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Communal Participation in Payment for Environmental Services (PES): Unpacking the Collective Decision to Enroll

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Abstract Payment for Environmental Service programs are increasingly applied in communal settings where resource users collectively join the program and agree to limit their shared use of a common-property resource. Who decides to join PES and the degree to which community members agree with the collective decision is critical for the success of said programs. Yet, we have limited understanding of the factors that influence communal participation and the collective decision process. This paper examines communal participation in a national payment for conservation program in Ecuador. We use quantitative and qualitative analysis to (i) identify the attributes of the communities that participate (or not), and factors that facilitate participation ($n = 67$), and (ii) assess household preference and alignment with the collective decision to participate ($n = 212$). Household participation preferences indicate varying degrees of consensus with the collective decision to participate, with those using the resource less likely to support participation. At the communal level, however, our results indicate that over time, those communities that depend more heavily on their resource systems may ultimately choose to participate. Our findings suggest that communal governance structures and outside organizations may be instrumental in gaining participation in resource-dependent communities and building consensus. Findings also point to the need for further research on communal decision-processes to ensure that the collective decision is based on an informed and democratic process.

Keywords Collective action · Conservation · Common-pool resource · Ecosystem services · Latin America · Páramo

Introduction

In recent years, the use of Payment for Environmental Services (PES) to promote conservation has increased, particularly in developing countries where a growing number of programs are applied to common-property systems in which a community decides to participate in a PES program and collectively abide by resource-use restrictions in exchange for a collective payment (Dougill et al. 2012; Kerr et al. 2014; Sommerville et al. 2010). Proponents of PES often argue that said programs are a more effective, democratic and just conservation tool than top-down protectionist policies as participants choose whether to participate, and receive economic compensation for their forgone use of a particular environmental resource (Engel et al. 2008; Grieg-Gran et al. 2005; Muradian et al. 2010, 2013; Wunder 2013).

The benefits of PES, however, are hotly debated (Igoe and Brockington 2007; Liverman 2004; McAfee and Shapiro 2010; Naeem et al. 2015; Pattanayak et al. 2010; Wunder 2013). Of particular concern is the voluntary nature of PES, and more specifically, who chooses to participate and why (Bremer et al. 2014; Ferraro 2008, 2011; Sommerville et al. 2010; Zbinden and Lee 2005). Scholars

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question whether PES participants were in fact using the resource prior to participation (Engel et al. 2008; Pattanayak et al. 2010), the degree to which poorer individuals can access, enroll, and benefit from said programs (Grieg-Gran et al. 2005; Landell-Mills and Porras 2002; Milder et al. 2010), and the degree to which economic and non-economic incentives influence the motivation to participate (Fisher 2012; Lapeyre et al. 2015; Van Hecken and Bastiaensen 2010; Wunder 2005).

The growing application of PES to collective settings raises additional questions about who chooses to participate and the factors that motivate participation (Sommerville et al. 2010; Kerr et al. 2014). Unlike the individual PES model, in which a private individual or household decides to participate, in communal settings, participation is a more complex decision process as the community agrees to participate and abide by the contract conditions. Thus, in deciding to participate household preferences must somehow be aggregated via community decision-making mechanisms.

Scholars caution that a community's agreement to participate in PES may not necessarily reflect all household participation preferences as communal agreement processes can vary in the degree to which all community members are actively involved in the decision (Kosoy et al. 2008; Pascual et al. 2010). Some express concern that communal decisions may represent only the leaders' or specific groups' interests and may overlook certain individual's preferences, particularly poorer or marginalized households (Corbera et al. 2007a; García-Amado et al. 2011; Kosoy et al. 2008; Neitzel et al. 2014; Pascual et al. 2010; Sommerville et al. 2010). Several also note that in addition to equity concerns, decision proccesses that fail to gain widespread support risk creating conflict and may fail to achieve the desired conservation goals (Neitzel et al. 2014; Pascual et al. 2010; Sommerville et al. 2010).

In this study, we investigate the factors that influence a community's decision to participate in a national PES program implemented in rural communities in Ecuador.[1] Our investigation focuses on two inter-related research questions. First, we ask, in common-property settings, what factors are associated with the collective decision to participate in a PES program, and do these factors change over time? And, second, how does the collective decision align with household participation preferences within the communities?

To answer the first question, our study uses quantitative and qualitative methods to contrast the attributes of 44 participant communities to 23 non-participant communities located in the same highland regions of Ecuador. Non-participant communities had knowledge of the program and were eligible to participate, but had not decided to participate.[2] For the second question, household surveys ($n = 212$) carried out in six participant communities enable us to assess household participation preferences and the factors that may contribute to greater alignment with the collective decision to participate.

In the following, we briefly describe how our study relates to previous literature on participation in PES. This is followed by the study context, and a methods section in which we describe our theoretical framework and the variables that we use in our analysis, the community and household selection criteria, and our methods for data gathering and analysis. Our findings and discussion are oriented around our two principal research questions on the factors associated with the collective decision to join and the alignment with household participation preferences. Results indicate that the characteristics of the participants may change over time as more communities decide to join PES. The findings also suggest that communal governance structures and external support may be instrumental in building consensus and facilitating communal participation in PES, although future research is needed to further support these findings.

Contributions to the Literature

PES programs are quickly becoming a policy tool of choice for major conservation organizations, international donors, and governments that seek to promote conservation and address poverty in resource-dependent communities (Adhikari and Agrawal 2013; de Koning et al. 2011; Engel et al. 2008; Ferraro 2011; Muradian et al. 2010, 2013; Wertz-Kanounnikoff and Kongphan-Apirak 2009). If PES is to succeed in providing additional environmental services and alleviating poverty, however, it must first attract participants that were using the resource prior to entering into a PES contract, and gain participation from some of the poorest members of society (Grieg-Gran et al. 2005; Pattanayak et al. 2010). Previous studies have questioned whether those that were using the resource were in fact, likely to participate (Arriagada et al. 2009; Ferraro 2011; Pattanayak et al. 2010). Studies have also found mixed results with respect to the participation of poorer communities and households, with several studies finding that application processes and use restrictions can be barriers to

[1] Note that the Ecuadorian government does not recognize Programa Socio Bosque (PSB) as a PES program, however, the conditions coincide with what is generally considered PES.

[2] In this study we specifically focus on the decision to participate; communities that actively made the decision to participate and were part of the PSB program. Non-participants are those communities in which the leader and/or community stated that they did not want to participate or were not wanting to pursue participation. For further description of our sample selection, please see the section "Site selection" in this paper.

participation (Adhikari and Agrawal 2013; Grieg-Gran et al. 2005; Milder et al. 2010; Pagiola et al. 2005).

The findings on participation in PES, however, are largely based on the characteristics of participants in one point in time (Bremer et al. 2014; Kosoy et al. 2008; Pagiola et al. 2010; Sommerville et al. 2010; Zbinden and Lee 2005). Previous work on agricultural adoption suggests that the characteristics of participants may change over time as communities gain more information and are better able to weigh the costs and benefits of participation (Dagang and Nair 2003; Kiptot et al. 2007; Mercer 2004). Likewise, collective decision-making processes can take time as communities gather information, build consensus, and resolve conflicts (Ostrom 1990; Ostrom et al. 1994; Agrawal 2001; Berkes et al. 2003). For example, a study on PES participation by Kosoy and colleagues (2008) suggested that the collective decision-making process may evolve as the program becomes more publicized, communities learn from their neighbors' experiences, build trust, and gain more information (Kosoy et al. 2008).

