient incentives ($24,000 and $19,000), payments were viewed as additional income, and not critical to their livelihoods. Several larger landowners indicated that they are investing or plan to invest in business, aquaculture, and ecotourism projects, with the potential to further increase financial capital. Additional financial benefits identified by individual participants included land tax exemptions associated with enrolling land in SocioPáramo and improved access to loans. However, participants indicated

Please cite this article as: Bremer, L.L., et al. Conservation and livelihood outcomes of payment for ecosystem services in the Ecuadorian Andes: What is the potential for ‘win–win’? Ecosystem Services (2014), http://dx.doi.org/10.1016/j.ecoser.2014.03.007
generally poor understanding of tax and loan benefits and asserted that improved training regarding these benefits remains essential.

Communities enrolling collective land generally viewed Socio-Páramo payments as modest but important in enabling community project development. The majority of communities are using at least part of their incentives to support agricultural or ecotourism projects. Ongoing or planned activities include purchasing seeds and fertilizer, financing organic agriculture and agroforestry projects, initial infrastructure development for potential future ecotourism potential, aquaculture development, and paying for a corral and a caretaker house for community alpacas (Table 3). Communities investing funds for future ecotourism have focused on building trails and shelters, which they also consider an important step towards improved land security and conservation. In addition, a number of communities are investing funds to directly pay community administrative costs, one through their own community bank (Table 3).

Perceived benefits for financial capital were, in part, due to low levels of land-use change required for the majority of participants. Approximately half of participants (50% of communities, 52% of larger landowners, and 45% of smaller landholders) were not utilizing the páramo they enrolled prior to joining SocioPáramo, and therefore did not need to change land use (Fig. 2). Another group of participants (28% of communities 20% of larger landowners, and 15% of smaller landholders) utilized the enrolled páramo for extensive burning and a reduction in grazing (mainly cattle). For the larger landowners who did change land use (22% of communities, 28% of larger landowners, and 40% of smaller landholders) utilized the enrolled páramo for extensive burning and a reduction in grazing (mainly cattle). For the larger landowners who did change land use (22% of communities, 28% of larger landowners, and 40% of smaller landholders), the páramo they enrolled prior to joining SocioPáramo, and therefore did not need to change land use (Fig. 2). Another group of participants (28% of communities 20% of larger landowners, and 15% of smaller landholders) utilized the enrolled páramo for extensive burning and a reduction in grazing (mainly cattle). For example, one medium-sized farmer was instructed to maintain “low” grazing levels, defined as maintaining the current number of

Table 3
Perception of strengthened and reduced financial, human, natural, social and political, and physical capital among community and individual SP participants. LLH—larger landholder (> 50 ha enrolled); SH—smallholder (< 50 ha enrolled).

<table>
<thead>
<tr>
<th>Capital</th>
<th>Strengthened</th>
<th>Reduced</th>
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<tbody>
<tr>
<td><strong>Financial</strong></td>
<td>Communities: • Investments in improved agricultural production (33%)</td>
<td>Communities: • Reduced access to páramo for grazing by some community members and outsiders (22%)</td>
</tr>
<tr>
<td></td>
<td>• Investments in ecotourism development (5%)</td>
<td>Individuals: • Reduced grazing or access to grazing lands (28% LLH; 40% SLH)</td>
</tr>
<tr>
<td></td>
<td>• Administration and community banks (33%)</td>
<td>• Incentives seen as less beneficial than previous earnings from grazing (4% LLH; 20% SLH)</td>
</tr>
<tr>
<td></td>
<td>Individuals: • Higher or more stable income (95% LLH; 80% SLH)</td>
<td>Communities: • Increased chemical use outside reserve (5%)</td>
</tr>
<tr>
<td></td>
<td>• Investments in improved agricultural production (28% LLH; 25% SLH)</td>
<td>• Potential leakage to lower elevation areas</td>
</tr>
<tr>
<td></td>
<td>• Investments in small business development (12% LLH)</td>
<td>Individuals: • Movement of animals into other páramo (5% SLH)</td>
</tr>
<tr>
<td></td>
<td>• Pay taxes or outstanding debt, reduced taxes (28% LLH)</td>
<td>• Potential leakage to lower elevation areas</td>
</tr>
<tr>
<td><strong>Natural</strong></td>
<td>Communities: • Reduced burning/grazing (22%)</td>
<td>Communities: • Lost land access by non-participants</td>
</tr>
<tr>
<td></td>
<td>• Investments in conservation (50%)</td>
<td>• Potential conflicts over access to reserved land and over activities placed in investment plans</td>
</tr>
<tr>
<td></td>
<td>• Investments in agroforestry and organic agriculture (28%)</td>
<td>Individuals: • Reduced grazing or access to grazing lands (28% LLH; 40% SLH)</td>
</tr>
<tr>
<td></td>
<td>• Perceived benefits for sustainability of conservation efforts (67%)</td>
<td>• Incentives seen as less beneficial than previous earnings from grazing (4% LLH; 20% SLH)</td>
</tr>
<tr>
<td><strong>Social and</strong></td>
<td>Communities: • Perceived improvements in land security (39%)</td>
<td>Communities: • Increased chemical use outside reserve (5%)</td>
</tr>
<tr>
<td><strong>political</strong></td>
<td>• Perceived improvements in community organization (50%)</td>
<td>• Potential leakage to lower elevation areas</td>
</tr>
<tr>
<td></td>
<td>○ Increased participation in community projects, improvements to communal meeting areas, increased enrollment, sense of pride at being involved in a conservation program, improved ability to manage funds and administrative affairs</td>
<td></td>
</tr>
<tr>
<td><strong>Individuals</strong></td>
<td>• Reduced burning/grazing (32% LLH; 40% SLH)</td>
<td>Individuals: • Movement of animals into other páramo (5% SLH)</td>
</tr>
<tr>
<td></td>
<td>• Investments in conservation (16% LLH)</td>
<td>• Potential leakage to lower elevation areas</td>
</tr>
<tr>
<td><strong>Human and</strong></td>
<td>Communities: • Perceived improvements in land security (28% LLH; 15% SLH)</td>
<td>Individuals: • &quot;Potential generational conflicts regarding land use restrictions.</td>
</tr>
<tr>
<td><strong>physical</strong></td>
<td>• Investments in health and basic services (44%)</td>
<td>• Decreased land security as neighbors now consider land part of the government (4% LLH)</td>
</tr>
<tr>
<td></td>
<td>○ Potable water systems and latrines, community pharmacies</td>
<td>None identified</td>
</tr>
<tr>
<td></td>
<td>• Investments in food security (33%)</td>
<td>* Speculated potential impacts based on authors’ interpretations.</td>
</tr>
<tr>
<td></td>
<td>Individuals: • Incentives used for education, food, health, and household expenses (95% SLH; 44% LLH)</td>
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<tr>
<td></td>
<td>○ Build and maintain fences (24% LLH)</td>
<td>• Potential impacts from foot traffic resulting from building trails and small access roads.</td>
</tr>
<tr>
<td></td>
<td>• Aquaculture and ecotourism infrastructure (12% LLH)</td>
<td>• Increased chemical use outside reserve (5%)</td>
</tr>
<tr>
<td></td>
<td>Individuals: • Incentives seen as less beneficial than previous earnings from grazing (4% LLH; 20% SLH)</td>
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Please cite this article as: Bremer, L.L., et al., Conservation and livelihood outcomes of payment for ecosystem services in the Ecuadorian Andes: What is the potential for ‘win–win’? Ecosystem Services (2014), http://dx.doi.org/10.1016/j.ecoser.2014.03.007
communities cash income refers to cash available for community projects. Regulated, but regulations are weakly enforced. Already regulated by municipal ordinance, where grazing is legally making livelihood impacts uncertain. All landowners who were case of two smaller landholders described above, it was unclear inadequately compensated by incentive payments. However, in the case of four smaller landholders (compared with grazing earnings) were a hardship. More stable, less risky income source. However, two (10%) smaller landholders who noted a loss of income opined that less frequent convert his páramo to exotic pasture, but decided to enroll in SocioPáramo represented a more stable income source. The most striking case was a medium-sized farmer who was in the process of creating a work-group to perceived improvements in land security associated with more community and individual participants, and the potential improvements in natural capital observed among community participants were not always shared by individual participants. Among individual participants, four larger landowners (16%) and no smaller landholders explained that they were using all or some of their SocioPáramo funds to finance fencing, as a conservation activity (Table 3; Fig. 1). While some individuals (44% larger landowners; 0% of smaller landholders) noted strengthened or sustained conservation as an important benefit of participation (whether through direct action and/or indirectly through formal protection), individuals generally did not express the same perception of the connection between land management in the highlands and water supply for consumption and agriculture in the lower areas that community participants did.

