



# The Impact of Payments for Environmental Services on Communal Lands: An Analysis of the Factors Driving Household Land-Use Behavior in Ecuador

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**Summary.** — This article examines how Payments for Environmental Services (PES) influence household land-use behavior in the context of common-property lands. PES programs have been increasingly applied to communities who collectively manage their lands. While a number of authors have expressed concerns about the ability of said programs to generate additional environmental benefits and the potential for PES to counter community resource management arrangements, few empirical studies have explicitly examined PES in the context of communal resource management. Here, we take advantage of the gradual rollout of an Ecuadorian PES program to compare land-use behavior on collective lands in participant communities to households in communities that are waiting to participate. The goals of the analysis are to (a) identify if the PES program has produced changes in land-use, (b) assess the degree to which household characteristics and communal governance conditions drive land-use behavior, and (c) explore the interplay between PES and communal resource management institutions. Data were gathered from a cross-sectional survey of 399 households located in 11 communities. We use difference-in-differences to estimate the average effect of PES program participation on household behavior. Logit models, coupled with qualitative analysis, unpack how communal governance characteristics influence land-use behavior and the interplay between communal governance conditions and PES. We find that PES reduced the number of households grazing livestock on collective lands by 12%, however, household and communal governance factors are also instrumental in determining land-use decisions. Our results provide empirical insights into the debate over PES in collective resource management and illustrate how PES and communal resource management institutions can build upon each other to attain desired household conservation behavior.  
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## 1. INTRODUCTION

In the fields of conservation and international development, scholars have repeatedly called for diagnostic tools and associated theories to assess not only whether, but under what conditions, a specific policy tool works (Basurto & Ostrom, 2009; Deaton, 2010; Miteva, Pattanayak, & Ferraro, 2012; Ostrom, 2007). This article contributes to our understanding of if and how Payment for Environmental Services (PES) works in the context of collective resource management.

PES and related incentive-based conservation programs are quickly becoming the policy tool of choice to promote conservation in developing countries (Adhikari & Agrawal, 2013; Muradian, Corbera, Pascual, Kosoy, & May, 2010; Wunder, Engel, & Pagiola, 2008). PES programs are supported by major conservation organizations and international donors, and are the core of many countries' plans to achieve Reduced Emissions from Forest Degradation and Deforestation (REDD+) goals (Engel, Pagiola, & Wunder, 2008; Ferraro, 2011; Wertz-Kanounnikoff & Kongphan-Apirak, 2009). The conventional PES model is frequently defined as a voluntarily transaction in which a buyer agrees to pay a resource user to provide an environmental service, on the condition that the resource user provides said service (or land uses likely to secure such environmental service) (Ferraro & Kiss, 2002; Wunder, 2005). In practice, however, PES programs include an array of incentive-based arrangements that vary with respect to the buyers and sellers, the incentive provided, and the degree of conditionality (Goldman-Benner *et al.*, 2012; Muradian *et al.*, 2010).

Proponents of PES argue that said programs may be a more just and effective means to achieve conservation outcomes as participants voluntarily enter a payment program and are compensated for providing the desired environmental services, or land-use proxies (Engel *et al.*, 2008; Ferraro & Kiss, 2002; Wunder, 2005, 2013). There is, however, considerable debate over whether economic incentives are an appropriate tool for conservation. Particularly in the context of resource-dependent communities, scholars express concerns about the social impacts of PES, and its effectiveness at attaining behavioral change and the desired environmental services (Igoe & Brockington, 2007; Liverman, 2004; McAfee & Shapiro, 2010; Naeem *et al.*, 2015; Pattanayak, Wunder, & Ferraro, 2010).

In recent years, governmental and non-governmental organizations have increasingly applied PES to communal systems where resource users share rights (*de facto* or *de jure*) to use

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and manage their common-pool resource systems (Dougill *et al.*, 2012; Kerr, Vardhan, & Jindal, 2014; Sommerville, Milner-Gulland, Rahajaharison, & Jones, 2010). In the communal context, a community agrees to participate in a PES arrangement and receive a collective payment for household compliance with the contract conditions (Kerr *et al.*, 2014). The application of payment programs to collectively managed resources obfuscates the relationship between the contract, payment and the individual resource use decisions found in more conventional individual PES agreements and raises a number of issues regarding the decision to participate, the ability of communities to transmit PES resource-use restrictions to all households, and equity implications (Kerr *et al.*, 2014; Pascual, Muradian, Rodriguez, & Duraiappah, 2010; Sommerville *et al.*, 2010).