Research on collective decision-making suggests that the length and ease of said processes may be influenced by community governance characteristics and external support (Agrawal 2001; Kosoy et al. 2008; Ostrom 1990; Poteete and Ostrom 2004; Sommerville et al. 2010; Taylor and Singleton 1993). Specifically in the context of PES, a number of researchers have noted the need to understand how communal institutions can facilitate participation and the implementation of PES (Clements et al. 2010; Dougill et al. 2012; Kerr et al. 2014; Kosoy et al. 2008; Muradian 2013; Sommerville et al. 2010). Previous research suggests that more organized communities and those with existent resource management institutions may be more likely to participate (Bremer et al. 2014; Kosoy et al. 2008).

An extensive body of research has also pointed to the potential of external governmental and nongovernmental actors to facilitate participation in PES, particularly for poorer participants (Adhikari and Agrawal 2013; Bracer et al. 2016; Bremer et al. 2014; Kosoy et al. 2008; Pham et al. 2010). While intermediaries can play various roles in the PES process (Pham et al. 2010), scholars suggest that external governmental and nongovernmental actors may facilitate participation by targeting particular communities, providing program information, building trust in the program, and reducing some of the transaction costs in navigating and fulfilling application requirements (Adhikari and Agrawal 2013, Bremer et al. 2014; Leimona and Lee 2008; Milder et al. 2010; Pagiola et al. 2005). Studies also indicate the potential of nongovernmental organizations to facilitate agreement across households with potentially diverse interests (Adhikari and Agrawal 2013; Kosoy et al. 2008).

Ultimately, the successful implementation of the collective PES agreements is dependent, in part, on household acceptance of that decision, and the respective resource regulations (Kerr et al. 2014; Sommerville et al. 2010). Research on decision-making and compliance suggests that if households fail to participate or disagree with the decision, they may be more likely to think that the regulations are unfair and are less likely to comply with the resource use restrictions (DeCaro and Stokes 2008; Frey et al. 2004; Kuperan and Sutinen 1998; Nielsen 2003; Tyler 2006). Household understanding and acceptance of the PES conditions is particularly important in commons arrangements where it may be difficult to monitor and enforce the regulations, and individual households face different incentives structures with respect to the costs and benefits of participation (Kerr et al. 2014; Ostrom 1990). While scholars have expressed concerns with household representation in the collective decision to join PES (Corbera et al. 2007a, b; Hendrickson and Corbera 2015; Kosoy et al. 2008; Pascual et al. 2014), to our knowledge, no study has explicitly examined how the decision to participate aligns with household preferences and the factors that may contribute to higher levels of consensus. Here, we contribute to our understanding of the communal decision to participate in PES by considering how the attributes of participant communities may change over time, the degree to which the communal decision aligns with households' preferences, and the role of specific communal governance factors and external support in facilitating the decision process.

The Ecuadorian PES Program

In 2008, the Ecuadorian government created Programa Socio Bosque (PSB) with the dual goals of preventing the destruction and degradation of native ecosystems, and increasing income and human capital in the poorest communities of Ecuador (De Koning et al. 2011). The program broadly targets regions of Ecuador that have ecosystems that are threatened, provide valuable environmental services such as regulation of hydrological systems, carbon storage, and biodiversity; and have some of the poorest households and communities (MAE 2009).[3] Within these targeted regions, PSB publicizes the program via newspaper ads, radio publicity, and its extension agents. In addition, several local NGOs promote the program in the communities they work with. It is ultimately, however, up to the individual communities to decide whether they wish to join.

[3] Note that this targeting is very coarse as PSB has identified large regions of Ecuador that fit these criteria, but has not refined the criteria to more specific locations or communities (Farley et al. 2011).

Similar to many PES projects in the developing tropics, in PSB, the government provides an economic incentive to poor farmers and communities who voluntarily enter into conservation contracts in which they agree to conserve native ecosystems in return for direct payments depending on the number of hectares conserved. Like many programs around the world, PSB is not directly linked to a market and the payments are intended to act as an incentive or compensation for conservation behaviors; the payments are not based on calculated opportunity costs (De Koning et al. 2011). The program works with both individuals and communities, however, 88% of the conservation lands are under community contracts (MAE 2012).

This study focuses specifically on communal participation in PSB's efforts to conserve Ecuador's highland ecosystem, páramo. Páramo, a high-elevation ecosystem of grasslands and shrubs (starting at about 3200 m, depending on the particular region), provides critical ecosystem services, namely water provision and carbon storage in the soils (Buytaert and De Bièvre 2012; Farley et al. 2004). The páramo is also home to many marginalized, rural residents who use the land for grazing sheep and cattle, and agriculture activities. Grazing, burning and afforestation with non-native species are often considered to be principal threats to the páramo, although their impacts are poorly understood (Buytaert and De Bièvre 2012; Farley et al. 2013; Hofstede et al. 2014). In addition, urbanization and climate change are considered to alter the ability of the páramo to provide ecosystem services (Buytaert and De Bièvre 2012; Hofstede et al. 2014).

In our study, all communities collectively own (de facto or de jure) their páramo lands. By law, each community is governed by an elected "executive body" that represents the community in all external relations with governmental and non-governmental organizations, and is charged with governing the day-to-day activities in the community. The executive body works with the community to make budgetary decisions, organize community assembly meetings and *mingas* (work parties), create and enforce community norms and rules, and mediate conflicts (Korovkin 2002).

The executive body also mediates the decision to join PSB. The decision and the amount of land to include in PSB is voluntary and must be approved by a community assembly, although the specific mechanism a community uses to gain approval is not regulated by PSB.[4] Once approved, the executive governing body signs the PES contract that commits that the community members will not burn, hunt, practice agriculture, or introduce non-native species or any activities that may impact the conservation value of páramo. In addition, participants agree to limit grazing in the páramo to less than semi-intensive levels, although specific grazing limits are ill-defined (MAE 2009).

As of February 2013, PSB had signed 47 contracts with highland communities. Páramo land under PSB varies from 23 to 6165 Ha per community (median of 333) and communities had between 13 and 3800 households (median of 94). Contracts are for 20 years and payments are made twice a year to the community. Payments are based on the number of hectares under conservation and are intended to be used for community development projects in accordance with community investment plans (Krause and Loft 2013; MAE 2012). Yearly payments range between $1380 and $62,030 per community (median of $11,414).

Methods

Theoretical Framework and Variables

We organize our study around two principal outcomes: the collective decision to participate and household participation preferences at the time a community decided to participate. To understand the factors associated with these outcomes, we use the social-ecological systems (SES) framework to structure our data gathering and our analyses (McGinnis and Ostrom 2014). The SES framework initially proposed by Ostrom (2007), is a multi-tiered framework that provides the researcher with a set of categories to examine how characteristics of the resource systems, household attributes, local governance systems, and external interactions influence resource management. The use of the framework provides us with a systematic means to organize the various variables predicted to influence participation, identify patterns of interactions, and contribute knowledge to the growing body of empirical studies that aim to understand the governance of complex social and ecological systems (please see McGinnis and Ostrom 2014 for a full description of the framework).