4.3. Social and political capital

An important benefit cited by some participants (28% of larger landowners; 15% of smaller landowners; 39% of communities) was perceived improvements in land security associated with more formal land protection due to affiliation with a government program and/or obtaining funds to secure and patrol their land. Communities (61%), in particular are investing funds to enhance land security, including paying park guards and defining boundaries (with fences, for example) between their land and neighboring lands. Far fewer individual participants (0% of smaller landholders and 32% of larger landowners) are investing funds on land security (Table 3).

Additionally, half of community representatives (enrolling collective land) identified improved community organization as a major benefit of SocioPáramo and no community representative indicated that participation had divided the community at this stage (Table 3). Several communities explained that participation reduced burning and grazing which participants often associated with improved water supply; payments for park guards and environmental workshops aimed at improving conservation efforts; and agroforestry projects in non-enrolled areas that may reduce pressure on the highlands (Table 3). In addition to direct changes in land use, natural capital can be affected by changes in management practices. Half of the communities indicated that they are investing part of their incentives in activities directed at improving conservation and security and reducing pressure on their highlands. These include activities aimed at improving agricultural production in lower elevation areas, park guards and community work groups to protect the enrolled areas, ecotourism development, environmental education, and trash clean-ups (Table 3).

Twelve (67%) communities explicitly emphasized the value of enrolling land in SocioPáramo to ensure the long-term sustainability of conservation efforts, noting that population and other pressures may threaten existing páramo conservation efforts in the future. For example, one community is using SocioPáramo funds in part to, “develop a management and monitoring plan for the highland zone (forest and páramo) to ensure its integrity over time.” Others are using funds to hire park guards, organize community work groups, and install signs indicating the protected status of their páramo. Another community explained that enrolling in SocioPáramo helped to formalize the “agricultural boundary line.” They explained that, while the community was largely aware of the importance of not converting more páramo to agriculture, there was always the risk that this could happen, and that SocioPáramo helped ensure that it would not. Likewise, another community leader explained that one objective of enrolling in SocioPáramo was, “to ensure long-term conservation as the next directive might not be conservationists.”

As with other forms of capital, differences exist between community and individual participants, and the potential improvements in natural capital observed among community participants were not always shared by individual participants. Among individual participants, four larger landowners (16%) and no smaller landholders explained that they were using all or some of their SocioPáramo funds to finance fencing, as a conservation activity (Table 3; Fig. 1). While some individuals (44% larger landowners; 0% of smaller landholders) noted strengthened or sustained conservation as an important benefit of participation (whether through direct action and/or indirectly through formal protection), individuals generally did not express the same perception of the connection between land management in the highlands and water supply for consumption and agriculture in the lower areas that community participants did.
had increased community membership, including one cooperative that attributed gaining 19 new members to SocioPáramo, which was attractive to young people in the community. Four participant communities in a single region also indicated that SocioPáramo had helped create an “alliance of four communities for water conservation,” as they interacted more through their enrollment in the program and activities with an affiliated NGO.

There were also several examples of actual or potential reduction in social and political capital (Table 3). While the majority of participants cited improved land security as an important benefit, one landowner explained that neighbors now thought of his land, “as part of the State, and so invade more.” There is also the potential that increased monitoring and security of the páramo could cause conflict among community members or between neighbors if land use restrictions are levied unevenly. While we found no evidence of this in community contracts, individuals from a single community who enrolled individually-held land pointed to a growing conflict between generations over locking up land in the highlands for 20 years when the lower area was already regulated through its location inside a protected forest.

