ABSTRACT

In recent decades, conservation planning that is organized and funded by international agencies has embraced market-based mechanisms to promote sustainable landscapes across the globe. Costa Rica has embraced these mechanisms, offering itself as a laboratory for sustainable development initiatives that purportedly intertwine human and environmental well-being. The effectiveness of these market-based mechanisms is little understood, in part because academics and policy analysts seldom question how conservation markets intersect with the human values that are their intended targets. In this dissertation, I analyze how market-based conservation mechanisms, particularly nature tourism and payments for environmental services, engage with landowner values for conservation land uses in the Bellbird Biological Corridor of Costa Rica, and the extent to which these mechanisms effectively foster sustainability. I employ mixed methods, combining ethnography with a stated choice experiment and spatial analysis to triangulate the relationship between landowner values and conservation land uses in the study area. I find that though forest has regrown throughout the study area during the last few decades, market-based mechanisms do not appear to be directly responsible for this regrowth. On the
contrary, the particular market-based mechanisms analyzed seem to impede rather than promote sustainability because they encourage some aspects of environmental health and undermine others. Analysis of landowner values indicates that these market-based mechanisms are poorly aligned with conservation values in the study area, and they may reinforce a simplistic, monetary view of the environment that runs counter to the long-term goals of sustainability. My findings contribute to literature in anthropology that examines the relationship between environmental markets and sustainability, as well as to interdisciplinary conservation literature examining policy efficacy. This research paves the way for further exploration of the impacts of market-based conservation policies on conservation values.

INDEX WORDS: Costa Rica; sustainable development; payments for environmental services; nature tourism; decision-making; nonmarket valuation; spatial analysis; sustainability science; social-ecological systems; conservation
CONSERVATION PLANNING IN A GLOBAL ERA: THE ROLE OF MARKET-BASED MECHANISMS IN PROMOTING SUSTAINABLE DEVELOPMENT IN COSTA RICA

By

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B.A., Williams College, 2001

A Dissertation Submitted to the Graduate Faculty of The University of Georgia in Partial Fulfillment of the Requirements for the Degree

DOCTOR OF PHILOSOPHY

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CONSERVATION PLANNING IN A GLOBAL ERA: THE ROLE OF MARKET-BASED MECHANISMS IN PROMOTING SUSTAINABLE DEVELOPMENT IN COSTA RICA

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May 2016
DEDICATION

For my husband, David, who is the present, and our children Joshua and Keila, who are the future
AKNOWLEDGEMENTS

There are so many people to thank for supporting me in this endeavor over the course of the last 6 years and prior: advisors, mentors, family members and friends who helped to see me through to the end. My advisor, Dr. Ted Gragson, has tirelessly worked to shape me into a respectable anthropologist, reading countless drafts of grant proposals, manuscripts, and dissertation chapters. He has encouraged me to stay true to my inclination to a scientific approach to social-ecological systems research, while providing me with the space to push boundaries in my own writing and analysis. And perhaps I am most grateful for his mentoring me as a human—for understanding that as a student I am a whole human being with outside commitments and priorities, and offering advice with that in mind. My committee members have been incredibly supportive and have helped to make me a better scholar. Dr. Julie Velásquez Runk has a sharp eye for “what a manuscript needs” to improve. Her dissertation writing labs have been fruitful spaces for receiving writing feedback and for moral support in the writing process. She gives a lot to her students and I am grateful for that. Dr. Pete Brosius spoke with me before coming to UGA and in many ways introduced me to anthropology. When the ICON program began, he invited me to apply. I feel that I have benefitted immensely from his vision for conservation and his dedication to the ICON program—the integrative framework has helped to define how I approach conservation and is evident in this dissertation. Dr. Nate Nibbelink agreed to be on my committee “at least temporarily,” and then stayed with it the whole way through. This dissertation has benefitted from his spatial, natural science perspective, and his commitment to the goals of an ICON “integrative dissertation.” I am also grateful for his support.
in teaching in Costa Rica, and for involving me in the study abroad program there. And finally, Dr. Rebecca Moore has been a mentor for me at UGA. I was fortunate to work as her research assistant for two years in a project at the Coweeta LTER, and she trained me in choice experiment design and analysis, a skill that proved essential to this research. She also gave me valuable advice on surviving graduate school, and learning to negotiate a career as a woman in science.

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Ministerio de Agricultura y Ganadería agents met with me in the beginning of data collection and attended presentations at the end; Randy Chinchilla Ramos shared data, contacts, and his office space; Debra Hamilton opened the doors of the Monteverde Institute; Justin Welch radiated his enthusiasm about corridor research. I am grateful for the love and support of my friends in Costa Rica, who encouraged me to come back to Monteverde, who shared dreams and frustrations, and who got me back on a soccer field, and to Karen Gordon, a lifetime friend, who encouraged me to apply to UGA in the first place and made sure I followed through to the end. At UGA, I am grateful for the moral support of fellow students in ICON and the Anthropology Department, and the dissertation writing group—Joe Lanning, Heather Gallivan, Jess Cook, Russ Cutts, Annie MacFayden—for their feedback and moral support. Though the ECOLAB has been an ephemeral space, I am thankful for all the people that have passed through it; in particular Mike Coughlan, who has been there to share ideas with, provide feedback, and liven up the place a bit.

Anyone that knows me even a little bit has heard about my family. I name drop them constantly. My parents are incredibly supportive – they flew out to help me on multiple occasions, including during my comprehensive exams, and they have vowed to be one of the few people to read this dissertation. My brothers and their families have followed my progression through the program, cheering the whole way. My children, Joshua and Keila, are incredible teachers. They have given me perspective. They have taught me about humanity and reminded me in one way or another that it is just a dissertation. Without them I may have lost myself somewhere between these lines. And of course the biggest thanks go to my husband, David, who has put up with it all. He has encouraged me, believed in me, listened to practice presentations, helped me to pick my head up, moved across the Caribbean numerous times in support of this
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CHAPTER 1

INTRODUCTION

If you were to ask my opinion on whether I would prefer to have kept things like they were 45 years ago, I would say that I would stick with what it was like 45 years ago. Only I would want the road paved.

-Interview excerpt

I once heard the word nostalgia defined as “a bittersweet longing for a past that does not exist,” though when I search for the definition now, the Oxford English Dictionary tells me it is a “sentimental imagining or evocation of a period of the past.” Both of these definitions carry uncertainty over what has been lost, a recognized human inability to compare the present to the past. Nostalgia, then, can be a problem for the anthropologist, for as we attempt to understand foreign cultures, we must be careful to not look for our lost selves in “the other,” particularly a self that never existed. This problem becomes further exacerbated when the topic is “development,” for by definition, development implies an improvement in human well-being, something that the multiplicity of development indices has proven is a challenge to measure. Add the prefix “sustainable,” and the phrase that is a bit of an oxymoron, since it implies continuous, sustained improvement in well-being for an entire social-ecological system into an unknown future. So, I begin with the impossible.

The topic of this dissertation is sustainable development, what it means, how policy assumes it might work, and what really happens in implementation. I reserve judgement here on what might be the “best” social-ecological system, or what sustainable development would look
like if it were accomplished, because of the impossibility of measuring well-being across time. How to judge today against yesterday, when one might prefer a yesterday that has elements of today? So instead I have tackled the process of sustainable development, comparing what is gained to what is promised, and using this to inform the way forward. But there is an important caveat here that might as well be stated upfront—in the end “best” is a value judgement. But perhaps by understanding the complexity of policy and processes, policy makers, conservationists, and academics can at least avoid repeating the mistakes of the past and setting up false expectations about the future.

**Research Question**

Sustainable development practice has been guided by an often unquestioned assumption: that economic exchange values drive land use decisions. This assumption has driven the implementation of market-based conservation mechanisms (MBCM) around the world. These mechanisms are varied, but they generally offer economic incentives for landowners to deliver ecosystem services on private landholdings (Wunder 2005). The logic is simple: provide people with alternative income earning opportunities, and they will profit from development and simultaneously cease to degrade ecosystems. And yet, research on MBCM shows mixed results: they can improve some indicators of ecological health and rural livelihoods (Stronza and Durham 2008, Almeyda-Zambrano et al. 2010), but they also tend to increase cultural degradation, resource competition, and income disparity (West and Carrier 2004, Igoe and Brockington 2007, McAfee and Shapiro 2010). One reason for such mixed outcomes is that MBCM are developed with little understanding of how cultural, economic, and ecological factors influence the values landowners have for particular land uses, and how these values in turn shape the landscape.
In this dissertation, I examine how payments for environmental services (PES) and nature tourism, two politically popular MBCM, engage with landowner values, and how they operate across the culturally, economically, and ecologically diverse landscape of the Bellbird Biological Corridor (CBPC, Corredor Biológico Pájaro Campana) in Costa Rica. This research is based on a broadly defined question: how do the values informing private land use decisions vary across the study area and do market-based conservation mechanisms foster sustainability? The research methodology and dissertation chapters are centered on answering different components of this question. First, I sought to understand landowner values by exploring exchange values and cultural values for land uses. I then asked how these values relate to patterns of land use change and overall experiences of sustainable development. And finally, I examined how MBCM engage with value systems and the implications of these policy mechanisms for sustainability.

Costa Rica

Most travelers comment on the natural beauty of Costa Rica, a characteristic that has served to encourage travel to the region. Costa Rica is a small country located in Central America between Nicaragua, to the northwest, and Panama, to the southeast (see Figure 1). Its topography is shaped by three volcanic mountain ranges that stretch across the center of the country: the Tilarán Range, the Guanacaste Range, and the Central Range. Though Costa Rica only accounts for 0.03% of the world’s land surface, it houses an estimated 4% of the world’s biodiversity (www.inbio.ac.cr/conservacion.html), and the country is a biodiversity hotspot (Myers et al. 2000). This extensive biodiversity has been attributed to Costa Rica’s position as a land bridge between North and South America (Evans 1999). The Costa Rican climate is tropical, with biotemperature ranging from 12 to 30 degrees Celsius, varying primarily with
elevation. Rainfall is between 1000 and 8000 mm a year, with the Pacific side of the country drier than the Caribbean slope (Holdridge 1979, Ortiz Malavassit and Soto Montoya 2008).

Costa Rica is a democratic country strongly influenced by the legacy of Spanish colonialism. The country is believed to have been sparsely populated prior to Spanish conquest, but pre-Colombian population estimates vary widely because disease is thought to have decimated Costa Rican indigenous populations prior to Spanish contact (MacLeod 1973). An extensive slave trade between the Guanacaste region of Costa Rica and Perú is also thought to have killed thousands of indigenous people with remaining populations slowly pushed into indigenous reservations that persist to this day (Edelman 1992). During the colonial period (1570 – 1821) Costa Rica was part of the United Provinces of Central America that included Nicaragua, Honduras, El Salvador, and Guatemala (MacLeod 1973). It was a poor colony that followed the economic trend common in Central America of successive cash crops powered by enslaved indigenous labor (MacLeod 1973). The subsequent growth in international coffee markets allowed for the establishment of a coffee oligarchy that featured powerful coffee processing elites who promoted economic liberalism, and many smallholders dedicated to coffee production (Gudmundson 1986). The oligarchy was overthrown by the 1948 civil war that ended in the institution of democracy, the abolishment of the army, and the promotion of a social welfare state (Booth et al. 2010). The social welfare state has been slowly chipped away through neoliberal reforms of the late 20th and early 21st centuries, including the removal of government subsidies for agriculture and the opening of markets under bilateral trade agreements (Edelman 1999, Shadlen 2008). In 2007 these neoliberal reforms came to fruition with the passing of the popular referendum that led to the ratification of the Central American Free Trade Agreement (CAFTA).
Costa Rica is considered a moderately developed country that boasts comparatively high income rates for the region, universal health care, and free public education. Table 1.1 provides basic demographic and education characteristics of the 2014 population for both Costa Rica as a whole, and for the Central Pacific planning region in which the study area for this dissertation is located. Table 1.2 provides both national and regional farm use characteristics from 2014. The Central Pacific region has higher levels of poverty and lower education levels in comparison to national averages. This is not surprising, as national averages for income and education levels are pulled-up by the central valley, the economic center of the country that contains the capital city of San José and surrounding areas.

Table 1.1: General demographic characteristics of Costa Rica, and the Central Pacific Region where the study area is located. Data was obtained from the Instituto Nacional de Estadística y Censos (INEC), Costa Rica (http://www.inec.go.cr). Data is based on the Encuesta Nacional de Hogares 2014. Education estimates are from a total of 3,776,510 people surveyed, where the remaining percentage of people did not respond to the question. Monthly income was converted to US dollars by dividing by the average exchange rate for 2014 taken from www.bccr.fi.cr.

<table>
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<tr>
<th>Index</th>
<th>Costa Rica</th>
<th>Central Pacific Region</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>4,772,098</td>
<td>275,483</td>
</tr>
<tr>
<td>Average monthly income (per capita) *</td>
<td>$660 USD</td>
<td>$480 USD</td>
</tr>
<tr>
<td>Poverty rate</td>
<td>24.5%</td>
<td>31.1%</td>
</tr>
<tr>
<td>Male</td>
<td>48.7%</td>
<td>48.3%</td>
</tr>
<tr>
<td>Female</td>
<td>51.3%</td>
<td>51.7%</td>
</tr>
<tr>
<td>Number of homes</td>
<td>1,425,297</td>
<td>83,682</td>
</tr>
<tr>
<td>People per home</td>
<td>3.34</td>
<td>3.29</td>
</tr>
<tr>
<td>Fertility Rate</td>
<td>1.8</td>
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*Education*

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<tr>
<th>Index</th>
<th>Costa Rica</th>
<th>Central Pacific Region</th>
</tr>
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<tbody>
<tr>
<td>Primary Incomplete</td>
<td>14.9%</td>
<td>18.1%</td>
</tr>
<tr>
<td>Primary Only</td>
<td>47.0%</td>
<td>52.7%</td>
</tr>
<tr>
<td>Secondary Only</td>
<td>16.0%</td>
<td>15.0%</td>
</tr>
<tr>
<td>University Degree</td>
<td>20.0%</td>
<td>13.3%</td>
</tr>
<tr>
<td>Graduate Degree</td>
<td>1.8%</td>
<td>0.6%</td>
</tr>
</tbody>
</table>
Table 1.2: Farmland characteristics for Costa Rica and the Puntarenas province, where the study area is located. Data was obtained from INEC, Costa Rica (www.inec.go.cr). Data is based on the Censo Agropecuario 2014. Remaining percentages were listed as “other uses.”