Tables 1 and 2 indicate the variables and their measurement in each of the respective SES categories that we have adapted to the specifics of our study. Our analysis is specifically focused on the socioeconomic attributes and governance conditions that may influence participation. In considering the attributes of the resource system, we have tried to maintain the broad biophysical conditions constant as all resource systems are páramo lands, located at similar altitudes, and with similar access conditions. While previous work suggests that the amount of land available, soil conditions, slope, altitude, and ease of access may either encourage or discourage land-use, and the propensity for a

[4] Communities may either vote or join by community consensus processes. Neither voting nor community consensus, however, necessarily ensure that a clear majority agrees with the decision.

household to want to join a PES program (Chowdhury 2006; Langpap 2004; Lopez and Sierra 2010; Mitsuda and Ito 2011; Zbinden and Lee 2005), in this study, our analysis is limited to how spatial characteristics may influence use and pressure on the resource system.[5] Specifically, we consider how size of páramo, the number of hectares of páramo per household, and the distance of the páramo from the community center are associated with participation. We expect that those with larger páramo, smaller population densities and those living farther from the páramo will be less dependent on the resource and will, therefore, be more likely to join PES (Langpap 2004; Pagiola et al. 2010; Zbinden and Lee 2005). Similarly, at the household level, we expect that those households with greater access to individual agriculture and grazing lands will be less dependent on the páramo, and therefore, more likely to support participation.

Our analysis considers a number of socioeconomic factors predicted to influence participation preferences (Bremer et al. 2014; Langpap 2004; Pagiola et al. 2008; Zbinden and Lee 2005). First, we consider ethnicity, specifically whether a community is predominately indigenous or not. In Ecuador, the indigenous federations have taken an explicit stance against PSB stating that are ideologically opposed to the commodification of nature in the PES model and cautioning that it may create conflict in the communities (Reed 2011). Given the Ecuadorian indigenous federations opposition to PSB, we expect that indigenous communities will be less likely to participate in PSB.

Second, we include variables to assess dependency on the páramo. Specifically, we assess wealth, reliance on off-farm income sources, and use of páramo for grazing (Bremer et al. 2014; Engel et al. 2008; Pattanayak et al. 2010). Wealth is an index based on the prevalence of different household assets. In our community-level analysis, this information is only available in the aggregate, and we are not able to do within community comparisons.

The variable off-farm income is a dummy variable that considers whether any of the top three income sources for households come from off-farm activities such as work in service industries in the nearby cities, contractual labor or remittances. As a dummy variable this is only a rough measure to assess dependency on agricultural activities and we recognize that it is limited in that it does not capture the complete portfolio of livelihood activities that support a household.

[5] Note that we are unable to assess more sophisticated biophysical features such as slope or soil conditions because of lack of geographically referenced data on the location of the páramo lands for all communities. Similarly, at the community level, we cannot assess how access to non-páramo lands (for agriculture and grazing) influences participation as non-páramo lands are often not collectively owned, but rather depend on each individual household's landholdings; information that is not available at the communal level.

Our measurement of prior use focuses specifically on whether a community or household had cattle in the páramo prior to PSB entering the region. While PSB does not explicitly prohibit grazing, livestock use of the páramo is one of the focal points for communities. In interviews with community leaders about the PSB restrictions, 76% stated that PSB either restricts or prohibits livestock on the páramo, the majority of those stating that the program prohibits cattle.

Lastly, in our household analyses of participation preferences, we include education of the head-of-the household, age of the head-of-household, and the size of the household as these factors have also been predicted to influence participation preferences in PES programs, although the direction and significance of the findings have been mixed (Bremer et al. 2014; Langpap 2004; Pagiola et al. 2010; Pattanayak et al. 2010; Zbinden and Lee 2005).

Our analysis of the role of communal governance attributes in facilitating participation considers a communities' capacity to organize and communal resource management institutions (Bremer et al. 2014; Clements et al. 2010; Kosoy et al. 2008; Petheram and Campbell 2010). Work by Kosoy et al. (2008) and Bremer et al. (2014) suggests that a community's organizational capacity, pre-existing land-use rules, and ability to create consensus facilitate participation. Here, we measure organizational capacity as an index that consists of the number of assemblies and mingas a community holds each year and if the community applies a monetary sanction for failure to attend assembly meetings. This index is based upon previous work that examined organization in Andean communities (Schmitt 2010; Hayes et al. 2015). The assumption is that communities that are more organized will have more opportunities to share information about the program and involve constituents in the decision-making processes. In addition, we consider whether the community had rules prohibiting grazing in the páramo prior to Socio Bosque entering the region, the perceived difficulties of monitoring the páramo, and the difficulty the community has in coming to consensus or agreement on collective decisions (Bremer et al. 2014; Kosoy et al. 2008; Schmitt 2010).

Finally, we consider how external support may influence the likelihood that a community participates (Bremer et al. 2014; Kosoy et al. 2008). In our analysis we consider whether the community learned of the payment program from PSB directly (i.e. if PSB targeted the community), and if the community had support from an NGO or government agency in the decision to participate. We also consider whether a community perceives that the process to apply to PSB is difficult, but are unable to include it in the statistical analysis due to relatively few non-participant communities with sufficient information to answer the question.

Table 1 Community level variables

Variable	Variable construction
Outcome	
Participation in PSB	Whether community participated in PSB as of 2013
Resource system	
Páramo size	Total number of hectares of páramo that a community collectively holds
Distance to páramo	Minutes walking to edge of páramo from community center
Population density	Hectares of páramo that a community collectively holds per household
Household socio–economic attributes	
Ethnicity (Indigenous)	Self-reports by leaders of whether the community is predominately indigenous, mixed, or mestizo. Dummy variable coded as 1 if community is predominately indigenous
Off-farm income	Self-reports by leaders of the top three income sources for households in the community. Dummy variable coded as 1 if any of the top three income sources for the households in the community come from non-farm activities
Páramo use before PSB	Self-reports by leaders of whether community members were using the páramo for productive activities (grazing, agriculture, hunting, etc.) prior to participation in PSB (1 = yes). For non-participants, the variable assesses if the community is currently using the páramo.
Wealth index	Community wealth based on leaders' report on the prevalence among households of: (1) electricity, (2) running water, (3) flush toilets, (4) vehicles, (5) motorcycles, (6) television, (7) gas stoves, and (8) cement floors. Using principal component analysis, the 8 variables were weighted with the first component vector of each normalized variable (Hayes et al. 2015)
Communal governance attributes	
Organization capacity index	Community organization level based on: (1) # of communities' assemblies per year, (2) # *mingas* (traditional communal work) per year, and (3) if there are monetary sanctions for members that fail to attend assembly meetings (Schmitt 2010). Using principal component analysis, the three variables were weighted with the first component vector of each normalized variable (Hayes et al. 2015)
Monitor páramo	Self-reports by leaders of difficulty level (difficult, medium, or easy) of controlling use of the collective páramo land. Dummy variable coded as 1 if monitoring is difficult or medium
Prior rules for páramo	Self-reports by leaders of whether the community had rules to forbid grazing in communal páramo before entering PSB. Dummy variable coded as 1 if community had rules
Difficult to achieve community consensus	Self-reports by leaders of difficulty in attaining community consensus in assemblies when new projects arrive to the community. Dummy variable coded as 1 if consensus is difficult or somewhat difficult to reach
Community size	Number of households in a community
External support	
Direct initial contact from PSB	Self-report by leaders on how learned about PSB. Dummy variable coded as 1 if community heard directly from a PSB extension agent, and 0 if they heard from media, events, neighbors, NGOs, or other governmental offices
External support from NGO or governmental agency	Self-reports by leaders of whether community received a positive influence from NGOs or local government to participate in PSB