4.4. Human and physical capital

The majority of individual participants (44% of larger landowners and 95% of smaller landowners) indicated that they were utilizing incentive payments to supplement educational, food, health, and household expenses. Fences were the only enhancement of physical assets identified among larger individual participants (16%), although three urban landowners discussed the potential for incentives to be used for aquaculture or ecotourism infrastructure in the future (Table 3). Forty-four percent of communities dedicated some of their of funds to improving health, education, and access to basic services (Table 3). Community investment in human capital includes projects to improve nutrition of elderly community members, improved potable water systems and latrines, establishment of community medical funds and pharmacies, training for community members in sustainable farming and grazing, and improved access to social security benefits. One community, for example, included the objective to “improve health and water supplies,” under which they are establishing an emergency health fund and improving water capture tanks and distribution in the community. Other communities are using funds to organize training workshops in agriculture, natural resource management, and community development with the joint goal of improving health, education, and economic production (Table 3). The majority (57%) of communities are using funds for smaller scale projects involving physical capital, including irrigation systems, latrines, potable water systems, initial materials to build community centers, a machine to process achira (starch harvested from canna flower rootstock), and access trails (Table 3). Five communities (28%) are funding pieces of larger projects, such as purchasing materials for renovating the community center in the first year, which will be followed by construction in later years.

However, all communities expressed that funds remained insufficient to cover the most urgent projects, including renovating community meeting areas, installing irrigation systems, improving roads, and improving access to potable water. Similarly, smaller landholders who did not have to reduce grazing and burning suggested that the “funds were important, but that they are small,” falling short of meeting their health, education, and nutrition needs. Likewise, due in part to the limited size of the incentives, investment plans do not include large-scale infrastructure projects.

5. Discussion

5.1. Impacts on financial capital

Our results point to overall moderate, but positive effects of participation in PES on financial capital. For smaller landholders, payments constitute an important contribution to the household budget, clearly exceeding the 5% of smallholder household income reported by Miranda et al. (2003), and supporting Wunder (2008)’s findings that PES often constitutes 10–50% of household income. While community incentives are low, if divided on a per household basis, most communities, particularly those that are well-organized, perceived great benefits for supporting community-based projects. Future research should further examine perspectives within individual households on the distribution of risks and benefits within participant communities (Krause et al., 2013).

Beyond the direct financial capital enhancements resulting from PES incentives, the effect of participation on financial capital depends on the type and extent of land-use changes that occur and their influence on income. As with many PES programs (Wunder, 2008), SocioPáramo payments are not based on calculated opportunity costs but on a fixed value per hectare. Few participants thought the incentive was sufficient to replace potential income from the most productive páramo land uses, such as potato farming and intensive grazing, however, few participants were using their páramo for these activities. In many cases, use of the enrolled páramo was already limited by biophysical, socioeconomic, and political land-use constraints (Bremer et al., 2014), leading to low opportunity costs for the majority of participants, who were either utilizing enrolled land or were using it for grazing at levels acceptable to program extension agents.

In the minority of cases where landowners reported hardships due to burning and grazing restrictions, legal regulations on land use already existed, and it remains unclear whether SocioPáramo, with limited monitoring capabilities, will actually give these regulations more teeth. PES has been framed as the “carrot that makes the stick of regulation more palatable”, (Engel et al., 2008: 669), suggesting that payments can provide an additional income source in the face of environmental regulation. We found little evidence of a “PES trap” (Wunder, 2008: 287), where PES participation would lock landowners into long-term agreements to forego use of their land, since regulations already limited land use among those landowners who saw enrolling in SocioPáramo as their only option. However, PES payments did not necessarily make the regulation “more palatable,” since those landowners did not distinguish between existing regulations and PES as the reason for reduced grazing access.

That the majority of landowners did not change their land use as a result of participation in SocioPáramo raises the question of additionality, or the notion that PES programs should result in a clear land-use change or avoided land-use change above and beyond what would have occurred in the absence of the program (Borner et al., 2010). From the “conservation efficiency” perspective on PES, a lack of additionality is a major concern given that one of the main goals is to achieve conservation outcomes in the most cost-efficient manner (Sanchez-Azofeifa et al., 2007, Honey-Roses et al., 2009, Pattanayak et al., 2010).

In the case of SocioPáramo, the highest levels of land-use change (and associated additionality) were observed among smallholder and medium-sized farmers. These landowners were also the ones who considered incentives to be most important to the household budget (where no land-use changes are required) and, conversely, who considered income reductions associated with required land-use changes as most detrimental. We found cases with potential for ‘win–win’ where small reductions in grazing (which may improve ecosystem services provision) were accomplished alongside small
increases or more stable income sources. However, ‘win–win’ may be difficult in that livelihood benefits were greatest where additionality was lowest, and cases with high additionality translated into few livelihood benefits. However, in 2011, SocioPáramo increased incentive payments for the first 20 ha of páramo enrolled to $60 per hectare. Higher payments for the smallest land parcels will likely increase enrollment and benefits among smaller landholders, particularly if coupled with alternative livelihood options, potentially allowing for greater opportunities for ‘win–win.’ This supports the idea that, despite higher transaction costs, working with smaller landholders can be an effective strategy to promote protection of ecosystem services (Swellow et al., 2005).

Contracts with larger, urban landowners also challenge the idea of achieving a ‘win–win.’ These participants are both wealthier and consider the incentive payments less important to their overall livelihoods than smaller landholders, making them the least suitable to SocioPáramo’s poverty alleviation goal. At the same time, with the exception of several urban landowners who indicated that joining SocioPáramo prevented them from selling their land to others who could potentially utilize the land more intensively, additionality appeared very low among this group. This suggests that contracts with urban landowners based on continued default conservation of their lands may be the least effective in achieving SocioPáramo’s social or conservation goals.

Community level agreements also involved low levels of additionality in terms of direct land-use change or avoidance of land-use change, but we argue in subsequent sections that results from SocioPáramo suggest that PES programs can have conservation benefits in terms of strengthened capacity to manage natural resources over the long-term, despite a lack of clear land-use change or immediate avoidance of land-use change. These community agreements may represent the clearest synergy of conservation and social benefits, but assessment must be expanded and continued to fully evaluate this idea, including explicit measures for both social and ecological outcomes over the long term. While these agreements may not be deemed successful under the “conservation efficiency” conceptualization of PES, they would be considered more successful under the compensation for ecosystem services conceptualization, which focuses on supporting rural stewards of lands important for ecosystem services provision and is more compatible with the design of SocioPáramo, which does not require additionality in its agreements (Rosa et al., 2004, McAfee and Shapiro, 2010).