<table>
<thead>
<tr>
<th></th>
<th>Costa Rica</th>
<th>Puntarenas</th>
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</thead>
<tbody>
<tr>
<td>number of farms</td>
<td>93,017</td>
<td>14,467</td>
</tr>
<tr>
<td>Total land (ha)</td>
<td>2,406,418</td>
<td>514,541</td>
</tr>
<tr>
<td>Percent in Cultivation</td>
<td>22.6%</td>
<td>27.0%</td>
</tr>
<tr>
<td>Percent in Pasture</td>
<td>43.4%</td>
<td>37.4%</td>
</tr>
<tr>
<td>Percent in Forest</td>
<td>30.6%</td>
<td>32.4%</td>
</tr>
</tbody>
</table>

Costa Rica provides an interesting national context for studying sustainable development because it frequently has been celebrated as a conservation success story (Wallace 1992, Evans 1999, Allen 2001). During the 1960’s and 1970’s, Costa Rica had the highest deforestation rates of Central America (Evans 1999). Much of the country’s land was concentrated in the hands of a wealthy minority who encouraged deforestation on marginal agricultural lands through largely unproductive cattle ranches (Edelman 1992). This period also witnessed a national transition away from subsistence agriculture toward cash crops (Edelman 1999) contributing to an increase in class disparity (Barlett 1982). Furthermore, the Costa Rican government encouraged deforestation on unoccupied lands through the 1941 law that provided titles to settlers for converting forests into agricultural land (Brockett and Gottfried 2002). The fast pace of deforestation in the 1960s and 1970s kindled an environmental crisis that resulted in drastic conservation measures: the forestry laws of 1969 and 1996 that prohibited deforestation, and the creation of the nation’s national park system (Evans 1999, Brockett and Gottfried 2002). The country has experienced significant forest regrowth since 1987, earning the country much praise from conservationists, but the stability of these secondary-growth forests is contingent upon local context (Schelhas and Sánchez-Azofeifa 2006, Morse et al. 2009, Daniels 2010).
Costa Rica has embraced market-based mechanisms, in particular nature tourism and Payments for Ecosystem Services (PES), to protect its secondary forests and encourage forest regrowth on private lands (Budowski 1976, Boza 1993, Aylward et al. 1996, Pagiola 2002). These mechanisms are increasingly important to conservation efforts, where the focus has shifted from preservation to conservation across landscapes, under the recognition that biodiversity protection and the maintenance of other ecosystem services require a broad scale perspective of environmental change (Soulé and Terborgh 1999, Turner et al. 2001, Brosius and Russell 2003). Market-based mechanisms are attractive because they offer incentives for private landowners to provide socially desirable ecosystem services that may not otherwise be economically appealing. Since these mechanisms target individual preferences associated with land uses, the context and efficacy of the incentives vary across ecologically relevant scales.

Nature tourism in Costa Rica arose out of science tourism and promised to link livelihoods to the conservation of protected areas. The establishment of the national park system in the latter half of the 20th century attracted scientists to the region who were interested in studying the nation’s flora and fauna (Laarman and Perdue 1989, Campbell 2007). In Monteverde, for example, a biology graduate student named George Powell was integral in establishing the Monteverde Cloud Forest Preserve, and he advocated for its protection because of the rare biodiversity of the region (Burlingame 2000). Because these scientists paid to tour these remote protected areas, Costa Rican policy makers began to recognize that nature tourism could garner economic support for the park system while fostering development among rural populations (Budowski 1976, Boza 1993). This shift occurred at a time when Costa Rica had instituted structural reforms that removed government incentives for agriculture (Edelman 1999), and policy makers were searching for an alternative industry. Tourism has since become the top
industry of the country (Brockett and Gottfried 2002) and nature tourism has been credited with aiding forest recovery (Almeyda et al. 2010). It is not clear, however, that nature tourism is an effective tool for promoting long-term sustainable development.

Although nature tourism has been present in the country for decades, Costa Rica became a pioneer in PES in 1997 when the government began to offer annual funds for the maintenance of ecosystem services on privately held lands (Castro et al. 2000, Pagiola 2002, Rodríguez Z. 2003). The Costa Rican government pays landowners for placing part of their land in forest protection for the production of ecosystem services, under the goal of promoting biodiversity, carbon sequestration, watershed protection, or scenic beauty (Pagiola 2008). Case-studies on the effectiveness of PES in delivering ecosystem services in Costa Rica have abounded, but they have not offered conclusive evidence on whether objectives are being met (Pattanayak et al. 2010).

Thus, Costa Rica has been considered an international laboratory for conservation and sustainable development initiatives (Boza et al. 1995), but it is not clear whether forest regrowth and other conservation successes are due to sustainable development policy or to general patterns of development that have promoted farm abandonment (Kull et al. 2007). Several researchers suggest that the environmentalism underlying sustainable development has only been superficially absorbed into Costa Rican culture, as land speculation, environmental commodification, and greenwashing of businesses is pervasive (Thrupp 1990, Vivanco 2001, Campbell 2002, Schelhas and Pfeffer 2005). In this dissertation, I shed light on the successes of market-based conservation mechanisms in Costa Rica, but the results have implications that stretch beyond this specific context because of Costa Rica’s unique position as an international pioneer of MBCM.
Study Area

The CBPC serves as an ideal study site because it is part of a relatively new landscape emphasis of Costa Rica’s sustainable development strategy. The CBPC came to fruition as part of the Mesoamerican Biological Corridor, envisioned by Costa Rican natural resource managers as a means for safeguarding biodiversity through connected habitats and secure migratory pathways for tropical fauna across Nicaragua, Panama, and Costa Rica (Boza 1993). Costa Rica succeeded in pushing this movement forward at the national level through the implementation of a 2006 law establishing a system of formal biological corridors under the Sistema Nacional de Areas de Conservación (SINAC) (Oduber et al. 2011). Thirty-seven of these corridors have been incorporated into the system to date (SINAC 2009), and they provide planning regions for the conservation and sustainable use of natural resources across privately owned, mixed-use landscapes. They are also target areas for new PES contracts (Decreto 2014, available at www.fonafifo.go.cr).

While the overarching goal of the CBPC is to increase three-wattled bellbird (Procnias tricapitatus) habitat, there is an explicit recognition that landscape connectivity provides a variety of ecosystem services. For example, migratory pathways are expected to become increasingly important for biodiversity maintenance as climate changes drive species out of their normal habitat range. In the Monteverde region, climate changes may include decreased precipitation and fewer mist days as well as an increase in average temperature (Magrin et al. 2007). Costa Rican fauna are already moving up the altitudinal gradient in response to these changes in climate (Pounds et al. 1999). Increased forest cover is also thought to contribute to human well-being through watershed protection, carbon sequestration, and scenic beauty (www.fonafifo.go.cr). By focusing on landscape connectivity across a mixed-use region, the
CBPC sets the ultimate goal of maintaining a multitude of ecosystem services while contributing to human well-being.

The CBPC is a 667 km$^2$ area that covers three watersheds that extend from the continental divide on the Pacific slope of the Tilarán mountain range, in the provinces of Puntarenas and Guanacaste, to the Gulf of Nicoya (Figure 1.1). It spans an 1800 meter gradient encompassing 11 Holdridge life zones (Holdridge 1979), and it has been estimated that 50% of Costa Rican terrestrial vertebrates use some portion of the CBPC (Oduber et al. 2011). The northern summit of the corridor forms a network of private and public preserves, with the popular tourism destination of Monteverde immediately below these protected areas. The remainder of the CBPC is privately owned, the majority of the land being dedicated to agriculture. The region has two seasons: a wet season stretching from mid-May through mid-November, and a dry season throughout the remaining months. Precipitation decreases and average temperature increases when moving down in elevation from Monteverde to the coast.

This research focuses on the section of the corridor between the district of Monteverde, including the towns of Santa Elena and San Luis, and the Pan American highway. The study area includes a 2 Km buffer around the main travel roads in this region (Figure 1.1). I chose this area to create an economic gradient within which to study landowner values without introducing excessive ecological variability. This region is composed of small family farms. Ministry of Agriculture collaborators estimated the average farm size to be under 50 hectares and the reported average in the study sample is 36.2 hectares. The region above the Pan American highway is mountainous, followed by a flat plain below. Though the entire CBPC has 11 Holdridge lifezones, the study area has only two main lifezones: Tropical wet forest and Tropical
very wet premontane forest, with a transitional zone in between (Ortiz Malavassit and Soto Montoya 2008).

Figure 1.1: Map of the study area showing location of the CBPC within Costa Rica (inset), and the positioning of the study area within the CBPC (main map). Major towns and roads are shown. The basemap is the “Ocean/World_Ocean_Base” provided in ArcMap 10.1, compiled from data provided by Esri, DeLorme, GEBCO, NOAA NGDC, and other contributors.
The study region was settled by families from the Central Valley, and nearby Puntarenas, primarily in the 20th century. Though the region reveals artifacts of precolonial people, such as pottery shards and burial mounds, local residents believe that the area was abandoned prior to settlement by their ancestors. Some current residents in the region descended from settlers who migrated to the area in the early 20th century. At that time, Guacimal had a profitable gold mine and housed one of the first hydroelectric plants in the country. Others moved in with the 1941 law that granted land rights for settlers who cleared the land and used it in agriculture (Brockett and Gottfried 2002). Locals told me that these settlers arrived mostly from the Central Valley, the area encompassing the four major cities of the country: San José, Cartago, Heredia, and Alajuela. The settlers tended to maintain ties to the Central Valley, especially in the lower section of the study area, and many absentee farm owners have returned to live in the Central Valley in the last generation.

A second wave of immigrants moved into the Monteverde district in 1951 from the United States. These immigrants were Quakers who were protesting the Korean War and were attracted to Costa Rica because it had recently abolished its army. Their arrival effectively has determined the economic changes in the region since: they established a cheese factory, opened the road for cars, and aided in the establishment of the Monteverde Cloud Forest Preserve. This protected area would inadvertently kindle the growth of the nature tourism industry in the region (Nadkarni and Wheelwright 2000). Luis Vivanco (2006) points to the foreign-driven nature of the conservation movement in Monteverde as originating in the Quaker settlement, and highlights the tensions that arose between Costa Rican and foreign visions of landscape development. It certainly bears recognizing that at the time of research there was notable tension between the Costa Rican and foreign communities in Monteverde. Santa Elena, the most
populated town in the district, was primarily Costa Rican, while the neighborhood known as Monteverde (which is not only the name of the broader district that encompasses Santa Elena and San Luis but also the name of the neighborhood between Santa Elena and San Luis) mostly was inhabited by foreigners who were Quakers, residential tourists, and/or small business owners. While this tension did not typically result in direct confrontation, it was common to hear resentful remarks during fieldwork among Costa Rican locals about the mischaracterization of Monteverde being “founded” by Quakers, or the Monteverde region of town being for “gringos.” Sometimes such criticisms were directed at the schools – locals often ridiculed the Monteverde Friends School and the Cloud Forest School, two bilingual schools in the zone, for being exclusive. On one occasion I heard a bus driver “jokingly” berate tourists in Spanish for not speaking the language for the amusement of the Costa Ricans on the bus. The tension itself was an elephant in the room, everyone knew it was there, but it was rarely talked about unless in jest.

The lower elevations of the study area, characterized by the towns of Guacimal and Sardinal, with a few sparsely populated towns in between, remained primarily rural in character. Many of the former residents of the towns north of Sardinal migrated to Monteverde during the tourism boom of 2000 - 2007. Others moved out of the remote mountain towns that are now largely abandoned and into the center of Guacimal where there was available infrastructure: primary schools, running water, and electricity. There were few wage-earning opportunities in the middle of the study area – most people either owned farms, worked on farms, or commuted out of the zone for employment. For example, at the time of data collection, Monteverde was a popular employment destination for residents of the Guacimal area. Sardinal had a chicken plant that was owned by Cargill that employs much of the town. It also was easily accessible from the
Pan American highway, and many Sardinal residents were able to secure employment outside of the study area.

Land uses in the region centered on pasture for cattle and dairy production, coffee, subsistence farming, and tourism. Coffee and dairy were predominant in higher elevations, while beef cattle were common in middle and lower elevations. There were some teak (*Tectona grandis*) plantations in the middle and lower elevations as well. Tourism, by far the most lucrative activity in the region, was mainly centered in Monteverde, but there were a few small, hopeful tourism endeavors throughout the study area. Tourism outside of Monteverde tended to be limited to farm tourism. Although the CBPC had been working with the *Fundación Neotropical* to promote rural community-based tourism throughout the corridor, it was not clear that there was a demand for tourism beyond Monteverde. Farm size increased when moving down the elevational gradient of the study area, likely an artifact of early settlement patterns and topography. The distance between Monteverde and Sardinal was only 36 km, but travel was slow on the unpaved road. The road between Sardinal and Monteverde was completely unpaved until 2008, at which point it was paved between Sardinal and Guacimal. The 16 km stretch between Guacimal and Monteverde is in the process of being paved, an initiative that began in March of 2013.

**Methods Overview**

I employed mixed quantitative and qualitative methods to understand the variation in landowner values across the study area, and whether MBCM foster sustainable development. The primary methods employed in this dissertation were a stated choice experiment, borrowed from behavioral economics, ethnography, interviews, and Geographic Information System (GIS)
analysis. I will discuss the role of each of these methods in answering guiding questions that related to the overall research objective.