PSB Programa Socio Bosque

Site Selection and Data Gathering

Site selection

The selection of study sites and the respective data gathering is based on a two tiered research design that sought to first survey all participant and potential participant communities in the highlands of Ecuador ($n = 67$), and then use a smaller set of case studies ($n = 6$) to further explore how household characteristics and community governance dynamics influence household participation preferences within communities.

To study the factors associated with the decision to participate, we surveyed participant communities ($n = 44$) and non-participant communities ($n = 23$) across the highlands. Our sample of participant communities is almost a complete census of the 47 communities that were participating in PSB as of February 2013. We were unable able to locate contact information and access three communities.

Non-participant communities were selected based on a list of potential participant communities that held collective páramo in the broad regions that PSB was targeting, had heard of PSB, but were not participating. We created the list of potential participating communities by (1) asking PSB

Table 2 Variables for household participation preference

Variable	Variable construction
Outcome	
Participation preference at time of decision	Report by head of household if they were in favor, against or undecided towards participation at the time of deciding to participate in PSB. Coded 1 as favor, and 0 as against and undecided as these two groups did not approve participation. In addition, we coded as 2 those households that did not have knowledge of the program (this category is not included in the logit model)
Resource system	
Individual farming land	Report by head of household on number of hectares of land household has for agriculture or grazing
Distance to páramo	Using GIS and focal groups, the community was divided in three sectors based on distance to the closest edge of páramo. Dummy variable coded as 1 if household resides close to páramo (higher sector), and 0 otherwise
Household socio–economic attributes	
Household size	Report by head of household on the number of adults/children living in household
Education level head of HH	Report by head of household on the number of years of formal education. Dummy variable coded as 1 if head of household has more than 6 years of education (equivalent to more than elementary school level)
Off-farm income	Report by head of household. Dummy variable coded as 1 if household has income from non-farm activities
Wealth index	Household wealth level based on report by head of household of having: (1) electricity, (2) running water, (3) flush toilets, (4) vehicles, (5) motorcycles, (6) television, (7) gas stoves, and (8) cement floors. Using principal component analysis, the 8 variables were weighted with the first component vector of each normalized variable
Grazed páramo before PSB	Report by head of household whether the household grazes cattle or sheep in the communal páramo in 2008 (before entering PSB). Coded as 1 if household was grazing before PSB participation
Household participation in governance	
Active participation in assembly meetings	Report by head of household on how they participate in assemblies: very active (almost always gives opinion), more or less active (sometimes gives opinion, depends on topic), and not active (rarely gives opinion). Dummy variable coded as 1 if household participation is very or somewhat active.

PSB Programa Socio Bosque

extension agents about targeted communities that haven't joined PSB, (2) asking participating communities for neighbor communities that could potentially participate, but had not as of yet chosen to do so, and (3) by asking municipal offices for the list of communities that held collective páramo lands in the target regions, and physically surveying communities in those regions. After contacting the communities on the list, in total we were able to include 23 of the 28 non-participant communities that we identified as potential participants. All non-participant communities held collective páramo lands and were familiar with the PSB program. In our sample, communities had heard of the program from a variety of sources including an extension agent or NGO, from their neighbors, or from advertising and flyers. In this study, we were particularly interested in those communities that had overcome the collective action challenges of making a definitive decision to join, and were thus, participating communities. The non-participants included communities in which the community had collectively decided not to participate, and those in which the leader and community members were not pursuing participation in PES. In our sample of non-participants, thirty percent had made a collective decision not to participate in the program, whereas the others had not taken actions to pursue the program.[6]

In the second stage of the research, we conducted six community case studies in participant communities to assess the factors that influence household preference for participation and explore how household preferences align with the collective decision to participate.[7] All case study communities were located in the central Andean region in the provinces of Tungurahua and Chimborazo (see Fig. 1). We chose to study the central highlands because the majority of PSB's work with communities in the páramo (68%) has been in this region. All communities had been with the program for a minimum of 2 years (maximum of

[6] In considering the sample of non-participants, it is important to recognize that the decision to participate is an evolving process. Our study highlights who are the first and second group of participants. It is quite possible that the current non-participants may change their minds at some point and become participants.

[7] We originally intended to compare household preferences across participant and non-participant communities, however, too many households in non-participant communities had insufficient information to be able to give an opinion on participation in PSB.