5.2. Impacts on natural capital

An important perceived conservation benefit of participation was enhanced natural capital through reduced páramo burning and grazing. If it is the case that reduced burning and grazing increases water supply, biodiversity, and other ecosystem services – a relationship that is often assumed, but still not well understood (Farley et al., 2013, Harden et al., 2013) – SocioPáramo agreements can be seen as enhancing natural capital where these types of land-management changes occurred. SocioPáramo has recognized the need for further study, but prohibits burning under the assumption that this is the best way to protect water, carbon, and biodiversity. This practice of basing land-use prescriptions on assumed relationships between land use and ecosystem service production is common in PES programs around the world, particularly in data poor regions (Muradian et al., 2010), but remains a constraint to fully understanding conservation outcomes as they relate to natural capital. Moreover, at the time of our study, SocioPáramo was still in the process of determining grazing regulations; accordingly, as found by Krause et al. (2013) in the Amazon region, in many cases, participants were not clear on exact expectations.

Many communities described strong links among financial, social, and natural capital and considered SocioPáramo as a way to strengthen these interlinked assets. While land use did not change in the majority of the community conservation agreements, SocioPáramo funds are being utilized in many cases to strengthen conservation and enhance stewardship and to facilitate long-term páramo conservation and sustainable management. Land management adjacent to tropical protected areas has been shown to be a critical determinant of conservation outcomes within protected areas (Laurance et al., 2012). Our findings demonstrate the potential of PES to facilitate the creation and/or strengthening of community managers of buffer areas, which can work along with protected areas to improve outcomes. Many communities suggested that improved capacity to sustainably manage natural resources strengthened rather than weakened development goals, contradicting the idea that PES may, “bring back the fences” by decoupling conservation from development (Wunder 2005: 2). Future evaluation of sustained conservation of lands enrolled in SocioPáramo compared with non-enrolled but currently conserved areas will help shed light on the outcomes for natural capital. Likewise, further research on individual and household level perspectives on benefits and risks of greater páramo protection is needed to better understand how well the program can meet both social and conservation goals (Krause et al., 2013).

While interviewees generally associated improved páramo protection with enhanced natural capital, there is also the potential for environmentally degrading land uses to be moved to other areas or for incentive funds to be utilized for activities that degrade natural capital (Table 2). Leakage, or the transfer of environmental problems from one place to another, was not an issue for community and individual landowners who were not utilizing their land prior to participation. For those participants who were required to change their land use by participating in SocioPáramo, on-farm leakage was not a problem when they sold their animals, but off-farm leakage could occur if animals were sold to other páramo landowners. On the other hand, those that moved their animals to lower areas intensified use in already utilized areas. Longitudinal research would prove useful to understand land-use change over the long-term.

5.3. Impacts on social and political capital

We identified impacts on social and political capital in terms of land security, community organization, and community-based management that provide insight into the debates about whether participation in PES will strengthen or weaken these institutions (Table 2). Previous research has found that PES can improve land tenure security through demonstrating economic use of land (Robertson and Wunder, 2005, Wunder, 2008), but PES also has been criticized for failing to help the most marginalized, who do not have land tenure (Landell-Mills and Porras, 2002). In this case, both community and individual informants cited improved land security as a major driver of participation (Bremer et al., 2014) suggesting that PES may play a role in improving land security and protecting land for those who do participate. However, the fact that urban landowners pointed to challenges of preventing outside use of land on which they are rarely present points to the importance of the context in which PES occurs; with respect to improved land security, the greatest benefits are reaped by those who are present on the land and can benefit from making improvements to land boundaries in addition to formal protection.

In terms of community organization, our findings suggest that, in the case of some SocioPáramo community participants, positive effects on social cohesion exist both within communities and across communities. Past research has found that pre-existing
social capital is a key determinant of PES outcomes (Corbera et al., 2007, Clements et al., 2010), and that strengthening community organization and social networks may lead to more positive PES outcomes (Krause and Loft, 2013). Our results support the idea that strong institutions and organizations are an important pre-condition for success of PES programs (Jack et al., 2008; Clements et al., 2010), but they also suggest that pre-existing social cohesion can be a particularly important determinant of program outcomes.

With respect to community-based management, most communities discussed their enrollment in SocioPáramo in the context of recognizing, reinforcing, and ensuring long-term continuation of the communities’ pre-existing desire to conserve. While efforts of participation will need to continue to be monitored over the next several years in order to understand longer-term effects, our data suggest a trend towards “crowding in” rather than “crowding out” of social norms and intrinsic motivation for conservation under collective rewards, supporting some previous research (Sommerville et al., 2010b) and contrasting with others (Narloch et al., 2012). Narloch et al. (2012: 2098) have noted that, “The extent to which external reward systems crowd-in or crowd-out existing social norms, as well as their overall effectiveness in increasing conservation levels, is context dependent and thus needs to be examined empirically.” Our research highlights individual versus collective ownership as an important component of this context-dependence, and future research should include long-term studies of changing perceptions of conservation among SocioPáramo participants, building on the current study to improve understanding of participation effects on social norms and potential differences between individual and collective incentives. Further, given that our research and that of others (Corbera et al., 2007a) suggests that enrollment communal land has strong potential to enhance community organization, while individual agreements among multiple community members may have more potential to cause conflict, greater attention to assisting individual smallholder participants in collectively utilizing payments may facilitate more positive and equitable livelihood benefits (Swallow et al., 2005).

5.4. Impacts on human and physical capital

Both community and individual participants are utilizing funds for health, education, and nutrition, constituting a potential improvement in human capital. In some cases, communities are utilizing funds to cover a portion of priority projects such as building several latrines at a time. This contribution to improvements in basic services is seen as a major strength of SocioPáramo by a number of communities and NGOs. However, an NGO that opposes SocioPáramo contested this explaining that, “It is the government’s obligation to provide basic services – health, education, roads – and communities should not have to enter into a contract…to be provided with basic services” (Table 3). This illustrates that, even where PES might be deemed successful by improving human capital, it may nonetheless be seen as falling short, given the lack of basic services. Our results concur with Rosa et al. (2003: 10)’s assessment that PES cannot be seen as a “panacea for combating rural poverty and environmental degradation,” but if situated as part of wider strategies, can “serve as valuable instruments for strengthening and diversifying community livelihood strategies.”