The first guiding research question of this dissertation was: how do landowner values vary across the study area? This question was intentionally vague, as it necessitated defining and characterizing landowner values prior to identifying variation in those values. Values, as I show in Chapter 2, are defined differently across the social sciences. Hence, it became immediately pertinent that I engage with mixed methods to understand the elusive concept of value. I chose a stated choice experiment (CE), popularly used as a nonmarket valuation technique, because frequently has been employed in environmental economics to understand the value of ecosystem services (Champ et al. 2003) (See Appendix B). This technique views values as “preferences” that maximize an individual’s utility, or overall well-being. Exchange value, according to this framework, is a reflection of preferences across the population. Anthropologists, on the other hand, have tended to define value amorphously – often subtly if not explicitly understanding values to be the societal importance of action, revealed through ethnography (Munn 1986, Graeber 2001). In both of these definitions, value is created through interaction. In the economic definition values are universal, and therefore measurable, whereas in anthropology values are relative and produced within society.

I used ethnography and semi-structured interviews to derive an anthropological conceptualization of landowner values (See Appendices A – C) to compliment the CE, which measured values according to economic theory. Because of the open-ended nature of semi-structured interviews, these questions only provided the loose outline of interview content. Participant observation also was a key element of ethnography. When possible, I toured farms with landowners and they described particular land uses to me. In some cases, I had the
opportunity to participate in farm activities such as rounding up cattle, spraying cattle for parasites, learning to harvest honey, milking cows, and harvesting oranges. Participant observation extended beyond these specific activities into my daily life while I was immersed in the region: sending my children to school, conversing with residents in towns throughout the region, informally interviewing business owners and conservation practitioners. This plethora of contextual experience informed continual data collection and analysis.

The next guiding research question asked: what is the relationship between landowner values and land use decisions? In Chapter 2, I explain that much of the literature on landscape change and land use decisions assumes that driving economic factors impact behavior, which influences landscape change. Few studies have examined the impact of driving forces on landowner values, and the relationship between those values and land uses. I therefore chose to map farm boundaries with farmers, examining the relationship between values and forest cover change. In some cases, either myself or a hired local field assistant mapped farm corners using a GPS receiver. Some terrain was near impossible to traverse given topography and time limitations, and instead I combined GPS points with observable landmarks on satellite imagery, such as mountain ridges or rivers, to identify farm boundaries. Toward the end of the data collection period, a government issued digital cadastral map was made available by the Costa Rican National Registry (www.registronacional.go.cr) for a small section of the northern study area, which allowed for the verification of some farm boundaries.

I used two classified forest cover maps to quantify forest cover change within farms during the 1986-2014 period. At the start of research, I had hoped to use a classified 25m² RapidEye image of the CBPC from 2010 to evaluate forest cover within properties. Unfortunately, the timeline of publication for that image did not coincide with the writing of this
Furthermore, I was concerned that the misalignment of years would not allow me to analyze any forest cover losses that may have occurred during 2011 and 2014. Finally, using only this image would have allowed for a static view of forest cover, and not forest cover change over time. These factors led me to seek collaboration on Chapter 4 with a fellow student in the Integrative Conservation Ph.D. program at UGA, Steve Padgett-Vasquez. Steve used 900m² LANDSAT imagery to classify forest cover maps for the years 1986 and 2014. I used these maps for subsequent analysis to link landowner characteristics to forest cover changes.

The final guiding question was: how are sustainable development goals experienced across the landscape? This question combined the results of the above methods with participant observation and immersion in the study area over an 18-month period. I originally proposed to hold focus groups throughout the study area to understand experiences of sustainable development, but I quickly realized that those focus groups would be superfluous to daily ethnography and landowner interviews. I did, however, hold focused discussions based on my research results, centered on the theme of how community members interpreted the implications of the results for sustainability. Ultimately, this last question helped to guide interviews and direct text analysis.

**Chapter Objectives**

This dissertation is organized by three self-contained manuscripts, surrounded by three supplementary chapters that link these manuscripts together in theory and broader significance. Chapter 2 provides a literature review focused on the challenges for MBCM being used for the sustainable management of landscapes. Chapters 3, 4, and 5 deal with different components of the overall research objective and the guiding research questions outlined above. Chapter 6 provides a dissertation conclusion.
In chapter 2, I describe MBCM as emerging to dominate the conservation movement in part due to a shift in focus from protected area management to conservation across landscapes. I show how sustainability science in particular has attempted to grapple with the challenges of landscape management, and how this field has tended to prefer simplified understandings of drivers of landscape change, resulting in management solutions that may prove erroneous in implementation. I then provide an overview of the theoretical basis of MBCM, using PES and nature tourism as particular examples of MBCM to explore some of the challenges most relevant to this dissertation. I finally move to a review of the concepts of conservation values and ecosystem services valuation, placing these within a cross-disciplinary debate about the role of valuation in informing MBCM policy design. By doing so, chapter 2 paves the way for the core data analysis chapters that follow, which collectively engage with the complexity of values, and the relationship between values and sustainability.

Chapter 3 primarily engages with the question of how landowner values are characterized in the study area, and whether or not exchange value is an adequate proxy for values. This chapter provides a detailed description of the CE methods and analysis, highlighting the implications of landowner preferences for PES and for Costa Rican conservation policy. I draw on interview data to provide explanations for the patterns observed in CE analysis, and to relate the CE results, which are based on a hypothetical experiment, to actual opinions of PES. This chapter reveals that PES in the study area falls short of efficiency goals, and that commonly suggested program improvements are not likely to correct current shortcomings. I argue in this chapter that the problem with PES is that it is based on a simplistic understanding of landowner values for conservation land uses.
Chapter 4 relates landowner values to land use decisions by comparing characteristics of landowners to forest cover change on their properties between 1986 and 2014. This chapter is co-authored with Steve Padgett-Vasquez, a Ph.D. student in geography who did all of the remote sensing analysis on Landsat imagery to construct a forest cover change map for subsequent analysis. I then use geographically weighted regression to analyze the forest cover change that has occurred on properties and relate these changes to landowner characteristics. I discuss these results in relationship to the political changes that have occurred at a national level to promote development in Costa Rica via integration into the global economy. Of particular focus in this chapter is the role of tourism in promoting sustainable development in the region, and whether forest cover is an adequate proxy for sustainability. I use ethnographic contextual evidence and text analysis of landowner interviews to create a conceptual framework for the relationship between development, forest conservation, and sustainability. This chapter demonstrates that tourism contributes to forest regrowth, but that it carries new sustainability challenges. In relation to the larger theme of the dissertation, this chapter demonstrates that forest cover change is a result of complex processes, and that proposed solutions, such as nature tourism, are not in fact solutions but rather create new conservation challenges.

Chapter 5 draws on data briefly analyzed in the previous chapters to answer the central question: do MBCM foster sustainability? Here, I return to the CE results and examine a particular finding that is outside the scope of Chapter 3—that landowner responses to the CE vary according to particular landowner characteristics along the socio-ecological gradient of the CBPC. I show that CE protest responses, or refusals to choose CE alternatives, reveal heterogeneity across the population toward MBCM. I use interview data to demonstrate that market fluency shapes CE responses. I then use text analysis of interview responses to reveal that
MBCM reduce complex environmental values to a strictly “exchange value” view of landholdings. Finally, I use ethnographic evidence to suggest that this simplification process promotes short-term uses that run counter to the long-term objectives of sustainability. Ultimately, I suggest that MBCM are not successful at promoting sustainability, and that they undermine the work of conservation initiatives that work to explicitly engage ethics and non-monetary values to change behavior.

Chapter 6 provides a synthesis for the dissertation. I briefly summarize chapters 3-5 and I explain their total contribution to our understanding of sustainability in the study area. I then move to a broader discussion of the implications of MBCM for fostering sustainable development on a global scale. Finally, I make suggestions as to how this dissertation opens the door for future areas of research.

**Conservation Planning in a Global Era**

During one of my early seminars in graduate school, a fellow student frustrated me by pondering aloud the problem with globalization, vaguely in response to something I had vehemently proposed moments before. He said something to the effect of “when you call an environmental challenge ‘global,’ you narrow the scope of causes and disempower the local.” I probably rolled my eyes. Five years later, I now realize that he was loosely citing a broad array of scholars who have successfully shown how labeling environmental problems “global” prioritizes certain power relations, gives preeminence to particular characterizations of environmental challenges, and leads to a narrow set of possible solutions (see for example: Shiva 1993, Scott 1998, Adger et al. 2001). At the time, my impatience with his argument came from my own profound desire to “fix” environmental catastrophes in the face of increasingly dismal scientific information about the future habitability of the planet. After all, so many of the
pressing environmental challenges of today have a global reach: climate change, deforestation, water scarcity, biodiversity decline. But I now realize the power of the argument; the word “global” can inadvertently lend credence to hegemony, while it effaces alternative world visions. This dissertation does not engage extensively with these particular debates on the use of the word global. I have incorporated the term in the title to highlight that market-based conservation approaches stem from a specific global view of environmental problems, as documented throughout the dissertation. This global view negates some ways of understanding the relationship between conservation and markets, and dismisses alternative visions for policy. Through this title, I am acknowledging the many scholars, who like this fellow student, have helped me to question the lens through which I view the world and understand the complexity of “global” environmental problems. So maybe there is a little humility in that, which seems as good of a place as any to start a dissertation.

References


CHAPTER 2

A REVIEW OF THE CHALLENGES FOR MARKET-BASED LANDSCAPE
CONSERVATION PLANNING

Introduction

Landscape conservation planning has moved to the forefront of conservation initiatives, and with it, policy makers have had to get creative—quite literally stretching the boundaries of protected areas and working to manage sustainable landscapes (Olson et al. 2001, Brosius and Russell 2003). In tandem with this shift in conservation, we have seen the rise of market-based conservation mechanisms (MBCM) that aim to promote sustainable landscapes by targeting the economic exchange value of ecosystem services (De Groot et al. 2010, Gómez-Baggethun et al. 2010). MBCM are appealing because they aim to change the behavior of individuals, thereby offering a means to incentivize conservation on privately held lands—territory that appears to be the new conservation frontier (Büscher et al. 2012, Alvarado-Quesada et al. 2014). They also work within the existing, and ever-expanding, global economy, an attribute reflected in their political popularity (Field and Field 2002). It is therefore timely to review how MBCM have risen to prominence within the context of landscape conservation, how they operate both in theory and in practice, and what are their potential promises and pitfalls.

In this chapter, I review literature on landscape conservation planning, MBCM, and ecosystem services valuation, the subject of this dissertation. This review examines the relationship between these topics, demonstrating how MBCM have risen to prominence within a political and academic climate emphasizing landscape conservation planning and sustainable
development. I show how MBCM originate from a world-view that conceptualizes humans as utility maximizing individuals, and that this assumption about human value systems forms the basis of a contentious debate between MBCM supporters and their critics. The objective of reviewing the relationship between these topics is to frame the theoretical basis of chapters 3, 4, and 5 that engage with the extent to which MBCM are appropriate tools to encourage sustainable development across a mixed-use landscape in Costa Rica.

This review is divided into three sections. The first section, Landscape Conservation Planning, examines the history of landscape conservation, highlighting the shifting emphasis from protected area conservation to sustainable landscape management, and the political challenges that have ensued in accordance with the new conservation scope. I then review the theory behind MBCM in section 2, Market-based Conservation Mechanisms, paying particular attention to how MBCM propose an improvement over other policy mechanisms, and providing concrete examples of the possibilities and shortcomings of MBCM in practice. I further show in section 2 how MBCM have grown in popularity in part because they offer accessible solutions to the challenges of landscape conservation planning and are framed within a politically popular worldview. Finally, in section 3, Conservation Values and Ecosystem Services Valuation, I move to a theoretical debate about the role of valuation in incorporating ecosystem services into effective conservation policy. I show how this debate hinges on a disagreement as to how conservation values are characterized and how effective policy may target those values.

Landscape Conservation Planning

Conservation has shifted focus in the last 50 years from the accumulation of protected areas to the sustainable management of landscapes. Prior to the 1980s, conservation was primarily focused on land acquisition—the need to set up protected areas safe from deforestation...
and environmental degradation (Phillips 2003). These were typically spaces that limited human access in favor of the preservation of biodiversity, often forcibly removing humans in their creation (Western and Wright 1994, Cronon 1995, West et al. 2006). This early conservation endeavor was inspired by the “crisis-driven” nature of conservation biology, namely that available land needed to be preserved before it was too late (Soulé 1985, Whitten et al. 2001).

Much of the focus during this phase was on preserving tropical areas and biological hotspots, which were presumed to both house more biodiversity and provide greater return on conservation dollars invested, given the relatively cheaper cost of land in many tropical countries (Wallace 1992, Myers et al. 2000). Continual developments in ecology, including metapopulation ecology and landscape ecology identified the need to increase the scale of conservation because biodiversity maintenance required large tracts of connected habitat for population migration (Saunders et al. 1991, Soulé and Terborgh 1999, Turner et al. 2001, Meine et al. 2006). Conservationists recognized that the preservation of isolated protected habitats alone was insufficient to prevent biodiversity loss, and they accordingly shifted focus to landscape scale conservation under the paradigm of biological corridors, mixed-use landscapes, and transboundary protected areas (Beier and Noss 1998, Holland 2012, Townsend and Masters 2015).

The shift in focus from protected areas to landscape conservation occurred in tandem with an increasing concern among academics and policy makers for human rights. Protected area conservation received extensive criticism from social scientists and human rights activists because park establishment frequently involved the forced removal of humans from within their boundaries, relegating former inhabitants to poverty while denying them access to natural resources necessary for survival (Brockington 2002, West 2006, Adams and Hutton 2007).
Scholars further revealed that conservation was inherently political and deeply rooted in colonialism – redefining who had access to nature and under what uses (Adams 2004). Similarly, government officials expressed concern that conservation stymies economic growth because it conflicts with development goals (Malik 1982). The combination of these voices resulted in a shift in conservation agenda; increasingly, human rights interests became intertwined with global conservation policy (Phillips 2003).