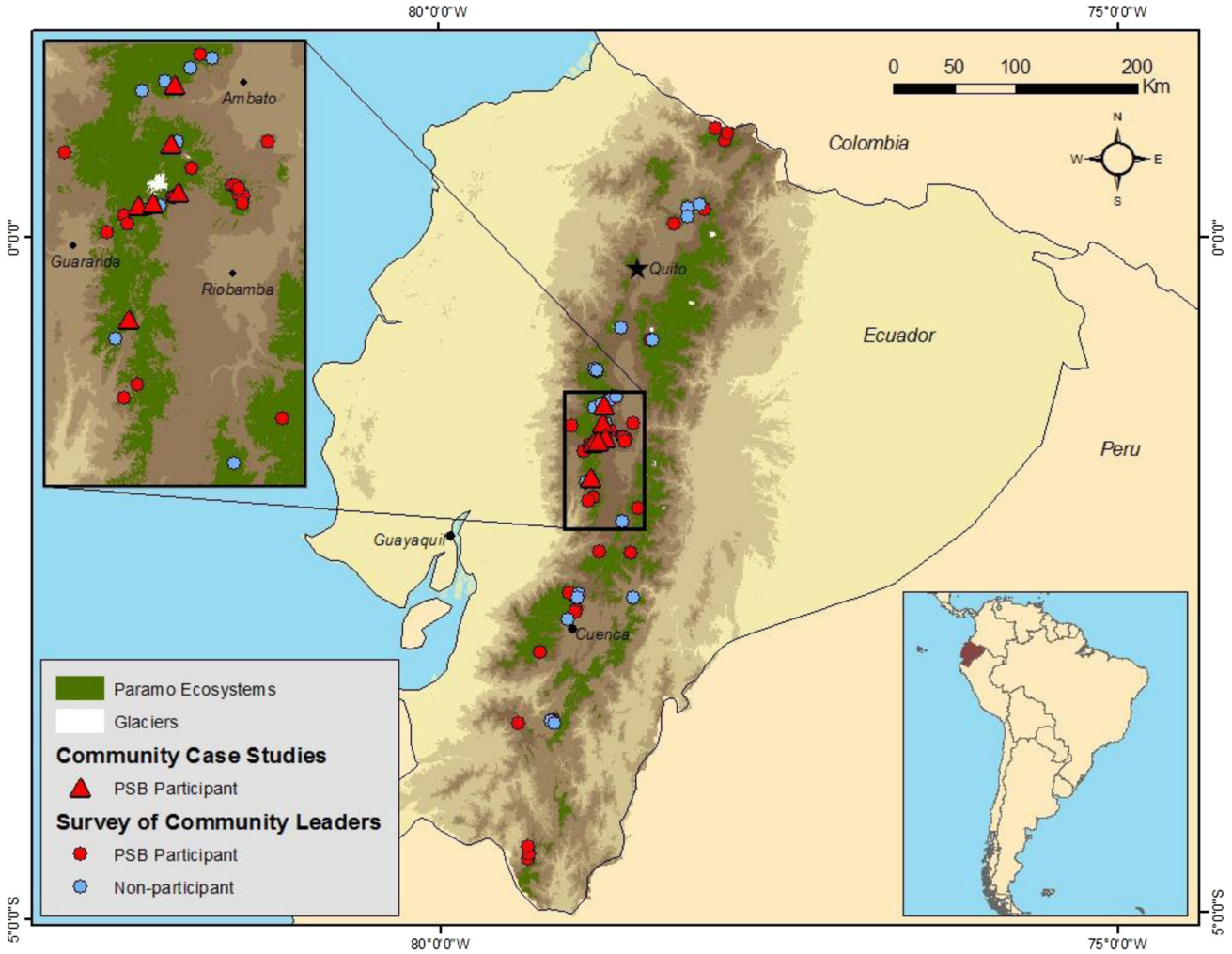

Fig. 1 Study region

5), and had been under one regional PSB coordinator who had been with the program since its inception. The case studies were selected to be representative of indigenous highland communities that had been using their páramo prior to PSB. As such, communities were selected based on the following criteria: identify as Quichua indigenous communities; households depend principally on farm-level activities for their livelihoods; communities had been using the páramo prior to 2008 when PSB entered the region; páramo is located at relatively similar altitudes and with similar topography; and, most residents can access the páramo by walking from their houses in less than 3 h. The communities are representative of the distribution of community sizes and páramo sizes common to the region; and, similar to other páramo regions of Ecuador (Colpari 2013), the communities are located in parishes where 85% of the population or more is unable to meet its basic needs (see Tables 3 and 5 for the descriptive statistics for the survey of highland communities and the characteristics of the case study communities).

Data gathering

To gather data on the characteristics and factors associated with participation in the PSB program, we administered an oral questionnaire to two representatives, hereafter referred to as 'leaders', in each community ($n = 67$). Leaders were former and/or current members of the community's executive board and were selected based on their participation in the original decision to join PSB, their current position as a member of the executive governing body, and their ability to speak to questions regarding the general community characteristics and the decision to participate in PSB. The questionnaire was crafted in alignment with our conceptual framework as described in the section "Theoretical Framework and Variables" and consisted of a set of closed and open-ended questions about the livelihoods of the residents, governance dynamics in the community and the decision to participate (or not) in PSB (see Table 1).

To gather data on household participation preferences, in the six community case studies we administered an oral

Table 3 Community characteristics

	Non-participant communities ($n = 23$)		Early PSB participant ($n = 17$)		Late PSB participant ($n = 27$)		Test
	Mean	SD	Mean	SD	Mean	SD	
Resource system							
Páramo size (ha)	1385	1531	2369	3801	1193	2060	$\chi^2 = 6.210$**[a]
Population density (ha páramo/HH)	16.3	25.0	13.5	16.2	27.8	42.0	$\chi^2 = 0.079$[a]
Distance to páramo (min)	127.1	154.1	126.1	90.1	101.6	87.8	$\chi^2 = 1.039$[a]
Household socio–economic attributes							
Ethnicity (1 = indigenous)	0.78	0.422	0.35	0.493	0.63	0.492	$\chi^2 = 7.659$**[b]
Off-farm income (1 = yes)	0.52	0.511	0.71	0.470	0.37	0.492	$\chi^2 = 4.727$*[b]
Páramo use before PSB (1 = yes)	0.78	0.422	0.65	0.493	0.70	0.465	$\chi^2 = 0.920$[b]
Wealth index	−0.16	1.134	0.30	0.774	−0.05	0.997	$F = 1.107$[c]
Communal governance attributes							
Organization capacity index	−0.22	0.677	−0.13	0.781	0.27	1.281	$F = 1.744$[c]
Monitor páramo (1 = difficult)	0.57	0.507	0.53	0.514	0.44	0.506	$\chi^2 = 0.769$[b]
Prior rules for páramo (1 = yes)	0.17	0.388	0.41	0.507	0.26	0.447	$\chi^2 = 2.835$[b]
Difficult to achieve community consensus (1 = yes)	0.24	0.436	0.29	0.47	0.48	0.509	$\chi^2 = 3.420$[b]
Community size (households)	381	843	594	1015	195	339	$\chi^2 = 3.796$[a]
External support							
External support (1 = yes)	0.09	0.288	0.41	0.507	0.26	0.447	$x^2 = 5.777$*[b]
Direct initial contact from PSB (1 = yes)	0.26	0.452	0.38	0.500	0.36	0.490	$\chi^2 = 0.626$[b]

PSB Programa Socio Bosque, *SD* standard deviation

*$p \leq 0.1$; **$p \leq 0.05$

[a] Kruskal-Wallis

[b] Chi-square

[c] ANOVA

questionnaire to the male or female head of household (48% respondents were female). In the smaller communities ($n < 50$), we administered the questionnaire to a minimum of 50 percent of the households, in the larger communities, we interviewed a minimum of 10 percent of the households. In total we interviewed 212 households (a 6% margin of error at 95% confidence level). Households were selected based upon a sampling process that stratified houses according to their proximity to the páramo. Within each cluster of houses, a relative percent was randomly selected to be interviewed.

The questionnaire asked respondents if, at the time of deciding to participate in PSB, they were in favor, against or undecided towards participation. It also included a set of closed and open-ended questions about what influenced their decision and their perceived benefits and costs since participation (see Table 2). To aid in the recall of the decision to participate, interviewers were instructed to establish a timeframe of reference for when the decision was made (Raphael 1987; Schaeffer and Presser 2003). Interviewers used open-ended questions to further probe and establish the head-of-household's attitude at the time of the decision as compared to current attitudes toward the program. For the analysis, we grouped those that answered against and undecided as these two groups did not approve participation.[8] In addition, we identified those respondents that were not aware that their community was participating in PSB.