6. Conclusions

It has been noted that PES has the greatest possibility of contributing to poverty alleviation where conservation opportunity cost is low and the potential for ecosystem services provision is high (Jack et al., 2008). Given that land-use change requirements were generally low, and that páramo ecosystems generally have very high service provision, at least in this early stage, SocioPáramo appears a promising context for PES to positively contribute to poverty alleviation. Since participants who relied on their land for agricultural production did not enter their most productive land, our results do not support the idea that PES will “trap” landowners into agreements that compromise their livelihood sources (Wunder, 2008: 287). Rather, with few exceptions, incentives provide a more stable income source and a diversification of income. Future research will usefully illuminate whether characteristics of landowners or enrolled land change through subsequent enrollment periods.

We also found that SocioPáramo was discussed in terms of its role in strengthening local conservation and sustainable development initiatives. The idea that a centralized, national-level program may facilitate greater participation among local communities in natural resource management is an important finding of this study. While land use did not change in many of the community conservation agreements, SocioPáramo funds are being allocated to strengthen conservation and stewardship efforts and facilitate long-term protection; if these efforts are carried to fruition, this may constitute one of the most efficient uses of conservation funds. Although the conservation efficiency perspective on PES focuses on the idea of incentives to promote avoided environmental degradation, our results highlight that this overlooks the role PES can play in changing attitudes or in shifting conservation from “the state as protector to the smallholder as steward” (Swallow et al. 2005: 33). Contrary to ‘mainstream’ PES conceptualizations that suggest that, “the ideal ES seller is, if not outright environmentally nasty, then at least potentially about to become so,” (Wunder, 2005: 12), we argue that utilizing PES funds to support environmentally friendly ecosystem services providers also provides value by strengthening current environmental stewardship and facilitating long-term continuation of these efforts, with the benefit of enhancing natural capital for participants and non-participants (Rosa et al., 2003). Across all of these findings, it is evident that the socio-economic and biophysical context under which PES transactions occur remains a critical determinant of program access and outcomes. Where social networks are strong and where alternative economic opportunities, biophysical constraints, and/or a desire to protect water supplies constrained páramo land use prior to program enrollment, SocioPáramo contributes to sustainable livelihoods through strengthening financial and non-financial capital. Where these contextual conditions are present, our findings suggest that PES has the potential to enhance social and political capital through increased land tenure security, strengthening of community-based organizations and sustainable resource management efforts (Grieg-Gran et al., 2005, Wunder, 2008, Kollmair and Rasul, 2010). These findings suggest that focusing on strengthening social networks and developing economic alternatives are two ways that PES programs may be able to improve equity in outcome and lay groundwork for PES to strengthen livelihoods.

Our research has three important limitations that could be fruitfully reconciled in future research. First, SocioPáramo is a new program; therefore, our research focuses on the preliminary stages of program outcomes. Following up with these participants and exploring how outcomes change with new participants in subsequent years is imperative for a more complete understanding of program outcomes. Second, our interviews with community participants focused on community leaders and representatives; to more adequately understand equity in outcome in terms of how costs and benefits are shared among community members, further research could evaluate outcomes at the household level (Krause et al., 2013), and within households to disaggregate outcomes by gender and other factors. Finally, our analysis of experiences of non-participants is limited; longitudinal research comparing how livelihoods of participants vs. non-participants change over time could illuminate the role...
of PES in contributing to sustainable development. Our findings suggest promise for PES, particularly in a biophysical context such as the páramo where ecosystem services provision is generally high, while also highlighting the importance of greater attention to the socio-economic, political, and biophysical context in influencing whether such programs can provide a ‘win–win’ for conservation and livelihoods.

Acknowledgments

This study would not have been possible without the support, patience, and enthusiasm of many people. We thank SocioPáramo (SocioBosque) staff for their time, insight, and assistance in contacting program participants. We are grateful to Karina Paredes and Patricio Padrón for their assistance in the field. We thank Fundación Cordillera Tropical, EcoCiencia, Naturaleza y Cultura, and Fulbright Ecuador for institutional support. We thank Tanya Hayes and two anonymous reviewers for helpful comments on the manuscript. Most of all we thank the participants of SocioPáramo for their patience and willingness to share their stories with us; it is our hope that this study helps in the continued development of this program to improve the livelihoods of program participants. This material is based upon work supported by a Fulbright Student Grant, the National Science Foundation under Grant no. 0851532, and the SDSU University Grant Program. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the Fulbright Foundation, the National Science Foundation, or San Diego State University.

Appendix A. Participant Interviews

INTERVIEW 1: Individual Participants in SocioPáramo

1. General information

(1) What type of work do you do the majority of the time? Your husband or wife?
(2) Do you or your family belong to a community, association, or other type of organization? If yes, which?
(3) How old are you? Your partner?
(4) How many people currently live in your household?

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<th>Age</th>
<th>Children</th>
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<th>Parents</th>
<th>Aunts/uncles</th>
<th>Parents in-law</th>
<th>Nieces/nephews</th>
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(5) Do (or did) your children attend primary school? High school? University? If your children are adults, what type of work do they do?
(6) What products do you buy in the city? What do you produce at home for consumption?
(7) What type of services do you have in the home? (Water, electricity, telephone, sewage?)
(8) Have you or anyone in your family left to work away? If so, where? How long did you or your family member work away?
(9) Have you or your family worked with an NGO or a governmental organization? If so, which, when, in what capacity, and with what frequency?
(10) Has there been any conservation or development project in your family’s páramo?
(11) Is there a national park or protected area close by? Does this have any affect on your family?

2. Map of property

(12) What is the area of your land in total? How much of your land is in the páramo? In the forest? How long have you had land tenure over your property?

3. Páramo land use and management

(13) How long does it take to travel to your páramo from where you live? What is the most common mode of travel (on foot, horse, car) to get to the páramo? Is there a road or trail that goes to the páramo?
(14) Does your family obtain anything from the páramo? If so, what? What does your family use the páramo for?
(15) Are there crops in your family’s páramo?
   a. If yes, how many hectares and what type of crops?
   b. How long has this area been cultivated?
(16) Are there tree plantations in your páramo?
   a. If yes, how many hectares and of what species? Why did your family decide to plant this species?
   b. When were the plantations established?
(17) How much of your páramo is used for grazing and for what type of animals?
   a. (How many animals (cows, sheep, alpacas, llamas) does your family have in the páramo and for how many months per year? b. Are there people outside of your family who use your páramo for grazing? If so, how many people and how many animals?
   How many months per year do you use the páramo for grazing?
   c. What management techniques do you or your family use to improve the land for grazing? In the case of burning – What is the reason for burning? At what frequency do you normally burn the páramo?
(18) Do you or your family use páramo plant or animal species for medicinal purposes? If yes, which ones and for what purpose?