As human rights and landscape planning moved to the forefront of conservation, the concept of sustainable development arose as a possible solution to bridge conservation with human well-being (Bruntland 1987). Though the term has been critiqued for its vagueness, it generally offers to bridge the development goal of increasing human well-being across world populations, with the recognition that environmental resources are finite and integral to the survival of future generations (Lélé 1991). The inexplicit nature of the term has lent itself to diverse interpretations; some scholars emphasize that sustainable development is an ideal that necessitates reordering existing human-environment relationships under a paradigm more harmonious with the natural world than existing capitalist structures, while others posit that sustainable development poses a technical challenge that can be realized with adequate policy measures (Mebratu 1998). In more recent literature, these opposing viewpoints have morphed into preference for different terminology rooted in the sustainable development concept—those advocating technology and policy solutions to sustainable development adhering to the original term, while those taking a more radical, value-oriented approach shifting to use the term sustainability (Robinson 2004). To further complicate terminology, sustainability science has arisen as an interdisciplinary academic approach focusing on human-environment interactions and probing the grand challenges of sustainability and sustainable development (Clark and
Dickson 2003, Clark 2007). The common thread among all of these terms is the emphasis on human-environment relationships and the grounding in the need to reconcile economic growth, human well-being, and ecological well-being. The divergence in sustainable development interpretation continues to be played out today in contesting the implementation of sustainable development initiatives and MBCM.

In practice, sustainable development policies have typically aimed to promote economic growth through encouraging livelihood activities that purportedly operate in harmony with the natural environment. Early sustainable development initiatives promoted non-extractive employment opportunities around parks through the implementation of Integrated Conservation and Development Programs (ICDPs) (Brandon and Wells 1992), and community control of natural resource management (Brosius et al. 1998). Examples of such initiatives include limiting activities in buffer areas in exchange for development infrastructure (Wagner 2001), ecotourism within protected areas (Aylward et al. 1996), and community management of sea turtle reproductive sites (including sustainable egg harvest) (Campbell 1999). Though widely differing in implementation, such initiatives share in common the philosophy that ecological sustainability depends upon the economic well-being of local populations (Western and Wright 1994).

These early initiatives have evolved into the contemporary discussion of ecosystem services, whereby the logic that conservation depends upon the sustainability of livelihoods has been reversed and the economic sustainability of society is now depicted as dependent upon ecosystem health (Costanza et al. 1997, Daily et al. 1997, Kareiva et al. 2011). Ecosystem services define the human benefits, such as water filtration and carbon sequestration, received from ecosystems (Daily et al. 2000). Scholars advocating this concept contend that it will assist in bringing ecosystem values into environmental planning to ensure their long-term sustainability.
(Engel et al. 2008, Turner and Daily 2008, Christie et al. 2012). The implication behind this is that “win-win” situations can be realized via spatial planning for ecosystem services (Nelson et al. 2008, Polasky et al. 2008, Kareiva et al. 2011). However, this requires that values for ecosystem services can be effectively identified and targeted across broad spatial scales (Wünscher et al. 2008), and that ecosystem services are not in competition with each other across scales (Nelson et al. 2009). Hence, the incorporation of the ecosystem services concept into policy requires extensive landscape planning.

Sustainability science is an interdisciplinary field integral to landscape conservation research, as it aims to understand temporal and spatial feedbacks in order to shed light on issues of sustainability and social and ecological resilience to better inform sustainable development policy (Clark and Dickson 2003, Wu 2006, Clark 2007). Sustainability science has attempted to understand human-environment interactions via aggregate methods of evaluating landscape change (Turner et al. 2007). This field has rested heavily on Geographic Information Systems (GIS) technologies that facilitate landscape analysis. Scholars operating within this research framework attempt to link human land use decisions to broad drivers of landscape change, in an effort to demonstrate how policy impacts the landscape on a broad spatial scale (Geist and Lambin 2002, Rudel et al. 2005). Hence, a particular strength of sustainability science lies in the explicit attention to spatial scale, and consideration of how human institutions and ecosystems can interact across the landscape (Levin 2000, Adger et al. 2005, Cash et al. 2006, Liu et al. 2007, Wheatley and Johnson 2008).

Sustainability science researchers have identified a number of challenges for conservation planning related to the concept of scale. For example, observations at one scale of analysis may be entirely contradictory at another level (Kaimowitz and Angelsen 1998, Crews-Meyer 2002,
Walsh and Crews-Meyer 2002). Research on forest cover change has shown that localized forest regrowth can signify deforestation elsewhere (Pfaff and Walker 2010). This challenge poses a problem when attempting to implement conservation measures across large regions. Some sustainability science scholars have attempted to uncover appropriate scales of analysis for linking humans with remotely sensed data (Liverman et al. 1998). These researchers have employed various sources of data including household surveys (Entwistle et al. 1998, Moran and Brondízio 1998), and ethnographic data (Fox 2002, Thompson et al. 2002), and used methods of aggregation to understand landscape dynamics (Fox et al. 2003). This literature has emphasized that environmental policies and economic opportunities in combination with cultural, demographic and technological factors are instrumental in influencing landscape change (Geist and Lambin 2002, Adger et al. 2005, Cash et al. 2006). A drawback to this approach is the over reliance on viewing conservation “from above” – employing broad scale models that understand landscape change as a culmination of gross factors, and often failing to understand the nuances of human-environment interactions (Brosius and Russell 2003). As sustainability science increasingly seeks to inform effective policy, diverse contributions of social science perspectives become essential to understanding social-ecological relationships at multiple scales (Gragson 2013).

**Market-Based Conservation Mechanisms**

MBCM are rooted in a particular epistemology that Gómez-Baggethun and Muradian (2015) refer to as “market environmentalism.” They define that market environmentalism is “embedded in a vision that conceives money and markets as the overarching system of reference defining what is internal and what is external to the mechanisms of societal choices” (218). Economists rooted in neoclassical theory characterize environmental degradation as an example
of market failure, where optimal individual decisions do not create optimal social outcomes (Hanley et al. 1997, Conrad 2010). Market failure exists because the benefits provided by the environment are external to the market and do not factor into private decisions. This is due to the open access or public nature of environmental goods, where individuals have incentives to overexploit resources because they do not personally bear the costs of exploitation (Gordon 1954, Hardin 1968). The solution, from this line of reasoning, has been to propose policy mechanisms that can internalize environmental factors (externalities), bringing their costs into decision-making.

Market-based instruments commonly refer to any policy mechanism that uses price signals to correct market-failure, in contrast to prescriptive (command-and-control) policies (Pirard 2012). Taxes, subsidies, payments for environmental services (PES), and trading schemes are all included under the common term “market-based” because they, “encourage behavior through market signals, rather than through explicit directives,” (Stavins 2007). Though in practice these mechanisms often fall short of establishing markets for the trading of environmental goods, they are deemed “market-based” because they attempt to change behavior by targeting the economic value of ecosystem services (Corbera 2015). Pirard (2012) notes that this broadly defined term is vague, as it obscures the role of economics, markets, and valuation in the establishment and function of these mechanisms. The vagueness of the term is also confusing for critics, who lump together ICDPs, ecotourism, PES, and natural capital approaches to conservation as “market-based,” while possibly failing to address the distinctions between these mechanisms and the broader category of economic incentives that includes taxes and subsidies (Corbera 2015). Matulis (2015) argues that the lumping of these mechanisms together is appropriate, as they all contribute to the “general financialization of conservation through the
integration of capitalist economic structures and rationalities” (pg. 158). I agree with this latter position, as similar to the term “market environmentalism” defined previously, lumping “market-based” incentives together highlights the common approach to MBCM characterized by an evolution of ideas within a singular approach to environmental policy.

Environmental economics texts tend to emphasize that the goal of market-based policies is to approximate markets to the greatest extent possible. When environmental economists propose that markets are the solution to market failure, they are looking toward the possibilities of an idealized market to efficiently regulate human behavior at the lowest cost to society: “Economists…work with the idea of complete markets to set a theoretical benchmark against which they can judge the effectiveness of different plans to organize economic activity” (Hanley et al. 2001). Hence, truly market-based structures are idealized for efficient environmental regulation even when they are not possible in practice. Though MBCM in implementation often fall short of establishing true ecosystem service markets (Fletcher and Breitling 2012, Pirard 2012), suggestions for improvements on existing market-based instruments frequently point to the need to make them more market-like (Field and Field 2002, Wunder 2007, Jack et al. 2008). Taken from this perspective, the current state of MBCM can be seen as an evolution of policies that have been proposed under the explicit goal of becoming increasingly more market-like, thereby providing an efficient means of conservation.

MBCM have evolved from taxes and subsidies to trading schemes and payments for environmental services. One of the first market-based instruments was proposed by Alfred Pigou, dubbed the Pigouvian tax, which suggests that taxes can alter price signals to incorporate environmental degradation into private decision making (Hanley et al. 2001). Subsidies follow the same logic, typically altering the price associated with environmentally beneficial behavior
(Field and Field 2002). A second set of instruments was theoretically proposed by Ronald Coase (1960), who demonstrated that allocating property rights can create markets for non-market goods, thereby efficiently correcting market-failure. Tradeable emissions permits and Payments for Environmental Services (in theory) find their theoretical grounding in the Coase theorem (Hanley et al. 2001, Muradian et al. 2010, Pirard 2012). From this perspective, it is possible to see that market-based instruments are not independent from each other, but rather united under the evolution of economic theory, whereby MBCM are designed to increasingly mimic market transactions. For example, tradeable permits, where polluting businesses are granted a set number of emissions permits that they subsequently renegotiate on an open market, have often been favored by economists because, “There is the expectation that this approach could give us pollution control at a substantially lower cost than the current system of technology-based effluent standards, and also a sense that, politically, they would be more acceptable than emission charges” (Field and Field 2002). However, the efficiency of MBCM depends largely upon context (Freeman and Kolstad 2007). I will therefore narrow the scope of this review to limited examples of some of the promises and pitfalls of MBCM that are most relevant for this dissertation.

Scholarship assessing the success of market-based mechanisms in promoting sustainable development has varied, depending upon the scale of analysis and the indicators of economic and ecological improvement. One of the oldest MBCM used in sustainable development initiatives is nature tourism, or tourism based on travel to remote wilderness areas. Nature tourism attempts to use existing markets to promote conservation by replacing extractive industry with one that benefits from environmental protection (Krüger 2005). Scholars have argued that under the right circumstances nature tourism can contribute to economic livelihoods while providing revenue
that finances protected areas (Budowski 1976, Wunder 2000, Honey 2008). Studies have shown that nature tourism successfully provides livelihoods that do not depend on resource extraction for local communities, and can contribute to forest regeneration (Almeyda-Zambrano et al. 2010, Almeyda et al. 2010, Liu et al. 2012, Hunt et al. 2015). However, nature tourism has also been critiqued for imposing a Western paradigm of human-environment interactions in which nature is valued solely for its economic returns (Mowforth and Munt 1998, Vivanco 2001, Campbell 2002, West and Carrier 2004). Further, nature tourism can be capitalized on by large powerful corporations who import labor, leaving local populations equally impoverished (Stem et al. 2003, Honey et al. 2010). Also, nature tourism can fall prey to “greenwashing” whereby the tourism industry claims to protect local ecosystems for marketing purposes while actually contributing to their degradation (Honey 2002). Some have argued that nature tourism can overcome these shortcomings if sufficient regulations and price signals are put in place to distinguish true “ecotourism” from other forms of nature tourism that may simply be mass tourism in disguise (Honey 2008, Stronza and Durham 2008). Others dismiss this possibility, asserting that ecotourism will always form part of a socially and ecologically detrimental international tourism industry (Gössling 1999, Carrier and Macleod 2005). In Chapter 4, I show that the success of nature tourism largely depends upon the social-ecological indicators being measured and how sustainable development is defined.

PES programs offer monetary compensation to landowners for providing socially beneficial ecosystem services. Such programs create markets for ecosystem services and identify exchange values for environmental goods (Landell-Mills and Porras 2002, Pagiola et al. 2002). The term PES has been employed somewhat indiscriminately, though many scholars adhere to Wunder’s definition (2005) where PES are defined as a contractual agreement between a PES
buyer and provider that is conditional upon the payment; thereby making PES by definition the creation of a market for environmental services. However, in practice most PES programs are administered by the government, with little accountability between PES providers and buyers (Wunder et al. 2008). The lack of a true market under most PES systems is pointed to as a shortcoming that is impeding potential market efficiency and contributing to some of the problems inherent in program design (Engel et al. 2008, Ferraro 2008).

Scholars have identified some challenges for PES programs, in particular: enrollment, program compliance, additionality, the link between land-use and ecosystem service provisioning, and leakage (Wunder et al. 2008). The first two challenges are related to the imperfection of PES markets. For example, if the government is setting prices for PES, and the price is not competing with opportunity costs, defined as the profit received from the next-best alternative land use, then enrollment could be low. Or, if people only enroll when they are already providing the ecosystem service in question then PES suffers from a lack of additionality, where program funds are purchasing ecosystem services that would have been supplied in the absence of payment (Sommerville et al. 2009). Program compliance is a particular challenge when oversight falls on the government as opposed to ES buyers because the government may not have sufficient infrastructure or authority to reprimand lack of compliance (Pagiola 2008, Wunder et al. 2008). The other challenges have to do with the science of ecosystem services. Despite the political support for ES, little is understood about the connections between ecosystem function and ecosystem service provisioning (Mace et al. 2012), and ecosystem functions are difficult to reduce to measurable ecosystem service units (Boyd and Banzhaf 2007). Hence buyers may not be convinced by the product that they are purchasing.
Also, a limited scale of PES implementation may signify that localized reduction in deforestation is offset by increased deforestation elsewhere, a problem known as leakage (Walker 2012).