In the survey of community leaders and the household survey, the questionnaires were administered by either the principal investigators or by trained local interviewers with expertise in highland communities. Interviews were conducted in Spanish and interviewers were instructed to present themselves as social-science researchers interested in the livelihood and land-use activities in the region. Interviewers were instructed to clearly state that they had no alliances with governmental or non-governmental

[8] We recognize that by aggregating these two groups (against and undecided) we are simplifying households' preferences and consequent analysis. However, PSB aims for communal consensus on participation. If a community member states that he/she was undecided, he or she was not actively approving participation. Furthermore, it is important to note that we did not find statistical differences between these two groups in terms of amount of farming land, distance to páramo, household size, education, off-farm income, wealth, prior use, and active participation in assembly meetings.

organizations working in the region and that all interviewee responses would be confidential.

Analyses

We use statistical analyses complemented by qualitative analyses of open responses to assess the factors associated with participation and household participation preferences. First, we use bivariate statistics (chi-square, Kruskal-Wallis, and ANOVA) to contrast the characteristics of "non-participant" communities (those that had not entered as of 2013), with "early participants" that entered the program at an early stage (2009–2010), and those that were "late participants" who had entered after 2011.

Second, to identify the characteristics of the households that were most likely to favor participation we use a logit model (see Appendix A in supplementary on-line material for correlation tables and descriptive statistics). Bivariate statistics (chi-square, Kruskal-Wallis, and ANOVA) and qualitative responses provide further insights into household motivations and the association of household consensus on the decision to participate with community governance dynamics.

In reading the results, we caution to the reader that the analysis and findings may be specific to the Ecuadorian PES program and context, and the central Andean region in particular. Furthermore, while our survey of communities contains almost a complete census of participant communities, the relatively small number of communities in the sample prohibits the use of regression analysis of the attributes of the communities that choose to participate in PSB and the role of community-level governance factors. Thus, we are unable to test for causation or specifically tease out the influence of external program or NGO targeting on participation as compared other communal characteristics such as organization or prior use.

Results

Who Participates?

Table 3 compares the characteristics of non-participant communities to the early participants that were the first to join the program to those that joined after the program had been in operation for 2 years. The results indicate that the early participant communities are significantly more likely to have larger páramo, although the number of hectares of páramo per household does not differ significantly across the participants and non-participants.

With respect to the demographic and socioeconomic attributes of participants, chi-square test results indicate that early participants are more likely to be non-indigenous. As the program has continued over time, however, more indigenous communities are joining PSB. Results show that earlier participants are significantly more likely to have off-farm income, and while wealth does not significantly vary across earlier, late and non-participants, the data trends suggest that the earlier participating communities are wealthier, as compared to later and non-participant communities. Counter to our expected hypothesis, use of páramo prior to PSB entering the region is not significantly associated with participation.

Communal governance attributes are not significantly associated with the decision to join. It is, however, interesting to note the trends: 40% of early participant communities had prior rules to protect the páramo, while only 17% of non-participants and 26% of late participants had rules. In addition, almost half of the late participants had difficulty achieving consensus, probably delaying the decision to participate, while just a third of early participant had difficult to achieve consensus. Unexpectedly, we found that early participants were less organized than later participants. The results suggest that those communities with prior rules may have found it easier to make the decision to participate in PSB as they were already restricting páramo use. Later communities, however, had to build community consensus to join a program that would imply creating páramo-use rules where before there were none. This process may have depended on greater levels of organization whereby community members had the opportunity to discuss and negotiate entrance in the PSB.[9]

External support from an NGO or governmental agency is significantly associated with the decision to participate, with a greater percentage of the earlier participants receiving external support. In each region in which PSB was working, we spoke with extension agents from PSB and NGOs to understand how PSB and the respective NGOs were promoting the program. Despite comments that the program initially targeted larger páramos, we did not find a significant relationship between PSB direct initial contact (targeting) and páramo size (K-W chi-square = 0.361, $p = 548$, $n = 57$) or with the decision to participate (as shown in Table 3). Nor did we did not find any significant associations between external support from governmental or non-governmental organizations and any of the characteristics of the early, late or nonparticipants identified in Table 3 (please see Appendix B in supplementary on-line material).

Results from semi-structured interview questions further elucidate the factors that influence the decision to participate and the decision-making process. Amongst participant communities, the majority of leaders reported that the

[9] Please note that there is no correlation between prior rules, organization, and difficulty to achieve consensus (see Table A.1 in the Appendix in supplementary on-line material).

reasons to participate were the payment (81%) and the promotion of conservation (66%), particularly the conservation of water. The decision to participate, however, was not easy. Of the participating communities, 59% said that it was difficult to reach an agreement to participate. Many leaders stated that households feared that PSB would take away their lands (59%), or would lose the use of the páramo (11%). Similarly, leaders in non-participant communities noted principal reasons not to join were mistrust of PSB (25%) and the potential to cause community conflict (19%). In addition, many non-participant leaders stated that they needed more external support to explain the program and the entry process (37%), and both participants and non-participants perceived the application process to be complicated (76 and 77% respectively, however, please note that only 9 of the non-participants were able to answer the question).

Household Alignment with Participation

To assess how the decision to participate aligns with household preferences we first analyze the factors associated with a household's participation preference at the time of the decision to join PSB in six participant communities. We then aggregate households' participation preferences to assess consensus levels in each of the six communities and explore some of the factors that may contribute to a higher level of communal consensus on participation.

Determinants of household participation preference

The logit results in Table 4 indicate that household preference to participate in PSB is significantly associated with the degree to which the household depended on the collective lands. Those that lived closer to the páramo and were using it for grazing prior to participating in the program were less likely to support participation. In addition, larger households tended to favor participation. Relative wealth, education, individual farming land and income source were not significantly associated with participation preference.

The logit results suggest that in addition to household-level attributes, community level factors may influence participation preference. We use bivariate statistics to unpack how communal governance and external support are associated with household participation preference ($n = 189$). The results indicate that smaller communities (less than 100 households), with relatively high levels of organization (index > 0), had a higher number of households in favor of PSB ($\chi^2 = 9.334$, $p = 0.002$ and $\chi^2 = 3.403$, $p = 0.065$ respectively). Households that had received external support in favor of participation were also more likely to agree with the decision to participate ($\chi^2 = 6.140$, $p = 0.013$). In addition, we found that households were more likely to be in agreement with the decision to participate in communities that joined PSB later as compared to the early adopters of PSB ($\chi^2 = 3.403$, $p = 0.065$).