Please cite this article as: Bremer, L.L., et al., Conservation and livelihood outcomes of payment for ecosystem services in the Ecuadorian Andes: What is the potential for ‘win–win’? Ecosystem Services (2014), http://dx.doi.org/10.1016/j.ecoser.2014.03.007
(19) Is the páramo contributing to the economy of your family?
   a. If yes, how? (Agriculture, forestry, grazing, tourism, etc.)
   b. How many people permanently in your páramo? Is there anyone who works there temporarily? What type of work do they do?

(20) Are there any people from outside of the community who your páramo? If so, who, and what do they use it for? What effect does this have on the páramo?

4. Land use history of the páramo
   (21) How was your páramo used in each time period? (Grazing, agriculture, forestation, conservation, cultural and religious activities, etc.). How often was the páramo burned in each time period? What was the purpose of burning?
   **Time line **
   (22) When was the last burn in your páramo? How much area was burned and what was the purpose of burning? Was it on purpose or an accident?

5. Experience with SocioBosque/SocioPáramo
   (23) How did you or your family find out about SocioBosque/SocioPáramo?
   (24) Why did you or your family decide to participate in SocioBosque/SocioPáramo?
      a. Was it easy to enroll in the program? Was there any additional cost to enrolling? Did you receive any assistance in completing the required documents? What was the most difficult aspect of enrolling in the program?
   (25) How much area of your páramo did your family enroll? How much of your forest and scrubland was entered? How did you or your family decide what, and how much, land to enter?
      a. Do you plan to enter more land in SocioBosque/SocioPáramo in the future?
   (26) How are the communications with SocioBosque/SocioPáramo? How many times have they visited your páramo?
   (27) What are the regulations concerning land use of páramo entered into SocioBosque/SocioPáramo.
      a. What activities are prohibited? What activities are promoted or permitted?
   (28) Which of the permitted or promoted activities are important for you or your family? (Tourism? Grazing (type of animal and amount of animals?), conservation?) Are these activities new for you or your family since joining SocioBosque/SocioPáramo?
   (29) Has you or your family had to change land use as a result of SocioBosque/SocioPáramo regulations (in terms of grazing, forestation, etc.)? If yes, what type of changes?
      a. Are you in agreement with SocioBosque/SocioPáramo regulations? Is there anything you would like to change?
   (30) What changes do you anticipate in your páramo enrolled in SocioBosque/SocioPáramo? (After 20 years)?
   (31) If you had not entered SocioBosque/SocioPáramo, how would your Páramo be managed or used in the future?
      a. What would happen in terms of páramo land use and management if the government decided to terminate the program prior to the 20-year agreement?
   (32) Have there been any land-use changes in your páramo that was not entered (if it exists) in SocioBosque/SocioPáramo since your entered other lands into the program (increased grazing intensity, agriculture, etc.). If yes, what type of land-use or management changes?
      a. How will páramo that was not entered into SocioBosque/SocioPáramo be managed in the future?
   (33) How did your or your family put together the property map for SocioBosque/SocioPáramo?
   (34) What are you or your family using SocioBosque/SocioPáramo funds for?
      a. What will future resources from SocioBosque/SocioPáramo be used for?
      b. Do you think the funds are sufficient (to serve as an opportunity cost, to complete activities or projects you would like to invest funds in)?
   (35) What are the advantages of participating in SocioBosque/SocioPáramo?
   (36) Are there any disadvantages?

INTERVIEW 2: Community Participants in SocioPáramo

1. Community information
   (1) How many members are there in the community? How many are female and how many are male?
   (2) What is the age range of heads of households of community members?
   (3) How often, and for what purpose, does the community have meetings or community events?
   (4) What product or products is this community known for?
   (5) What products does the community purchase in the city? What products are produced in the community for consumption?
   (6) What services are available in this community (water, electricity, telephone, sewage)?
   (7) Where does the water used in this community for drinking and for irrigation come from?
   (8) How many children of school age (7–12 years) attend primary school? How many do not? How many attend high school? How many do not? Is there anyone in the community who has gone to college?
   (9) What do you consider to be the most urgent goals or necessities of this community?
   (10) What type of work or jobs do community members do? Females? Males?
   (11) Are there community members who have left the community to work or study abroad or in other areas in Ecuador?
      a. If yes how many people and what type of work (or study) are they dedicated to? How much time to they work away from the community?
      b. How does this affect the community?
   (12) Has the community worked with a non-profit or governmental organization? If yes, which, when, and in what capacity? How often?
   (13) Has there been any conservation or development program focused on the páramos of this community?
   (14) Is there a national park or protected area near the community?
      a. How does this affect the community?
2. Community map

In order to better understand land use, particularly of the communal páramo, would you please draw a map of the community?

16. What is the area of the community in total? What is the area of communal páramo and of communal forest? Does the community have land tenure of all communal lands?

17. How much private land does each family in the community have on average? How are families using their private land? Are there differences in the quality or quantity of private lands between families? What are the three largest and three smallest private land holdings in the community?

3. Communal páramo land use and management

18. How much time does it take to travel to the communal páramo from the community? What is the most common mode of travel (on foot, horse, car) to get to the communal páramo? Is there a road or trail that goes to the páramo?

19. Does the community obtain anything from the communal páramo? If so, what? What is the communal páramo utilized for?

20. Is, and how is, land use regulated in the communal páramo? If yes, is it written or known by everyone?

21. Have there been repartitions of communal land into private ownership? If so, could you please explain the history of these repartitions?
   a. If the communal páramo has been repartitioned: How are families using the land? Are there differences in the quality or quantity of private lands between families? What are the three largest and three smallest private land holdings in the community?

22. Does the community have crops in the communal páramo?
   a. If yes, how many hectares and what type of crops?
   b. How long has this area been cultivated?