Another challenge for PES programs is coping with limited funds. Targeting PES payments to low cost areas with high conservation value has been proposed as a solution, with several authors advocating that alignment of ecosystem service values with landowner opportunity costs across a spatially heterogeneous area will maximize their efficiency (Wätzold and Drechsler 2005, Sierra and Russman 2006, Wünscher et al. 2008). Targeting programs to specific areas can also maximize conservation benefits by fostering landscape connectivity (Albers 1996, Polasky et al. 2008). Targeting relies on estimates of landowner opportunity costs and nonmarket valuation measures of willingness to accept compensation (WTA) for providing ecosystem services (Ferraro 2004, Engel et al. 2008). By estimating these measures of economic exchange values, PES can align exchange values with conservation values and target low-cost/high-priority areas for inclusion in programs. While PES programs have begun to use economic valuation to target priority areas (Barton et al. 2009) the idea operates on assumptions that necessitate further research: (1) that exchange values drive land use decisions, and (2) that target ecosystem services are not in conflict with each other across scales.

Conservation Values and Ecosystem Services Valuation

There has been considerable theoretical research from the social and ecological sciences examining appropriate measurements of ecosystem services values, a process referred to as valuation (Costanza et al. 1997, Martin-Lopez et al. 2007, Brondízio et al. 2010, Kareiva et al. 2011, Chan et al. 2012b). A particular challenge for MBCM lies in disagreement as to the role of economic valuation in shaping environmental policy (Matulis 2015). Much of the divergence between disciplines on this matter stems from the fundamental question of “how do we
understand value?” This question has implications for modeling approaches and qualitative assessments of value, as well as for the broader discussion of how individual actions contribute to social well-being. This question has been explored throughout the social sciences, with strong roots in early economic theory.

The debate between the early economists was two-fold: (1) what determines value in a capitalist system? And, (2) do capitalist markets contribute to social well-being? Adam Smith, famous for his notion of the invisible hand, claimed that values were determined by price and that through selfish actions, individuals would maximize social welfare (Smith 1910). David Ricardo and Karl Marx asserted that all value in a capitalist system is derived from labor (Hunt 2002). Capitalists, therefore, had to control labor to produce objects for exchange in a market, and they achieved this through controlling the means of production (Marx and Engels 2007). Hence, in contrast to Smith, Marx saw capitalism as an unnatural system, where the self-interested behavior of individuals would serve to oppress the masses.

In mainstream economics, Adam Smith’s idea of the invisible hand prevailed, and was reworked through a generation of scholars, including William Stanley Jevons, León Walras, and Jeremy Bentham, to arrive at the neoclassical concept of value, centered around the idea of utility (Hunt 2002). In this framework, individuals seek to maximize utility, or overall well-being, and through this self-interested behavior efficiency is maximized (and the greatest amount of total social good is produced) (Jevons 1866, Frank 1991). Some scholars have objected to the vagueness of the notion of utility, and have pointed to the potential teleological argument – well-being is realized by maximizing well-being (Broome 1991). Amartya Sen (1977, 1999) has argued that the emphasis on utility has caused economists to lose interest in other aspects of the market, such as social relations, equity, and justice.
While environmental economists have focused on the problem of environmental degradation from the perspective of market failure, other social scientists consider environmental degradation to constitute a social failure, via the collapse of social institutions (Feeny et al. 1990). Some scholars have emphasized how non-market societies have monitored natural resource uses through effective governance (Cox 1985), and that policies undermining social cohesion exacerbate the problem of environmental degradation as they effectively train people to act like self-interested, profit-maximizing “rational” actors (Ostrom 1998, Bowles 2008). In contrast to policy aimed at altering market incentives, these scholars assert that policy should focus on the establishment and maintenance of effective institutions to mediate environmental behaviors (Agrawal 2003, Dietz et al. 2003).

The above scholars have been influenced by work in anthropology demonstrating that values are embedded in social systems (Polanyi 1957, Mauss 1990), where they are produced by and reflected in cultural institutions and relationships (Munn 1986). It follows from this line of logic, that economic activity and decisions cannot be understood as independent from social systems (Dalton 1961, Sahlins 1972, Polanyi 1977), and exchange value is only one facet of values that has arisen to predominance in a capitalist system (Graeber 2001). Although anthropology has internally debated the usefulness of economic modeling approaches to human behavior (Cook 1966, Tucker 2012), and occasionally borrows from economic approaches to understand how humans allocate resources (Kuznar 2001, Henrich and McElreath 2002), the tendency within the discipline is to understand capitalism as a particular system that shapes social relations (Wolf 1982). Therefore, any attempt to understand human behavior in an economy needs to understand the entirety of the system within which individuals interact (Godoy et al. 2005). This poses problems for economic valuation.
In order to appropriately factor environmental values into decision making scholars must approximate ecosystem service values in models (Brown et al. 2007). Since economists tend to support the idea that exchange value is representative of total value, they utilize nonmarket valuation techniques that reduce environmental values to commodities (Swinton et al. 2007). Nonmarket valuation refers to a suite of techniques employed by environmental economists to estimate the exchange value of natural resources that are not usually exchanged in a market setting (Champ et al. 2003). There are a variety of techniques that fall in this category. The indirect techniques of travel cost and hedonic modeling rely on market values that can serve as proxies for environmental goods, such as the amount of money spent to travel to a recreation area, or the price for a house that includes environmental amenities (Champ et al. 2003). Stated preference methods, in contrast, are direct techniques that rely on surveys that ask individuals to state their willingness to pay (WTP) or willingness to accept (WTA) compensation for changes in environmental services (Adamowicz et al. 1998). Stated preference methods, such as contingent valuation (CV) and stated choice experiments (CE) have been considered preferable to indirect methods of valuation, in some circumstances, because they can elicit nonuse values as well as values for potential environmental changes (Adamowicz et al. 1994, Hanley et al. 1998, Louviere et al. 2000). However, they have also been critiqued for eliciting merely “hypothetical” values and for the cognitive demands placed on the respondent (Bishop and Heberlein 1979, Adamowicz et al. 1994). Best practices techniques are continually being developed to limit these deficiencies (Carlsson et al. 2007), and economists assert that imperfect valuation is still preferable to no valuation.

Other scholars have challenged the role of economic valuation in informing environmental policy. Anthropologists have asserted that economic valuation reduces the
multitude of human values to a simplistic, and often ironic, monetary exchange value (Graeber 2001). In the context of sustainable development, policies that focus on exchange value incentivize a capitalistic focus on short-term profits that, despite the predictions of economic equilibrium models, typically promote unsustainable private decisions (Acheson 2000). While nonmarket valuation is useful for applying cost-benefit analysis, an aspect of conservation decisions, many scholars and conservation activists have raised concerns about placing a monetary value on the environment (Goulder and Kennedy 2011). The key arguments against such techniques are that they undermine the intrinsic value of nature (Ghillarov 2000, McCauley 2006), and that they are inappropriate given the complexity of natural and social systems (Robertson 2004, Kosoy and Corbera 2010, Spangenberg and Settele 2010). For example, many scholars adhere to the idea that environmental values are inherently incommensurable, indicating that exchange values do not represent other potential values, such as biodiversity value of species, and aesthetic value of amenities (Martinez-Alier et al. 1998: 283, Norton and Noonan 2007). Inappropriate valuation may also provide a solution to conservation ailments with unforeseen social and ecological consequences through undermining other value systems that are crucial for sustainability (Adger 2000, West 2006). Given these challenges to valuation, scholars have suggested that the next step forward should involve understanding the interactions and tensions among values across scales (Pascual et al. 2010), and incorporating a diversity of values into policy (Brondízio et al. 2010, Roe and Walpole 2010, Chan et al. 2012a).

While in theory ecosystem service valuation can estimate multiple aspects of value, the desire for policy-relevant information and comparability of values across scales tends to emphasize exchange values through the use of a common metric - money (Gómez-Baggethun et al. 2010). This is problematic, as evidence from behavioral economics has demonstrated that the
method of valuation determines how values are defined. Martín-Lopez et al. (2014) examined the impact of valuation method on values elicited for ecosystem services and found that different valuation techniques resulted in different values being articulated by the study population. They convincingly conclude from this study that decision-making centered on cost-benefit analysis runs the risk of ignoring non-monetary values (Martín-López et al. 2014). This finding is echoed in similar studies. For example, Hattam et al. (2015) find that comparing nonmarket valuation with deliberative valuation in the same study site resulted in different values being articulated by the sample population. They conclude that valuation needs to frequently employ multiple valuation techniques to provide a more holistic perspective of ecosystem service values. Other researchers have made headway in employing innovative valuation methods, such as interviews and focus groups (Terer et al. 2004), deliberative valuation (where panels of individuals discuss ecosystem service values prior to answering questionnaires) (Howarth and Wilson 2006, Spash 2007, 2008), and Q methodology (where respondents sort ecosystem service values into categories of preferences) (Pike et al. 2014). Ultimately, all valuation methods intend to better understand the values of ecosystem services for better incorporation into policy (Christie et al. 2012).

Conclusion

This review has focused on the evolution of MBCM as concomitant with the shift in conservation focus from enclosed protected areas to sustainable landscapes. It has revealed MBCM as a set of popular policy tools that attempt to promote sustainable landscapes by using market signals to alter behavior, thereby internalizing environmental externalities and correcting market-failure. These tools have moved to the forefront of conservation policy as emphasis has moved beyond protected areas to geographically larger extents, but they are faced with practical
challenges related to the concept of value: namely, what kinds of values reflect environmental values and can these be measured and targeted? Though there is abundant literature on the theory of how value is created, there is little empirical research within the ecosystem services literature examining the underlying assumptions of how different types of values influence action within a capitalist society.

My dissertation attempts to begin to fill this gap by examining how MBCM engage with values in a socially diverse landscape, and subsequently, whether MBCM can fulfill the promise of promoting sustainable landscapes. In Chapter 3, I use nonmarket valuation, complemented with semi-structured interviews, to understand the values that landowners have for ecosystem services and their preferences for PES. This chapter contributes to literature on valuation methodology by providing an innovative, mixed-methods approach to valuation. Contrary to some findings in the literature (Martín-López et al. 2014, Hattam et al. 2015), I find that values solicited were consistent across nonmarket valuation and interview responses, but that interviews deepen understanding of nonmarket valuation. I also use these results to speak to some of the particular efficiency challenges of PES. In Chapter 4, I combine spatial analysis of forest cover change maps produced by Steve Padgett-Vasquez, with interview data to understand whether MBCM effectively contributes to landscape conservation planning. This chapter highlights challenges of scale in sustainable development analysis, supporting the conclusions of scholars who have found that GIS methodologies and broad-scale indicators of conservation success can obscure the realities of sustainable development (Jiang 2003, Turner 2003, Velásquez Runk et al. 2009). In Chapter 5, I examine a long-standing debate in anthropology of whether market participation provokes self-interested utility maximizing behavior (Polanyi 1957). I revisit this debate in reference to ecosystem services, providing timely field data to compliment behavioral
economics experiments demonstrating that market-behavior is a learned social norm that may be detrimental to conservation. Taken together, these chapters intend to expand understanding of how MBCM function at a landscape scale, and whether they ultimately contribute to sustainable development goals.

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CHAPTER 3

UNDERSTANDING PAYMENTS FOR ENVIRONMENTAL SERVICES IN COSTA RICA

FROM THE GROUND UP: A NONMARKET VALUATION APPROACH

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1 Allen, Karen. Submitted to Ecological Economics, 3/29/16.
Abstract
Payments for Environmental Services (PES) are part of a suite of market-based conservation mechanisms that are gaining international attention for their potential to produce ecosystem services across private landholdings. The Costa Rican government, a PES pioneer, provides landowners with remuneration for conserving forest cover on their properties. The efficacy and efficiency of PES programs have been critiqued because little is understood about the ability of payments to alter conservation behavior. I use data from landowner interviews and an economic nonmarket valuation technique known as the stated choice experiment to explore preferences for PES and the impact of PES on conservation behavior in the mixed-use Bellbird Biological Corridor of Costa Rica. The choice experiment estimates landowner values associated with a particular environmental benefit. The landowner interviews provide context for the choice experiment results and illuminate the implications for policy. Results indicate that landowners in the study area are generally resistant to the PES program and prefer to combine conservation land uses with agricultural production. Results further suggest that PES in Costa Rica are not economically efficient and suffer from lack of additionality. Potential program improvements require a better engagement with multifaceted landowner values.

Introduction
Market based mechanisms have moved to the forefront of conservation policy because they propose an economically efficient means to protect natural resources (Ferraro and Kiss 2002). Market-based conservation mechanisms are designed to incorporate environmental benefits into tradeable market goods, thereby correcting the market failure that leads to the under-provision of ecosystem services (Jack et al. 2008). Payments for Environmental Services
(PES) are market-based conservation mechanisms through which the providers of environmental benefits (typically landowners) are paid by consumers for the continued supply of ecosystem services (Wunder 2005, p. 3). PES offer the potential for a more efficient return on conservation dollars spent because they provide property rights and a market for ecosystem services, thereby potentially correcting market failure. By economic definition, if the environment can successfully be incorporated into markets, market trading of environmental goods will result in *pareto optimality* where the total environmental benefits provided to society are maximized (Haab and McConnell 2002). Several questions have arisen as to the true impact PES programs have on conservation, but they can be reduced to the broader issue of *how do program managers ensure that the payment is making a difference in actual behavior?*

One way of understanding human behavior is by evaluating the preferences of the individuals who would sell the ecosystem services in question, and comparing these to existing PES programs. The stated choice experiment (CE), a nonmarket valuation technique, is useful for this purpose as it is a method that tests behavioral responses to hypothetical environmental changes (Louviere et al. 2000). I used a CE, combined with in-person interviews, to examine preferences for PES among private landowners in the Bellbird Biological Corridor (CBPC, *Corredor Biológico Pájaro Campana*), Costa Rica. This paper contributes to the body of literature examining the impact of PES in Costa Rica by offering insight into how landowners responded to PES program design, thus providing a ground-level approach to understanding PES policy efficiency and efficacy.