Qualitative findings further illustrate some of the divisions within communities on the decision to participate. In household interviews, 32% of those that did not vote in favor said they did not want to lose access to the páramo for extractive benefits (namely grazing), and 60% of the households stated that they were against or undecided because they distrusted the program and/or did not fully understand what they were committing to. In contrast, those that were in favor, cited the conservation benefits as a principal reason for participating (27%), and the value of the economic benefits for themselves or for their broader community (50%). Several households noted that the program was a benefit to poorer members of the community, namely the elderly and single mothers who had few sources

Table 4 Logit regression results on factors influencing households' decisions to participate in six PSB communities

	Coefficient	Standard error	Marginal effect
Active participation in assembly meetings	0.354	0.389	0.072
Household size	0.180	0.078**	0.036
Individual farming land (ha)	−0.030	0.051	−0.006
Distance to páramo (1 = close)[a]	−1.005	0.477**	−0.210
Education level head of HH (1 = high school)[a]	−0.116	0.452	−0.023
Off-farm income (1 = yes)[a]	−0.349	0.456	−0.070
Wealth index	0.251	0.180	0.050
Graze páramo before PSB (1 = yes)[a]	−0.672	0.353*	−0.135
Community 1[a]	2.114	1.210*	0.260
Community 3[a]	−0.107	0.735	−0.022
Community 4[a]	−0.906	0.622	−0.196
Community 5[a]	−0.750	0.673	−0.161
Community 6[a]	0.115	0.748	0.022
Constant	0.399	0.727	
N	184		
Likelihood ratio test	32.68***		
McFadden's Pseudo R^2	0.132		
Overall correct predictions	70.65%		

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Dependent variable: Decision to participate (1 = favor)

*$p \leq 0.1$; **$p \leq 0.05$; ***$p \leq 0.01$

[a] dy/dx is for change of the dummy variable from 0 to 1

of income. One community participant explicitly stated that participation in the program was good because it meant that the páramo no longer benefitted only a select few that use the páramo for grazing; it now provided benefits for the entire community.

Household consensus across communities

Figure 2 demonstrates how the degree of consensus on participation varies significantly across communities and Table 5 shows the household and community characteristics associated with each community. The results indicate a high degree of variation in the level of household support for the decision to participate. While no community had 100% support, less than 50% of those interviewed in communities five and six stated that they favored participating in PSB. Furthermore, in community six, 39% of the respondents did not know that the community was participating in the program.

Recognizing the limits of a small sample size, a comparison of the community characteristics associated with higher and lower levels of consensus points to the importance of communal governance and external support (see Table 5). While prior use is significantly associated with household participation preference (see Table 4), there is no clear association between use and consensus across communities. Rather, communities with higher levels of consensus tended to be smaller communities that are more organized and have greater participation by households in community assembly meetings. In contrast, the two communities with the lowest levels of consensus are larger, have low levels of organization and household participation in assembly meetings, did not have external support in the decision process, and were some of the first to join.

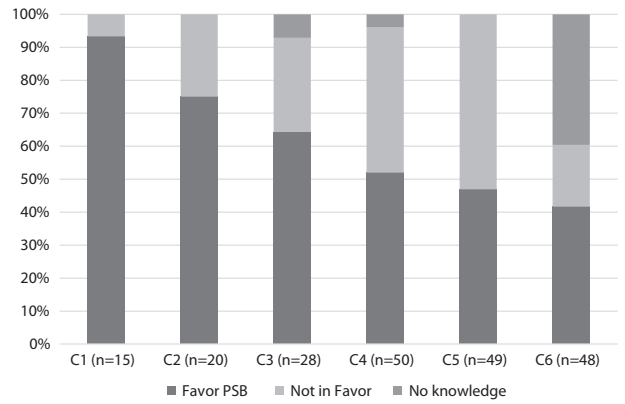

Fig. 2 Household's decisions to participate in six PSB communities

Discussion

In the PES literature there has been much discussion about the characteristics of those that participate in such programs (Engel et al. 2008; Ferraro 2011; Pattanayak et al. 2010). Particularly for collective PES programs, scholars debate how governance factors influence participation and the degree to which the collective decision to participate is supported by the respective households (Clements et al. 2010; Kosoy et al. 2008; Pascual et al. 2014). In the following, we highlight some of the insights from communal participation in PES in Ecuador that contribute to our understanding of the socioeconomic characteristics of the participants, the factors that facilitate the decision to participate, and communal consensus on that decision. The findings suggest that PES can attain participation from communities that were previously using their resource, but that consensus-building may take time. While external support can facilitate the decision to join, the results point to the need to delve further into the degree of household alignment with the decision to join, and how community size, organization and external support may influence the ability to gain collective agreement and transparency.

Table 5 Case studies' community and household characteristics

	Community 1	Community 2	Community 3	Community 4	Community 5	Community 6
Favor participation (% of hh)	93	75	64	52	46	41
Páramo size (Ha)	1079	823	3500	419	1387	1370
Community size (# hh)	18	35	48	300	197	500
Wealth index (avg)	−2.428	−0.506	−0.560	0.914	0.394	−0.522
Páramo use before PSB (% hh)	67	35	82	51	58	35
Active participation in assemblies (% hh)	80	80	82	84	56	63
Organization capacity index	0.947	0.009	0.947	1.459	−0.148	−1.358
Prior rules for páramo	No	No	Yes	No	Yes	Yes
External support	Yes	No	Yes	No	No	No
Time of enrollment in PSB	Late	Late	Late	Late	Early	Early

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Who Joins: The Socioeconomic Characteristics of Participant Communities

Counter to concerns that only those that are not using the resource will voluntarily join a PES program (Engel et al. 2008; Ferraro 2008; Pattanayak et al. 2010), our results found that, over time, resource use was not a prohibitive barrier. Although at the household level, use of páramo was negatively associated with the decision to participate in PSB, there was no significant difference between participant and non-participant communities and prior use of the páramo. In our study, thirty of the 44 participant communities had been using the páramo prior to entering PSB, of which 73% had made changes to their use of the páramo as a results of joining PSB.

Furthermore, the comparison of early, late and non-participant communities indicates that similar to findings in agricultural adoption (Dagang and Nair 2003; Mercer 2004), the characteristics of participant communities may change over time as communities gain more information about the program and its potential costs and benefits. Earlier work on PSB suggested that wealthier communities and those that depend less on their resource systems were more likely to participate (Bremer et al. 2014). In our analysis we found that while early participant communities were significantly less likely to depend on their natural resource systems for their livelihoods (only 29% did not have off-farm income), and tended to be relatively wealthier (although not significantly), late participant communities demonstrated higher levels of dependency on their resource systems that were similar to those of the non-participants (63 and 48%, respectively, did not have off-farm income).

In addition, the comparison of participant communities over time indicates that the ethnic makeup of the participants differed significantly between early and late participants. Only 35% of the early participant communities were indigenous, however indigenous participation was increasing; 63% of the late participants were indigenous communities. The initial reluctance of indigenous communities to join PSB was as expected as the indigenous federations in Ecuador have condemned PSB for ideological reasons and there is a general distrust of government interventions (Reed 2011). Indigenous leaders, however, commented that as the program expanded, they became more confident that PSB would not take their lands, and they also saw how participation could directly benefit their communities.

Interview results further support how participants may change their attitudes toward participation over time. Similar to other studies that examined motivations to participate in PES (Bremer et al. 2014; Farley et al. 2011; Fisher 2012; Kosoy et al. 2008), our interviews found that households that were against participation mistrusted the program (specifically in guaranteeing their rights to their land), and feared losing economic benefits from the páramo. Seven community leaders noted however, that after they saw their neighbors participate, and households gained more information about the program, they supported program participation.