23. Does the community have tree plantations in the communal páramo?
   a. If yes, how many hectares and of what species? Why did the community decide to plant this species?
   b. When did the community plant the plantations?

24. How much of the communal páramo is used for grazing and for what type of animals?
   a. How many animals (cows, sheep, alpacas, llamas) can each community member graze in the communal páramo? How many community members currently use the communal páramo for grazing? How many months per year do they use the communal páramo for grazing?
   b. Are there people who are not community members who use the communal páramo for grazing? If so, how many people and how many animals? How many months per year do they use the páramo for grazing?
   c. What management techniques does the community use to improve the land for grazing? In the case of burning – What is the reason for burning? At what frequency does the community normally burn the páramo?

25. Does the community use páramo plant or animal species for medicinal purposes? If yes, which ones and for what purpose?

26. Is the communal páramo contributing to the economy of this community?
   a. If yes, how? (Agriculture, forestry, grazing, tourism, etc.)
   b. How many people in the community work permanently in the communal páramo? Is there anyone who works there temporarily? What type of work do they do?

27. Are there any people from outside of the community who use the communal páramo of this community? If so, who, and what do they use it for? What effect does this have on the páramo?

4. Land use history of the communal páramo

This part focuses on the land use history of the communal páramo and how land use may change in the future.

28. How was the communal páramo used in each time period (before and after the community formed, before and after the agricultural reforms, other time periods defined by events important to the community, etc.)? (Grazing, agriculture, forestation, conservation, cultural and religious activities, etc.). How often was the páramo burned in each time period? What was the purpose of burning?

**Time Line **

1) Event Year Páramo land use and management

29. When was the last burn in the communal páramo? How much area was burned and what was the purpose of burning? Was it on purpose or an accident?

5. Experience with SocioBosque, Capítulo Páramo (SocioPáramo)

30. How did the community know about SocioBosque/SocioPáramo?

31. Why did the community decide to participate in SocioBosque/SocioPáramo? Was it the decision of the entire community or one or several representatives?
   a. Were there people in the community who did not want to participate in the community? If so, how many? What were the reasons for not wanting to participate?
   b. Was it easy to enroll in the program? Was there any additional cost to enrolling? Did you receive any assistance in completing the required documents? What was the most difficult aspect of enrolling in the program?

32. How much area of communal páramo did the community enter? How much communal forest and communal scrubland was entered? (Using the community map – ask whether the community was able to enter páramo with plantations, agriculture, or grazing). How did the community decide what, and how much, land to enter?
   a. Does the community plan to enter more communal páramo in SocioBosque/SocioPáramo in the future?
   b. What activities are prohibited? What activities are promoted or permitted?

33. How are the communications with SocioBosque/SocioPáramo? How many times have they visited the community? Have they seen your communal forest and communal páramo entered into the program?

34. What are the regulations concerning land use of páramo entered into SocioBosque/SocioPáramo? What is the communal páramo utilized for?

35. Which of the permitted or promoted activities are important for the community? (Tourism? Grazing (type of animal and amount of animals?), conservation?) Are these activities new for the community since joining SocioBosque/SocioPáramo?

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Has the community had to change land use as a result of SocioBosque/SocioPáramo regulations (in terms of grazing, forestation, etc.)? If yes, what type of changes?

a. Are you in agreement with SocioBosque/SocioPáramo regulations? Is there anything you would like to change?

What changes do you anticipate in the communal páramo entered in SocioBosque/SocioPáramo? (After 20 years)?

a. What would happen in terms of páramo land use and management if the government decided to terminate the program prior to the 20-year agreement?

Have there been any land-use changes in communal páramo or privately owned páramo that was not entered in SocioBosque/SocioPáramo since the community entered other lands into the program (increased grazing intensity, agriculture, etc.). If yes, what type of land-use or management changes?

a. How will communal and privately owned Páramo that was not entered into SocioBosque/SocioPáramo be managed in the future?

How did the community put together the investment plan and community map for SocioBosque/SocioPáramo? How did the community prioritize projects to include in the plan? Was there a vote?

What project or activities did the community include in the 2009–2010 Inversion Plan? What has been completed?

a. What other ideas did the community have in terms of activities to include, but that, in the end were not included? Why did the community decide on final activities?

b. How does the community plan to put together the investment plan for the next year? What will future resources from SocioBosque/SocioPáramo be used for?

c. Do you think the funds are sufficient (to serve as an opportunity cost, to complete activities that you would like to include in the investment plan)?

How is the community putting together the required expense reports to SocioBosque/SocioPáramo? Has the community received any assistance with this? Who is in charge of managing expenses?

What would be helpful to the community to help better manage expenses and paperwork?

What are the advantages of participating in SocioBosque/SocioPáramo?

a. Has participation in the program strengthened the community? If so, how?

b. How does the community plan to put together the investment plan for the next year? What will future resources from SocioBosque/SocioPáramo be used for?

c. Do you think the funds are sufficient (to serve as an opportunity cost, to complete activities that you would like to include in the investment plan)?

INTERVIEW 3: Community Non-Participants in SocioPáramo

Sections 1–4: Same as community participant interviews.

The following are questions unique to non-participant interviews:

(1) How do you think the community will utilize the communal Páramo over the next 20 years?

5. Experiences with SocioBosque/SocioPáramo

(2) Has the community heard of SocioBosque/SocioPáramo? If so, how did the community learn of the program?

(3) Is, or has, the community thought of entering the program? Are there people in the community who would like to participate? Are there others who do not want to participate? What are the reasons for wanting and not wanting to participate?

(4) Would the regulations of SocioBosque/SocioPáramo (no burning, no intensive grazing, no forestation) require the community to change land use or management practices?

(5) What changes in the páramo would you anticipate if you decided to enroll in the program?

(6) What would the community utilize SocioBosque/SocioPáramo funds for if you decided to participate?

(7) Do you think SocioBosque/SocioPáramo incentives would be sufficient to serve as an opportunity cost for any changes you would need to make in land use or management? Would funds be sufficient to complete projects or activities you would ideally like to complete with SocioBosque/SocioPáramo funds?

INTERVIEW 4: Individual Non-Participants in SocioBosque/SocioPáramo

Sections 1–4: Same as community participant interviews.

The following are questions unique to non-participant interviews:

(1) How do you think you or your family will utilize the páramo over the next 20 years?