*Background*

PES propose to alter behavior by providing direct, monetary incentives for conservation. They differ from other incentive mechanisms because under PES the quantity of ecosystem
services supplied are, theoretically, regulated by market demand and prices (Wunder 2005). Stated more clearly, buyers decide the quantity of ecosystem services that they want to purchase, sellers decide how much they are willing to sell, and the market price ensures adequate provisioning of these services. Though the ideology of PES is theoretically sound, implementation has faced some challenges. Some of the problems with PES include: (1) the idea of leakage, or whether environmental improvements in one location signify damage in another, (2) concerns about the permanence of ecosystem services provisioning under temporary PES contracts, and (3) the question of whether payments alter behavior, or merely subsidize activities that would occur in the absence of payment, a phenomenon known as lack of additionality (Wunder et al. 2008). Much of the literature supporting PES focuses on how to strengthen the market aspects of PES (Jack et al. 2008), and how to guarantee the connection between ecosystem function and ecosystem service provisioning (Boyd and Banzhaf 2007). For example, suggestions to correct for lack of additionality usually relate to providing an adequate opportunity cost (the potential earnings from alternative land uses) (Engel et al. 2008), or targeting environmentally degraded areas (Wünscher et al. 2008, Barton et al. 2009). These arguments rest on the assumption that providing a competitive payment in a target area will alter behavior in favor of conservation because monetary exchange values drive decision making. This assumption is seldom empirically tested in the literature on PES.

There have been numerous studies evaluating the efficiency and efficacy of PES in Costa Rica, often with contradictory findings. Most of these studies have used satellite imagery to examine the effects of PES on forest regrowth. Some have found the impacts to be minimal, where much of the reforestation mistakenly attributed to PES is actually due to other macroeconomic changes (Sierra and Russman 2006, Sánchez-Azofeifa et al. 2007, Pfaff et al.
Other studies have found that PES is effective at discouraging deforestation, but not necessarily encouraging reforestation (Morse et al. 2009, Daniels 2010). Still others have matched PES and non-PES parcels to conclude that PES is successful in achieving the efficiency goal of net forest regeneration (Arriagada et al. 2012). These studies all take a birds-eye view of the impact of PES on forest cover, with little emphasis on human decision making. Satellite imagery plays an important role in demonstrating how policy relates to net forest cover, but it can be extremely challenging, as the above studies show, to tie human decision-making to forest cover change.

An alternative approach to reliance on satellite imagery is to utilize techniques that reveal population preferences and characteristics, such as the combination of a stated choice experiment with ethnography used here, and then infer policy impacts. This approach provides ground-level data on landowner characteristics and preferences for PES programs, which can help to untangle the relationship between PES design, landowner decision making, and land use change (see Arriagada et al. 2009, Arriagada et al. 2015). Stated choice experiments (CEs) are increasingly being used to understand landowner behavior and preferences for environmental policy design (Espinosa-Goded et al. 2010, Kaczan et al. 2013, Richardson et al. 2013). By comparing population preferences for PES, as revealed through a CE, to existing programs, this paper sheds light on landowner behavior under current program conditions.

**Study Area**

The study area is in the northwestern section of the Bellbird Biological Corridor (CBPC) in Costa Rica. The CBPC (~667 km²) covers three watersheds on the Pacific slope of Costa Rica that extend from the continental divide north of the popular tourist destination of Monteverde to the Gulf of Nicoya. It is part of a network of 37 mixed-use conservation corridors in Costa Rica.
that are target regions for PES (SINAC 2009). Members of the CBPC directorate told me that PES is an important component of the CBPC conservation strategy, and thus an appropriate location for the current study. The study area is limited to the region between the Pan American highway and the tourist town of Santa Elena, incorporating parts of the districts of Monteverde, Guacimal, and Acapulco.

Costa Rican law allows for 4 different categories of ecosystem services that are eligible for payment: water protection, carbon sequestration, scenic beauty, and biodiversity (Chomitz et al. 1999). The payments are financed by a combination of a fuel tax, taxes on public utilities, carbon certificates, and donations made to the state, and are then channeled through FONAFIFO (the Fondo Nacional de Financiamiento Forestal), the government institution charged with administering public funds for forestry projects (www.fonafifo.go.cr). Program implementation is overseen by independently contracted forestry regents (regentes forestales) who have an intermediary role between the ecosystem service providers and FONAFIFO (Pagiola 2008). These ecosystem services are not purchased directly, but rather through the proxy of forest cover. Landowners are paid either per hectare of forest cover, or per tree reforested, and the payment amount varies depending upon the branch of the program that the landowner is entering.

Methods

I combined a stated choice experiment (CE) with semi-structured interviews among landowners to understand population preferences for PES in the CBPC. The CE estimated preferences for participation in a hypothetical program that would pay landowners for sustainable land uses. Interview data explained landowner engagement with the CE instrument, and value systems underlining preferences.
Sample Selection

The target population for this study was landowners who own at least one hectare of land within the study area. At the time of this research, the municipalities in the study area did not have a complete centralized database of landowners due to high rates of untitled farms. The best records of landowners in the study area were available through the Ministry of Agriculture and the Monteverde Cheese Factory. I compiled lists from the two regional Ministry of Agriculture offices working in the study area (Monteverde and Chomes), and the Monteverde Cheese Factory suppliers office, and deleted duplicate farms. From the final sampling frame of 210 farms, I selected a random sample of 100 landowners for participation. Of this sample, 87 people agreed to participate in the CE survey and semi-structured interview for a response rate of 96.7%. Three people refused participation, and 10 people could not be contacted because their primary residence was outside the zone.

Table 3.1 shows the summary statistics for the sample population. The study area included two market centers where a little over a third of the participants lived (Santa Elena or Sardinal) while the balance resided on small family farms in the remaining rural areas. Most participants inherited their farms; thus there is a high average tenure to age ratio. Primary income sources varied between general off farm employment, farm tourism, and farm production. The primary income source for most of the population was from off-farm employment, such as in tourism, agricultural factories (dairy and chicken), or on other farms. Just over a quarter of participants reported receiving their income solely from agriculture, and a small percentage participated in farm tourism. Less than a third of the participants had a high school education and/or a higher education degree. The majority of participants claimed that they had some portion of their farm allotted to forest cover.
Table 3.1: Summary Statistics of the sample population. Income sources refer to the percentage of individuals who reported the activity as their primary income source.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average farm size</td>
<td>36 ha</td>
</tr>
<tr>
<td>Gender</td>
<td>85.1% male</td>
</tr>
<tr>
<td>Average age</td>
<td>52 years</td>
</tr>
<tr>
<td>Average tenure</td>
<td>46 years</td>
</tr>
<tr>
<td>High school</td>
<td>27.6%</td>
</tr>
<tr>
<td>Live in market center</td>
<td>35.6%</td>
</tr>
<tr>
<td>Inherited farm</td>
<td>69%</td>
</tr>
<tr>
<td>Income source agriculture</td>
<td>28.7%</td>
</tr>
<tr>
<td>Income source farm tourism</td>
<td>12.7%</td>
</tr>
<tr>
<td>Income source off farm employment</td>
<td>58.6%</td>
</tr>
<tr>
<td>Percent of individuals who reported forest</td>
<td>74.7%</td>
</tr>
<tr>
<td>conservation on farms</td>
<td></td>
</tr>
</tbody>
</table>

**Choice Experiment Design and Interview Methods**

The goal of the CE was to estimate landowner preferences for PES programs. The Costa Rican government has several categories of sustainable land uses that are incentivized under PES: agroforestry systems, forestry plantations, forest conservation and/or regeneration, and most recently, organic agriculture (Ley Agricultura Orgánica 2007, Decreto 2014). A CE poses choices between hypothetical outcomes that have different attributes. Observing these choices allows for an understanding of how people value the various components of the CE. I designed a CE to estimate preferences for incentive payments associated with sustainable land uses and associated ecosystem services in the CBPC. For this experiment, the choice questions included 4 attributes: a percentage attribute that varied the amount of land placed in the hypothetical program, a land use attribute that varied permissible uses on land placed in the program, an environmental services attribute that varied the target environmental services, and a cost vector.
that varied compensation (Table 3.2). In this CE, the cost vector measured willingness to accept (WTA) for participation in the program.

Table 3.2: The attributes and levels of the choice experiment.

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
<th>Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage of Farm</td>
<td>The percentage of a given farm that would be put into program</td>
<td>25%; 50%; 75%; 100%</td>
</tr>
<tr>
<td>Permitted Uses</td>
<td>The uses that would be permitted on the portion of the farm placed into the program</td>
<td>No permitted use; Organic agriculture; Agroforestry; Forestry</td>
</tr>
<tr>
<td>Environmental Benefit</td>
<td>The goal of the government incentive program</td>
<td>Forest Cover; Water Quality</td>
</tr>
<tr>
<td>Compensation</td>
<td>The dollar amount that would be paid for participation in the program, per ha, per year.</td>
<td>$50; $175; $300; $425</td>
</tr>
</tbody>
</table>

I tested the CE design and accompanying survey questions in two phases. In June 2011 and July 2013, I interviewed landowners in the region (n=11) and conservation practitioners (n=5) to confirm the appropriateness of the CE instrument and develop relevant supplementary survey questions. Using NGENE 1.1.1, I created a d-efficient experimental design with 12 choice situations. In September through November 2013, I completed a trial run of the CE with a convenience sample of 10 landowners in the study area. From the trial run, I learned that the CE design was comprehensible to landowners, that 12 CE questions per respondent was not excessively demanding, and that the attribute relationships presented in the questions were realistic. I also learned that respondents needed more clarity about program specifics, such as who assumes cost for program involvement, minimal land inclusion in the program, and
clarification of allowable uses. This information was incorporated into the script for the final survey administration.

I administered the final CE during the months of February through December, 2014. I contacted respondents by phone, and established an interview time. In most cases, interviews occurred at the respondents’ residences, and averaged 45 minutes. I administered the CE in Spanish, the respondents’ native language. The CE was prefaced with a script that asked the respondents to imagine that they were considering dedicating part of their farm to a PES style program where they would be paid for undertaking sustainable land uses on their farm. I explained that they would be required to have a management plan for the land placed into the program, designed to monitor the permitted use and promote a specific environmental service. This management plan would have no additional cost for them. Each respondent was asked all 12 versions of the CE question. A sample CE question is provided in Figure 3.1. Each version of the CE question presented the respondent with two alternatives for participation in the hypothetical program, and a status quo alternative. The status quo alternative provided respondents with the option of maintaining current land-uses by not participating in the program. To minimize the impact of “learning” on choice responses, the questions were randomized prior to each CE administration. In addition to the CE, I asked respondents survey-style questions to account for demographic variables, such as age, gender, tenure, and income source.
Model Estimation

Model selection and estimation were driven by the purpose of the experiment – to understand behavior and preferences in the study area, and relate these to existing incentive programs. It was apparent in survey administration that CE responses varied according to a general resistance to PES among a certain segment of the population. Frequently, this resistance took the form of a “protest response,” in which respondents chose the status quo for every choice scenario presented. Explanations of these responses subsequent to CE administration indicated that some respondents rejected the premise of the program, as opposed to the specific attributes. This was the case for 34.5% of respondents. I identified these individuals in the dataset and coded them with a protest response binomial variable (see Table 3.3). I used a latent class regression, conditioned on protest responses, to examine preference heterogeneity within the
population. I then used a binomial logit on protest responses to identify the particular characteristics of the individuals who protested the choice experiment.

Latent class models assume that there is unobserved heterogeneity in the population that conditions responses, and provide a mechanism, when combined with theory, to explain this heterogeneity (Boxall and Adamowicz 2002). These models assume that the population consists of latent classes and the parameter estimates are common within these classes but distinct from one class to another (Greene and Hensher 2013). The model estimates the probability of class membership based on an individual’s response. The indirect utility function for member $i$ of class $s$ can be written as:

$$U_{i|s} = \beta_{0s} ASC + \beta_{1s} Percentage_i + \beta_{2s} Permitted Use_i + \beta_{3s} Ecosystem Service_i + \beta_{4s} Payment_i + \epsilon_i$$

The probability that individual $i$ is a member of class $s$ is estimated by

$$P_{i|s} = \frac{exp(\alpha_s Z_i)}{\sum_{s=1}^{S} exp(\alpha_s Z_i)}$$

Where $Z$ denotes the respondent characteristic, and $\alpha_s$ indicates the class-specific parameter to be estimated. The latent class model is then estimated according to the probability that individual $i$ belongs to class $s$ and chooses alternative $j$:

$$P_{ij|s} = \left[ \frac{\exp(B_s X_{ij})}{\sum_{j=1}^{J} \exp(B_s X_{ij})} \right] \ast \left[ \frac{exp(\alpha_s Z_i)}{\sum_{s=1}^{S} exp(\alpha_s Z_i)} \right]$$

Where $X_i$ is a vector of attributes associated with choice alternative $j$, and $B_s$ is a class-specific vector of preference parameters.

To determine the optimum number of classes, I used exploratory analysis to develop theory about the structure of underlying classes, and then used class model probabilities and parameter estimates to determine whether a model becomes over-fit with increasing classes (see
Greene and Hensher 2013). I began with a two class model in accordance with theory about the attitudinal division among the population regarding government intervention in farm practices. I ran a three class model to explore further heterogeneity in the population, but the model proved too demanding for the sample size, with extremely large parameter estimates that were oversensitive to small manipulations in the data. I therefore decided that the appropriate number of latent classes was a two-class model.