Who Joins: Facilitating Factors

The findings also provide greater empirical support that external organizations and communal governance factors may facilitate the decision to join (Bremer et al. 2014; Clements et al. 2010; Kosoy et al. 2008). In the analysis of the characteristics of early, late and non-participants, PSB direct targeting was not significantly associated with participation; however, external support from NGOs and other governmental agencies was significantly associated. In particular, early participants were more likely to have received external support in the decision to participate. Similar to findings in the literature on the difficulties communities may face in understanding the PES application process and the potential role of intermediary organizations in navigating these processes (Adhikari and Agrawal 2013, Bremer et al. 2014; Leimona and Lee 2008; Milder et al. 2010; Pagiola et al. 2005), the majority of leaders in our study communities (participant and non-participant) stated that the application process was difficult to understand. Furthermore, leaders from non-participant communities commented that they needed greater external support to explain the program to their communities and to help them through the application procedures. It is unclear, however, how the PSB program or the other external organizations targeted their support. While previous research suggests that external organizations or intermediaries can facilitate participation, particularly for the poor (Leimona and Lee 2008; Pagiola et al. 2005; Bracer et al. 2016), we did not identify any specific community characteristics associated with the likelihood that a community would receive external support.

Furthermore, although governance factors (organization, prior rules, difficulty to achieve consensus) were not significantly associated with the decision to participate, data trends in participation over time suggest that community organization may be instrumental in facilitating the decision to participate in communities with greater dependency on the resource system and in those with more difficulties in reaching consensus. The data suggests that for early participant communities, it may have been a relatively easy decision to join. Despite having lower levels of organization, these communities do not tend to rely on farm-level activities for their livelihoods, have larger páramos, and had previously established rules prior to participation. Community leaders did not report difficulties attaining communal consensus in assembly meetings. This, in conjunction with support by an external organization may have

facilitated the fairly quick decision to join PSB. In contrast, late participant and non-participant communities are more reliant on their natural resource systems for their livelihoods, and less likely to have previously established páramo rules. These communities are also less likely to have received external support for the decision. The late participant communities (unlike the nonparticipants), however, tend to be more organized. Interview results with leaders from late adopter communities suggest that while their communities had more difficulties reaching consensus, after a period of watching other communities and discussing the program within their own community members, these communities ultimately agreed to join. While future research is needed, the results suggest that communal organization, specifically regularly organized community meetings, may facilitate learning and negotiation processes needed to attain agreement on the collective decision to join.

Consensus Building

Finally, the results suggest the need to carefully assess how household preferences are aggregated and the factors that may contribute to consensus building. PSB does not require a unanimous vote in support of participation. Rather, communities are required to discuss participation in a communal assembly and come to collective agreement (ill-defined) to join. The results indicate that household support for the decision to participate ranged from 41 to 93%. Those in support of participation were less likely to have been using the páramo, more likely to live closer to the community center, and more likely to have a greater number of children. Qualitative findings concur with the statistical results as households that did not support participation tended to state that they were worried about losing rights to the land and the economic benefits from the páramo. In contrast, similar to other study findings (Farley et al. 2011; Kosoy et al. 2008), those in support of participation expressed arguments about the current and future conservation needs of the community and how the economic incentive could contribute to community development, in addition to providing support to some of the poorer members of the community.

While our analysis of household preferences at the time of the decision did not reveal any systematic differences with respect to wealth, education or participation in the process, the low levels of collective agreement or awareness in some communities, raises concerns about program compliance and transparency. In particular, in one community with low levels of agreement (community 6, see Fig. 2), 39% of the respondents did not know that their community was participating, and thus were unaware of PSB regulations, and had no knowledge of the PSB funds or how they were spent.

The analysis of household participation preferences in the six case studies further supports the role of communal organization and external support in building consensus around the decision to join PSB. Households residing in more organized communities were significantly more likely to agree with the decision to participate as were those households in which the community had received positive support from an external organization in the decision process. Interestingly, communities with high levels of consensus had varied levels of prior páramo use, but tended to be small, and highly organized, with more households actively participating in assembly meetings. Likewise, similar to theories and findings from other studies that outside intermediaries can be instrumental in providing information and building consensus in the decision process (Adhikari and Agrawal 2013; Khurana 2002; Kosoy et al. 2008; Pham et al. 2010), in interviews, community leaders and extension agents (both NGO and governmental) frequently emphasized the importance of community meetings and outside actors in "socializing" or informing the community of the program, building trust, and gaining community approval.

Conclusions

Since the late 1990s, with the turn to market-based mechanisms for conservation and the United Nations proposal to use PES schemes as a means to channel funding for Reduced Emissions from Deforestation and Forest Degradation (REDD+), PES has become increasingly prevalent as a tool for conservation in poor, resource-dependent communities (Kerr et al. 2014; Pascual et al. 2014). If PES is to succeed in the communal context, however, we need to better understand the collective decision-making process to join PES and its implications for sustained resource management of complex SES. Communities are heterogeneous social structures whose decisions may be influenced by a number of internal and external conditions, and as such, may vary in the degree to which they represent the interests and actions of all constituents (Agrawal and Gibson 1999). The findings from Ecuador suggest that internal governance conditions and external support may play an instrumental role in encouraging resource-dependent communities to join PES and building internal consensus. But, further research is needed.

Specifically, we need to better understand the procedure by which communities make decisions to identify if there are particular community governance characteristics that facilitate transparency in the decision process and widespread agreement with the decision outcomes. Our study

found that level of organization, principally community meetings, were an important factor in gaining household support. Previous research has also found organization important for the successful implementation of PES (Hayes et al. 2015, 2017). We need, however, to broaden our understanding of organization and unpack the formal and informal institutional mechanisms that characterize more organized communities to understand what specifically enables them to facilitate consensus and implement programs.

Linked to the above, research is needed to empirically assess household representation in communal decisions. Much of the discussion of equity has focused on the distribution of outcomes, namely the costs and benefits, from participation in PES (McDermott et al. 2013; Pascual et al. 2014). Acceptance of the program, and perceived fairness of the outcomes, however, may depend on the degree to which a household was included in the decision process (DeCaro and Stokes 2008, 2013). In our analysis we are unable to fully evaluate internal decision-making dynamics, and who ultimately influenced participation, as we were not present in the actual decision-making processes. The resistance to PES by households that were using the resource prior to joining the program, however, points to the need to understand how the individual interests of a few households are weighed against broader community benefits and how the respective collective decisions outcomes may result in greater community cohesion or conflict.

Finally, the results suggest that external governmental and non-governmental organizations may be instrumental in consensus building and the decision to participate. While the specific ways in which external organizations facilitated participation was largely outside the scope of this study, recent research has begun to empirically identify the specific roles that external organizations or intermediaries can play in PES, and how they may serve to support participation by the poor (Bracer et al. 2016; Leimona and Lee 2008; Pham et al. 2010). Scholars, however, caution that while intermediaries can support collective participation; in their desire to encourage participation, they may also thwart participatory decision-processes (Pham et al. 2010). Future research is needed to assess how external organizations and extension agents might more strategically target their support to those communities that meet the desired program characteristics, but are reluctant to join, and the specific type of support (i.e. financial, logistical, training, etc.) that will best serve to empower communities in their collective decision-processes and contribute to their sustained management of their resource systems. If PES is to succeed as an effective means to support conservation in rural, resource-dependent communities, we must further our understanding of how to support collective decisions that are based on an informed and democratic process.

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Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no competing interest.

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