5. Experiences with SocioBosque/SocioPáramo

(2) Have you heard of SocioBosque? If so, how did you or your family hear of the program? Have you or are you thinking about joining the program? Why or why not?

(3) Would the activities not permitted by SocioBosque/SocioPáramo (no burning, no intensive grazing, no forestation) require you to change land use or management of your páramo?

(4) What changes would you anticipate in your páramo if you joined the program (after 20 years)?

(5) What would utilize SocioBosque/SocioPáramo resources for if you decided to participate? Do you think the funds would be sufficient to serve as an opportunity cost for required land use or management changes?

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Appendix C. Interviews with SocioPáramo Staff

INTERVIEW 5: Regional extension agents of SocioPáramo:

1. What does your work as SocioBosque/SocioPáramo promoter consist of?
   a. Name?
   b. How long have you worked in this position?
   c. What region or regions are you responsible for?
   d. How do you meet and recruit communities and individuals to participate in the program? Do you work with a governmental or non-governmental organization?
   e. How do communities and individuals enroll in the program? What are the reasons for wanting to enroll?
   f. Have you met with communities or individuals who do not desire to or are not able to participate? What are the reasons for not wanting to or not being able to participate?
   g. How often do you have contact with the communities and individuals who have enrolled in the program? In what capacity (verification, monitoring, capacitating, etc.)?

2. Biophysical goals
   a. What are the biophysical goals of SocioBosque/SocioPáramo?
   b. What type of páramo can and cannot enter into the program (planted with what species? Time since last burn? Burn frequency? Number and type of animals?). What is the process of verification of eligible land uses?
   c. What land uses are prohibited in SocioBosque/SocioPáramo agreements? What land uses are permitted or promoted? What is the reason for these regulations?
   d. Has land use changed in the SocioBosque/SocioPáramo community and individual agreements in your area? If so, how? How was land used prior to entry and how has it changed?
   e. How often did the communities and individuals burn their páramo prior to entering the program? What do you think of the current regulation of no burning?
   a. What type of grazing did the communities and individuals have prior to entry (type and animals per hectare)? Have grazing practices changed? Have any individuals or communities in your area been required or chosen to lower the quantity of animals? If so, where were they moved?
   b. Do the community and individual participants have tree plantations in their páramo? What species (pine, Polylepis racemosa, etc.). Were these planted before or after entry into the program?

3. Socioeconomic goals
   a. What are the socio economic goals of SocioBosque/SocioPáramo?
   b. How are the communities putting together their inversion plans? What do you think is the most complicated part of the inversion plan?
   c. How are the communities putting together their financial reports?
   d. Do you think the funds are sufficient to serve as an opportunity cost? To help alleviate poverty?

4. Monitoring
   a. Is there any type of monitoring in SocioBosque/SocioPáramo agreements? If so, what type and who is responsible for the monitoring?
   b. How frequently is monitoring completed?

5. Challenges and lessons
   a. What are the primary challenges related to implementing this program?
   b. What type of institutional, economic, and political challenges have you had? What about challenges in related to land owners?
   c. Is there anything you would like to change or improve about the program?

INTERVIEW 6: Program Directors: SocioBosque/SocioPáramo

(BASED ON Tallis et al., 2009 and Farley et al., 2013)

1. Basic project information
   a. Project start date and expected length
   b. Land ownership in project location(s)
   c. Project partners (national government, regional government, local government, non-profit, education, corporate, other)
   d. Project funding sources (national government, regional government, local government, non-profit, education, corporate, other)

2. Project goals
   a. Target ecosystem services
   b. Scale of target services (local, regional, national, global)
   c. Priority ecosystem services
   d. Pre-project land cover
   e. Target land cover
   f. Pre-project land use
   g. Target land use
   h. Synergies or tradeoffs among ecosystem services with target land use
   i. Other biophysical goals

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j. Socioeconomic goals
k. Differences in goals among project partners

(3) **Project tools**
   a. Land management tools/approaches used
   b. Person/group implementing land management
   c. Prohibited land uses or activities
   d. Finance tools used
   e. Who pays for the services?
   f. Who receives payment for the services?
   g. Legal or policy tools used
   h. Level of community involvement

(4) **Valuation/analysis**
   a. Was an economic valuation of services done for the project?
   b. If so, when (pre, during, post-project)?
   c. What type of valuation was done?
   d. Which services were valued?
   e. Was a policy analysis done to evaluate policies existing or required for project goals to be met?
   f. Was an ecological analysis done to determine past and current conditions?
   g. How was the target land cover/use determined/chosen?

(5) **Monitoring**
   a. Is any project monitoring done to assess how well objectives are being met?
   b. If so, what is being monitored?
   c. How is it being monitored?
   d. In which locations and with what frequency is monitoring done?
   e. Who collects and analyzes the data?
   f. What is the source of financing for monitoring?

(6) **Challenges/lessons**
   a. Main challenges in setting up and/or implementing the project
   b. Institutional challenges
   c. Economic challenges
   d. Political challenges
   e. Challenges in working with project partners and/or local landowners
   f. Data that were needed but unavailable
   g. Science needed to make the project better
   h. Lessons learned

**Appendix D. NGO Interviews**

**INTERVIEW 7: NGOs with agreements with Socio Páramo**

(1) **What types of projects does the organization have in relation to páramo conservation or development?**
   a. What are the socioeconomic and biophysical goals of these programs?
   b. Does your program promoter or prohibit particular land uses? If so, which, and why?
   c. What do you consider the most important risks to the páramos of this region?
   d. Beyond SocioBosque/SocioPáramo, has there been any payment for ecosystem services programs in the communities or individuals you work with?

(2) **For organizations with relationships with SP: what is the nature of your organization’s position as a SocioBosque/SocioPáramo program partner?**
   a. How long has your organization had this partnership?
   b. How long, and in what capacity, do you work with participating communities and individuals? Do you assist in the recruiting process?
   c. Have you met with communities or individuals who do not desire to or are not able to participate? What are the reasons for not wanting to or not being able to participate?
   d. How often do you have contact with the communities and individuals who have enrolled in the program in what capacity (verification, monitoring, capacitating, etc.)?
   e. Do you consider SocioBosque/SocioPáramo a tool for conservation of biodiversity and ecosystem services? For development and poverty alleviation?

*The rest of the interview follows sections 2–5 from the SP regional extension agents interview (see interview 5).*

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