Continuing with a deductive approach, I decided to condition the classes on protest responses. I constructed the latent class logit so that the binomial protest response variable entered into the class probabilities and protest responses would tend to fall into one class or another. Protest responses are sometimes viewed in nonmarket valuation studies as an obstacle—an extreme response to the CE tool but not an accurate reflection of the target populations’ values toward a particular ecosystem service (Bateman et al. 2002). These responses can be controlled for in CE models in order to calculate a more accurate willingness to pay (WTP) or WTA for the ecosystem service in question (Horne 2006). An alternative approach is to understand how these responses reflect distinctions in the value systems of respondents (Colombo et al. 2005). By leaving the protest responses in the model, I was able to examine heterogeneity of preferences based on a gradient of resistance to PES within the population. ²

I used a binomial logit to examine characteristics of individuals who chose the protest response. The model estimates the probability that the respondent chose the protest response based upon characteristics of that individual. The model used to estimate this relationship is:

---
² Though this method results in one of the classes having parameters that are driven by a small subset of the responses (given that protest responses have null CE data), it isolates those responses to a class that has little interest in the CE. A similar approach would be to remove protest responses from the model and estimate one conditional logit for the remaining population, but this approach does not allow me to identify responses that are similar to protest responses. I have explored models with the protest responses removed. Latent class logits are too demanding for the data set and have a low adjusted $R^2$. Conditional logit models without protest responses reflect similar relationships to those reported in the PES Accepting class here but have a poorer fit. Results are available upon request.
\[
\ln \frac{P_1}{P_0} = \beta_0 + \beta_1 High School + \beta_2 Region + B_3 Age + \beta_4 Off Farm
\]

In this model, \( P_1 \) indicates the probability that the respondent chose the protest response. High School is a binomial variable that indicates whether the respondent has a minimal high school degree, Region is a binomial variable that signifies whether the individual lives in a “market center,” Age indicates the respondent’s age, and Off Farm is a binomial variable that indicates whether income was exclusively generated via off farm employment (Table 3.3). Variance Inflation Factors and the Covariance Matrix were examined for possible problems with multicollinearity and none were found.

Table 3.3: Variables used in Protest Response logit.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Proxy For</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protest Response</td>
<td>Probability of choosing opt out for all choice alternatives presented</td>
<td>Protest response indicating resistance to experiment</td>
</tr>
</tbody>
</table>
| (dependent)      | 1 = Protest Response  
|                  | 0 = Chose at least one of the CE alternatives                             |                                                     |
| High School      | Binomial variable indicating whether respondent has a high school education | Education level; controls for cognitive demand of choice |
|                  | or higher.  
|                  | 1 = High School education  
|                  | 0 = No high school education                                             | experiment                                          |
| Region           | Binomial variable indicating whether respondent *lives* in a “market center.” | Market exposure                                      |
|                  | 1 = Lives in Monteverde or Sardinal  
|                  | 0 = Lives in other (rural) area                                          |                                                     |
| Age              | Continuous variable indicating the respondents age                        | Age; tradition; change averse                        |
| Off Farm         | Binomial variable indicating whether respondent receives some portion of   | Dependence on farm as sole source of income          |
|                  | income from off farm employment  
|                  | 1 = Off farm income  
|                  | 0 = farm income (production or tourism)                                   |                                                     |
**Interview Data**

Subsequent to CE administration, respondents answered interview questions designed to provide context and depth for CE results (Table 3.4). When permission was granted, interviews were audio recorded and transcribed. Of the 87 total interviews, 71 were audio-recorded. Eight people did not grant permission for recordings, but extensive field notes permitted a limited level of analysis. For 8 other individuals, audio recording was not permitted and the answers to the interview were concise; hence, qualitative analysis was not possible. Interview responses were analyzed and coded for themes in MAXQDA 11. Themes are concepts that emerge from qualitative data that are understood to both explain and control behavior and relationships (Opler 1945). I used grounded theory to identify themes according to repetition, word frequency, word co-occurrence, and key words in context (Ryan and Bernard 2000). I then coded the text to mark any segment of an interview that expresses a given theme (for more information, see Ryan and Bernard 2003). I analyzed theme concepts and frequency and used them to provide insight into quantitative models.

<table>
<thead>
<tr>
<th>Semi-Structured Interview Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Did the CE questions make sense?</td>
</tr>
<tr>
<td>2. Which alternatives seemed the most important to you when choosing?</td>
</tr>
<tr>
<td>3. Do you have any experience with (and opinions of) the national PES program?</td>
</tr>
<tr>
<td>4. Do have experience with conservation organizations?</td>
</tr>
<tr>
<td>5. Do you have forest on your property? (And if so, why?)</td>
</tr>
</tbody>
</table>
Results

Regression Models

The latent class logit revealed preference heterogeneity among the sample population with regards to government mediated PES style programs (Table 3.5). The latent classes were conditioned on protest responses, and the model had an improved fit over the alternative models, with an adjusted R2 of .385. I labeled the latent classes PES Resistant and PES Accepting to characterize the observed gradient of resistance across the sample population as represented by protest responses. The PES Resistant and PES Accepting classes had class membership probabilities of .516 and .484 respectively.

Table 3.5: Parameter estimates for latent class logit with two classes, conditioned on protest responses.

<table>
<thead>
<tr>
<th></th>
<th>PES resistant</th>
<th>PES accepting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage</td>
<td>-.057***</td>
<td>-.007**</td>
</tr>
<tr>
<td>Agroforestry</td>
<td>-.237</td>
<td>.286***</td>
</tr>
<tr>
<td>Organic Agriculture</td>
<td>.562</td>
<td>.220**</td>
</tr>
<tr>
<td>No Permitted Use a</td>
<td>n.s.</td>
<td>-.506a</td>
</tr>
<tr>
<td>Forestry</td>
<td>-.410</td>
<td>.128</td>
</tr>
<tr>
<td>Ecosystem Service</td>
<td>.230</td>
<td>.079*</td>
</tr>
<tr>
<td>Compensation</td>
<td>.004**</td>
<td>.002**</td>
</tr>
<tr>
<td>Status Quo</td>
<td>1.179***</td>
<td>-1.042***</td>
</tr>
<tr>
<td>Class Membership Probability</td>
<td>.516</td>
<td>.484</td>
</tr>
</tbody>
</table>

Protest Response 4.318*** -----

Note: ***, **, * indicates significance at 1%, 5%, and 10% level, respectively.
a. The coefficient for No Permitted Use is calculated using as – (B1+B2) for the other effects coded attributes. The coefficient for forestry is not included in this calculation since there is not a detectable difference in preferences between Forestry and No Permitted Use.
The *PES Resistant* class showed a decreased willingness to engage with the CE and PES-style incentive programs, as revealed by the significant probability of protest responses and status quo responses. The status quo variable signified the probability of choosing the status quo in general, but not necessarily for every alternative. The only significant attributes for this class were the Percentage of Farm that would be devoted to the hypothetical program, with this class preferring to put less land into any incentive-based sustainable land use program, and the Compensation, where participants preferred to receive payment for participation.

The *PES Accepting* group was less likely to choose the status quo and was generally more willing to participate in a PES style program (Table 3.5). This class showed a slightly significant preference for a program that would emphasize water quality ecosystem services, and a preference for receiving compensation for participating in the program. In general, individuals in this class preferred to put less land into a hypothetical PES style program. The attributes for Permitted Uses were effects coded, with the parameters for the levels measured against the baseline (-1 -1 -1) No Permitted Use level. Participants in the PES Accepting class significantly preferred Agroforestry and Organic Agriculture uses to No Permitted Uses. There was a slightly higher coefficient for Agroforestry than for Organic Agriculture, indicating that the odds of choosing a hypothetical program for agroforestry uses were greater than for other uses. There was not a significant difference in preferences between Forestry and No Permitted Use programs. The coefficient for No Permitted Use was calculated by taking the negative of the sum of the significant coefficients for the effects coded variables (Kaczan et al. 2013).

I used a binomial logit to identify the characteristics of the subpopulation that exhibited the protest response. The defining demographic characteristics of the protest respondents were landowners who did not have a minimal high school education, those who did not live in a
market center, people who were older, and those whose income was derived exclusively from farm employment (Table 3.6). This model had a pseudo R2 of 0.27 and a prediction success rate of 77%.

Table 3.6: Parameter estimates for binomial logit on protest responses. Variable descriptions are provided in Table 2.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Odds Ratio</th>
<th>Standard Error</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>High School</td>
<td>-2.343</td>
<td>.096</td>
<td>1.098</td>
<td>.033**</td>
</tr>
<tr>
<td>Region</td>
<td>-1.646</td>
<td>.193</td>
<td>.758</td>
<td>.030**</td>
</tr>
<tr>
<td>Age</td>
<td>.047</td>
<td>1.048</td>
<td>.027</td>
<td>.082*</td>
</tr>
<tr>
<td>Off Farm</td>
<td>-1.108</td>
<td>.330</td>
<td>.545</td>
<td>.042**</td>
</tr>
<tr>
<td>Intercept</td>
<td>-1.760</td>
<td>.172</td>
<td>1.480</td>
<td>.234</td>
</tr>
</tbody>
</table>

Note: **, * indicates significance at 5%, and 10% level, respectively

Qualitative responses

The qualitative data deepens understanding of formal models. Figure 3.2 compares the explanations given for CE responses between the protest respondents and all others (“CE Participants”), with the code descriptions provided in Table 3.7. The protest respondents tended to use terms that referred to self-reliance, agricultural production, and conservation ethic, when describing their responses to the CE. In general, these themes expressed the importance of maintaining a farm lifestyle, and of having conservation ethic as part of that lifestyle. The CE participants most frequently explained that the motivation for participation related to additional income. This was typically voiced as something akin to: “this option is the most similar to what I am already doing.” This does not mean that this group reported more forest cover on farms.
the contrary, I ran a logit in which reported “conservation use” on farms served as a predictor variable for protest responses and the variable was not significant.

Figure 3.2: Comparison of explanations of CE responses between the CE participants and the Protest Response group. The frequency refers to the number of times that a category was given as an explanation for responses. Category descriptions are found in Table 3.7.

![Bar chart showing comparison of explanations between CE participants and Protest Responses]
Table 3.7: Themes identified from semi-structured interviews explaining CE responses.

<table>
<thead>
<tr>
<th>Theme Name</th>
<th>Key Words, Concepts expressed</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-reliance</td>
<td>“I run my farm and I don’t want anyone to tell me what to do on it.”</td>
<td>A value associated with relying on oneself for economic production and farm maintenance</td>
</tr>
<tr>
<td>Agricultural Production</td>
<td>“If I were to do this, I couldn’t work the farm.”</td>
<td>That agricultural production has a value that runs counter to incentive programs</td>
</tr>
<tr>
<td>Conservation Ethic</td>
<td>Environmental awareness/ concientización</td>
<td>Awareness drives forest conservation, not payment.</td>
</tr>
</tbody>
</table>
| Forest Values               | “No one pays me for my forest, but it is worth a lot to me.”  
|                             | or Forest values merit monetary compensation      | Forests have values that are (not) adequately recognized by incentive programs |
| Government                  | “This lends itself to corruption”                 | The government is corrupt and is looking to appropriate farm lands or otherwise benefit from the program. |
| Cost Effectiveness          | “The payment is too little”  
|                             | or “If the payment were right, I’d change my land use.” | The payment offered was considered (in)sufficient to change land uses |
| Additional Income (Lack of Additionality) | “Why not receive payment for something I’m doing anyway?” | Program provides additional income for those who are not using lands. |

The cost effectiveness and forest values categories were shared themes between both groups, and yet the CE participants and Protest Respondents talked about them in contrasting ways. Among the CE participants, cost effectiveness described that they were looking for cost effective alternatives. This demonstrated an ability to rationally weigh the costs and benefits of joining the program and compare them to current uses. Ultimately, when an alternative was chosen, the individual asserted that they were better off with the hypothetical alternative.

Meanwhile, the few responses that referred to cost effectiveness among the protest responses explained that the program was cost-ineffective and that it would not provide sufficient income.
for their survival. Note that this explanation was very infrequent (2 responses). The CE Participants also liked the idea that PES pay for forest values. These respondents described that the payment would help them to protect the forest, and in particular, the water supply. In contrast, the protest respondents described that the payment did not adequately recognize forest values. This sentiment was often stated as follows: *I don’t need payment to protect the forest because it has value to me.* The government code identified a common sentiment across respondents of general distrust in the government. While this use of the theme was relatively infrequent when describing the CE, I identified 54 total descriptions of this theme across all interviews, indicating the pervasiveness of government distrust among the sample population.

Respondents’ opinions of the existing PES program mirror their reactions to the CE instrument. Figure 3.3 summarizes the qualitative data on opinions of PES programs, as given in the responses to the question, “Do you have any experience with (and opinions of) the national PES program?” (Table 3.4). The themes that arose from this question were nearly identical to the CE reactions in Table 3.7, suggesting that the hypothetical scenario posed in the CE questions was realistic to respondents. Only 25% of the respondents had clearly positive opinions of the PES program. Those who had positive opinions voiced that: (1) it is cost effective for landowners who do not have their land in production, and (2) in general the government is doing the right thing by compensating forest owners for the social benefits that forests produce.

The other comments were more critical of PES. Most of these categories perfectly mirrored the resistance expressed by those who protested the CE, and are therefore described in Table 3.7. A new category not mentioned previously was the forestry code, which captured the opinions that the majority of the funding for the program stays with forestry professionals, and a small percentage trickles down to the forest owner. Though this category only encapsulated 5%
of the direct opinions of PES programs, the sentiment mirrored the distrust expressed in the more pervasive government code. The lack of additionality code described a general opinion that the program exists to benefit those who already have forest cover on their landholdings and was analogous to the additional income code from Figure 3.2 (Table 3.7). This sentiment was not necessarily negative, but neither was it positive. Rather, it was a matter-of-fact sense that those who participate in the program do so because it offers additional income for things they are already doing. Hence, the program was typically described as beneficial for large landowners who have forest patches, or landowners who already have abandoned their land and “do not know what else to do with it.”