Here, we address one piece of this discussion by considering how PES influences behavioral change on collectively managed lands. Previous research on the effectiveness of PES in providing additional conservation benefits has largely focused on the ability of payment programs to, on average, reduce deforestation levels, with a few studies looking specifically at behavioral change for a broader range of resource uses (Alix-Garcia, Shapiro, & Sims, 2012; Arriagada, Ferraro, Sills, Pattanayak, & Cordero-Sancho, 2012; Arriagada, Sills, Pattanayak, & Ferraro, 2009; Bremer, Farley, Lopez-Carr, & Romero, 2014; Clements & Milner-Gulland, 2015; García-Amado, Pérez, Escutia, García, & Mejía, 2011; Sommerville *et al.*, 2010). While the findings are mixed, a number of studies point to ability of PES to reduce deforestation (Alix-Garcia *et al.*, 2012; Arriagada *et al.*, 2009, 2012; Clements & Milner-Gulland, 2015), others find varying reductions in resource-use behavior (Bremer *et al.*, 2014; Clements & Milner-Gulland, 2015; Sommerville *et al.*, 2010). Study findings suggest that there is substantial heterogeneity across the impacts and point to the need to better understand the conditions associated with greater program effectiveness (Alix-Garcia *et al.*, 2012; Boerner *et al.*, 2016; Pattanayak *et al.*, 2010).

With respect to the effectiveness of PES on collectively managed resource systems, of particular interest is how a community's governance characteristics may influence its ability to convey the PES land-use restrictions to all users (Clements, John, Nielsen, An, Tan, & Milner-Gulland, 2010; Hayes, Murtinho, & Wolff, 2015; Kerr *et al.*, 2014; Sommerville *et al.*, 2010), and how PES impacts may vary across households faced with different incentive structures (Kerr *et al.*, 2014; Kosoy, Corbera, & Brown, 2008). To our knowledge, no quantitative study on PES has analyzed the governance characteristics of the respective communities to assess how these characteristics, in addition to household characteristics, engage with PES to influence changes in land-use behaviors.

In this study, we examine the impacts of an Ecuadorian payment for conservation program on household land-use behavior on communal lands. The goals of the analysis are to assess whether, on average, the Ecuadorian payment program influences household land-use behavior to produce changes in land-use that would otherwise not have occurred absent the program, and to identify how communal governance characteristics mediate household land-use behavior and engage with PES.

Our analysis uses the "Institutional Analysis and Development" (IAD) framework developed by Ostrom and colleagues (Ostrom, 1990, 2005) to structure the various theories and associated variables predicted to influence rural land-use decisions and collective resource management. Cases were selected based on a quasi-experimental design that matched participant

communities with non-participant communities. To address possible self-selection bias into the program, we compare land-use behavior in participant communities to households in communities that have expressed an interest in participating and are on an informal waitlist to participate. Data were gathered from a cross-sectional survey of 399 households located in 11 communities. Behavioral change is based on stated changes in land-use, which we further verify with field-based land-use assessments and key informant interviews. We use difference-in-differences to estimate the average effect of PES program participation on household behavior. Logit models, coupled with qualitative analysis unpack how communal governance characteristics influence land-use behavior and the interplay between communal governance conditions and PES.

We find that, on average, the Ecuadorian payment program significantly reduces household use of collective lands, namely via a decrease in the number of households grazing. However, household and communal governance factors also shape land-use decisions. Furthermore, our findings suggest that the Ecuadorian program performs better in communities with a history of land-use rules. Future research is needed to track behavioral change, institutional development, and actual changes in the provision of ecosystem services in the respective communities over time.

## 2. THEORETICAL APPROACH

In the PES model, farmers are assumed to make land-use decisions that optimize their net financial benefits in light of perceived risks (Fisher, 2012; Wunder, 2013). While a substantial body of literature in land-economics supports the theory that farmers consider the expected benefits and costs in their resource-use decisions (Koontz, 2001; Mercer, 2004), interdisciplinary work in the social and behavioral sciences suggest that resource-use decisions are not purely economic. Nonmonetary and cognitive factors such as the noneconomic value that a farmer places on the resource, the perceived legitimacy of the prescribed land-uses and the communal norms associated with those uses may all shape behavior (Beedell & Rehman, 2000; Chowdhury & Turner, 2006; Grothmann & Patt, 2005; Hirsch, Adams, Brosius, Zia, Bariola, & Dammert, 2011; Koontz, 2001; Petheram & Campbell, 2010; Vignola, Koellner, Scholz, & McDaniels, 2010).

Furthermore, in the context of collective resource management, theoretical and empirical work suggests that household resource-use decisions depend on the community, and the respective governance institutions, in which the household resides (Agrawal, 2007; Ostrom, 1990; Ostrom, Gardner, & Walker, 1994). Researchers have consistently found a positive association between a community's governance characteristics and household resource use practices. Specifically, communities that are able to self-organize to address collective action problems, devise communal resource management rules, and monitor and enforce those rules are more likely to sustain their resource systems (Berkes & Folke, 1998; Chhatre & Agrawal, 2008; Coleman & Steed, 2009; Gibson, Williams, & Ostrom, 2005; Ostrom, 2005; Ostrom & Nagendra, 2006; Persha, Agrawal, & Chhatre, 2011).

While a number of PES scholars have discussed the potential role for communal organization and governance institutions in PES (Adhikari & Agrawal, 2013; Clements *et al.*, 2010; Dougill *et al.*, 2012; Kosoy *et al.*, 2008; Sommerville *et al.*, 2010), the ways in which PES programs interact with communal resource management systems are poorly understood (Dougill *et al.*, 2012; Kerr *et al.*, 2014; Muradian, 2013; Narloch, Pascual, &

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