![Opinions of PES Program](image)

**Figure 3.3**: Opinions of PES mirror reactions to the CE. Figure shows categories of responses to the question, “Do you have any experiences with (and opinions of) the national PES program? The percentage refers to the number of times a theme was used to describe the PES program out of the total number of opinions given (81 total). Positive opinions always related to cost effectiveness and an agreement with the concept that farmers should receive payment for ecosystem service production, while the negative opinions were split into the categories shown.
Discussion

Landowner Preferences for PES

Approximately half of the sample population, the PES Accepting class, appeared to like the PES alternatives offered in the CE. Despite the greater acceptance for the PES incentives among the PES Accepting class, the preferences for program design demonstrated an overall inclination toward maintaining autonomy on landholdings. The individuals in this class expressed a preference for placing a small percentage of land in a program where they would be allowed to continue using their farms in a slightly limited capacity such as in agroforestry or organic agriculture production.

Somewhat surprisingly, there was a negative preference among this class for “no permitted use,” which most closely mirrored PES as it actually operated in the study area. Hence, strict forest conservation was associated with a decrease in well-being among landowners. This finding is particularly notable because, though there are legal provisions in Costa Rica for providing PES for sustainable land uses such as organic agriculture and agroforestry, members of the Monteverde Conservation League explained to me that the main use of PES in the CBPC has been to promote strict forest conservation to meet the goals of habitat restoration and watershed protection. The results here suggest that per hectare payments for strict forest conservation would theoretically need to be substantially higher than the opportunity cost in order to initiate participation.

The other half of the sample population (the PES Resistant class) demonstrated resistance to PES either by protesting the CE or only choosing participation with small amounts of land when the payment was sufficiently large. The demographic characteristics of protest respondents help explain PES resistance. Firstly, individuals who received part of their income from off farm
labor were less likely to choose the protest response. Logically, those who worked “on farm” were more dependent upon farm production for income, and PES participation would have required the greatest change from current activities. Secondly, people who did not protest the choice experiment tended to live in the market centers of Sardinal and Monteverde, suggesting that market exposure facilitated the CE task. Thirdly, older residents tended to protest the CE, indicating contrasting value systems between younger and older respondents. And finally, respondents who did not have a high school education were more likely to exhibit the protest response. One interpretation of this last finding is that the CE was too cognitively demanding for some respondents. A well-documented concern of the CE instrument is that it requires complex cognitive reasoning (Bateman et al. 2002, Barkman et al. 2008). The CE design here is relatively straightforward, and the in-person method of data collection was able to lessen cognitive demand through clarification of CE questions when needed; hence, 84.9% of the survey population reported that they understood the CE questions. It is therefore more likely that education provided a subset of respondents with training in thinking about competitive land uses and opportunity costs; thus changing the way some people valued land uses. Taken together, these characteristics of protest respondents suggest that CE resistance was characterized by a distinction in a subset of the population, where preferences did not easily align with the proposed PES program.

The interview data helps to explain some of the preference heterogeneity observed in the latent class model. Those who exhibited the protest response and those who preferred the CE alternatives to current land uses provided similar explanations for CE decisions, and yet they talked about these decisions in different ways. All respondents talked about the importance of self-reliance, agricultural production, and a conservation ethic, but the protest respondents
represented one extreme in terms of strength of conviction. Protest respondents frequently expressed that if they were to join one of the hypothetical programs then they would not be able to work their farm—they would lose their vocation and the associated values they hold for agricultural production. These respondents tended to object to the idea of paying for conservation on farms, sometimes voicing that people should conserve regardless of incentives.

The respondents who preferred CE alternatives to the status quo differed from protest respondents in the willingness to accept payment for things they were already doing. The CE participants voiced that it seemed appropriate to receive payment for their actions as ecosystem service providers, and they described that they frequently sought out alternatives that would not require a drastic change of land uses but would instead remunerate them for existing land uses. This explains why the agroforestry land use option was so appealing—many people already keep forests on their land as windbreaks or shade protection for cattle, and an agroforestry option would allow them to continue to use the understory of the forest and not fence it off for conservation purposes. Similarly, respondents expressed a strong interest in organic agriculture, as they stated that this would not depart significantly from how they grew food for home consumption on their farms. The prospect of receiving payment for land uses that were already being undertaken seemed to be the strongest enticement for participating in the CE, but it points to a general lack of additionality within the hypothetical program.

Most scholars suggest that PES need to compete with opportunity costs in target areas to provide adequate incentives to change conservation behaviors and overcome the problem of lack of additionality (Wunder 2007, Wünscher et al. 2008). I estimated the opportunity costs for agricultural production land uses in the study area at the time of data collection and compared these to actual and hypothetical PES payments (Figure 3.4). Milk was clearly the best return on
investment, per hectare, of the possible land uses listed. However, this land use was also the most labor intensive. Coffee was less labor intensive than milk, and it had a higher return on investment than beef. Coffee also varied widely in quality by region, and there was an added value for producers who were able to market their products directly. The best comparison for the opportunity cost of the PES program was beef. Beef production required minimal labor due to the fairly recent introduction into the area of imported hybrid grasses that did not require constant pasture maintenance. Many informants described that maintaining cattle only required a bi-weekly visit to their farm to supply salt, molasses, and to bathe cattle for parasites. Given the low labor input for cattle, it was the most comparable to the secure payment and labor-free, tax-free option of placing land in PES.

The PES column in Figure 3.4 compares what was offered at the time of the study for participation in PES under “no permitted use” ($64 per ha per year) with the range of values offered in the CE. Though PES did not compete with any of the opportunity costs shown in this graph, the hypothetical program used in the CE did compete with both beef and coffee uses. The CE questions offered up to $425 per hectare per year, tax-free, and free of transaction costs for placing their land under a sustainable management program with the target of producing ecosystem services (shown as the upper limit of the error bar in Figure 3.4). Despite offering over 6 times the current payment, I was unable to detect a population preference for “no permitted use.” This lack of preference for the strict conservation program, the main goal of policy in the area, confirms that exchange value was not the only value driving landowner decision making in the region. Consequently, converting land uses from production to conservation may not be as simplistic as offering an adequate exchange value. An effective
program may need to emphasize maintained autonomy and flexible land uses, while engaging with the multifaceted value systems reflected in protest responses.

Figure 3.4: PES payments (actual is shaded, and hypothetical is shown by the error bar) compared to production opportunity costs in the study area. The error bars for production opportunity costs show a range for average production, measured per ha per year. Opportunity costs of beef and milk were estimated using data from the Asociación de Productores de Leche Monteverde. The coffee opportunity cost range was estimated using the production costs for a fanega of coffee produced by a local coffee grower and using national averages (www.mag.go.cr) to estimate the range of output.

From Nonmarket Valuation to Policy: Implications for PES

The CE results translate directly to participant opinions of PES programs, suggesting that PES in Costa Rica are neither economically efficient, in terms of the program costs resulting directly in conservation benefits, nor are they effective in contributing to net forest regeneration. Both the CE results and the direct opinions of the current PES program point to a lack of
additionality. Respondents frequently described that the PES program is advantageous for people who do not produce on their land, an opinion reflected in the tendency to seek out CE alternatives that did not appear to require a change in land use. It is certainly not economically efficient to pay landowners for things they do anyway, and this would not contribute to the goal of net forest regeneration. The finding that the current PES program suffers from a lack of additionality is not particularly novel; since payments do not compete with alternative land uses it is not surprising that existing PES does not alter behavior. It is somewhat unexpected that offering significantly more money for conservation land uses, as was the case in the CE questions, did not appear to erase this tendency. This could have been because opinions toward PES were deeply set among the respondent population so that they were generally unwilling to reconsider the alternatives offered in the CE questions. However, I believe the prevalence of lack of additionality across both existing PES and hypothetical programs posed in the CE speaks to a conflict between landowner values and how PES engages with those values.

The responses to the CE and the opinions of the PES program reveal a complexity of values toward PES that go beyond the compensation offered. On the whole, the negative attitudes toward PES are reflective of the kinds of resistance demonstrated by the protest responses in the CE. This resistance is characterized by a sentiment that PES do not adequately value forests, nor do they value the way of life of the Costa Rican small-scale agriculturalist. Hence, a competitive payment is insufficient to compensate for these perceived detrimental aspects of PES.

The largest concern about PES was that it is run by, from the perspective of respondents, an untrustworthy government. Respondents frequently voiced the concern that the government effectively becomes the owner of the land in the program. This concern mostly was rooted in the
1996 Forestry Law that prohibits deforestation. According to this law, if a landowner were to participate in the program for 5-10 years, and a substantial amount of forest regrows on the property during that time, they would be unable to cut down that forest in the future and return the land to agricultural production. Therefore, though the secure payment in the contract is offered for a set number of years, the conversion of agricultural land to forest can be considered potentially permanent.

There was also a general opinion that the government invents policies that support itself with little concern for the small producer. From this perspective, PES is (yet another) government policy that undermines small scale agriculturalists and serves to support big government salaries. This is not entirely off-base, though respondents occasionally conflated FONAFIFO with the intermediary forestry regents that receive a percentage of yearly PES payments for monitoring program compliance and assisting with program enrollment. Contacts in conservation organizations explained to me that the amount redirected to forestry regents can vary between 20% and 40% of the total PES payment. This is a substantial sum for a program that is not approximating opportunity costs for land uses, and explains some of the negative attitudes toward the program.

Conclusion

The CE employed in this research estimated landowner preferences for PES, and in doing so, illuminated some of the inefficiency challenges faced by the current PES program as it is implemented in Costa Rica. The preferences expressed by participants both toward the CE and toward the national PES program indicated that there is a strong tendency for the program to have a lack of additionality. The CE results indicated that overcoming this obstacle may not be as simple as meeting opportunity costs with a sufficient payment to encourage conversion from
productive land-uses to reforestation. Rather, the results suggested that the multifaceted values that landowners have toward landholdings and productive land uses may render exchange value an insufficient motivation for forest conservation.

Other research that studied PES from the perspective of program participants in Costa Rica found a similar tendency toward lack of additionality (Arriagada et al. 2009, Arriagada et al. 2015). Arriagada et al. (2015) found that landowners participating in the program reported no increase in well-being from program participation, as compared to non-participants. Though this contrasts slightly with my finding that the program appeals to landowners who expect an increase in livelihoods from participation (when land is not currently in use), given the current payment scheme it is not surprising that many would find the monetary rewards to be minimal. Arriagada et al. (2015) conclude that the nonmonetary values must motivate program participation, my study indicates that resistance to PES is a reflection of nonmonetary values.

It is not clear whether PES could change to more effectively engage with the complex values held by landowners towards land uses. Doing so would require that payments work in tandem with land uses that permit a degree of autonomy on farms, while honoring agricultural production values and still efficiently working toward conservation goals of increased forest cover. However, PES may not be the best way to achieve conservation on farms. These results suggest that conservation values may exist among farmers, and perhaps cultivation of these values through alternative mechanisms could encourage small scale ecosystem services production on all farms, independent of payments made to specific landowners. If this is the case, then PES may be pushing in the wrong direction by encouraging ecosystem service producers to not think of environmental stewardship as a duty, but rather as a contractual service contingent upon payment. Though this study is not conclusive in that regard, it opens the door to
further research that looks at PES impacts on value systems and implications for long term sustainability.

References


CHAPTER 4
FOREST COVER, DEVELOPMENT, AND SUSTAINABILITY IN COSTA RICA: CAN ONE POLICY FIT-ALL?  

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Abstract

Forest Transition Theory offers the hope that global economic development can continue in tandem with forest recovery. Costa Rica has been lauded for its successful forest transition—once the fastest deforesting country in Central America, forests began to regrow in the 1980s and have had a steady trajectory of recovery since. This forest regrowth can be linked temporally to Costa Rican policies that have promoted tourism and discouraged small-scale agriculture. We use a case study from the Bellbird Biological Corridor (CBPC), Costa Rica, combining remote sensing analysis with interviews and ethnography, to unravel the relationship between national policy, forest regrowth, and social-ecological sustainability. The Land Cover Change analysis between 1986 and 2014 indicates that, at the parcel-level, national policy has served to promote farm abandonment in favor of tourism and that this change has been critical to forest recuperation. However, these changes have occurred within a development framework that has created new social-ecological challenges that threaten future forest and economic sustainability. Examining the parcel-level impacts of the driving forces of landscape change highlights that forest cover is an insufficient proxy for conservation success, and conservation policy focused primarily on forest recovery may create new sustainability challenges.

Introduction

Sustainable development goals propose to improve socioeconomic conditions while sustaining environmental well-being across generations (Bruntland 1987). Under this paradigm, socioeconomic conditions are often reduced to income, and environmental well-being is reduced to forest cover. Declining forest cover is frequently used as the primary indicator of a litany of global environmental concerns: biodiversity loss, climate change, and the decreased provision of
ecosystem services for human well-being (Vitousek et al. 1997, Kalnay and Cai 2003, Turner et al. 2007). Global environmental policy, spearheaded by the United Nations (UN) redirects funds from categorized “developed” countries to “less-developed” countries under the explicit goal of creating markets and incentives for forest retention to spur sustainable development (Angelsen and Rudel 2013). It is not clear, however, that coupling forest cover with economic growth will lead to environmental sustainability and increased well-being among populations in the regions that are targeted by these policies.

This paper explores the relationship among land use policy, forest cover, development, and social-ecological sustainability by examining evidence from a nation frequently praised for its forest recovery—Costa Rica. In doing so, we seek to provide a nuanced perspective on the connection between forest regrowth and sustainable development policies as observed by the Forest Transition Theory (FTT) literature. We begin by briefly describing the relationship between land cover change and development outlined in the Forest Transition Theory and related Environmental Kuznet’s Curve literature and describe how it can, possibly unintentionally, support the types of sustainable development policies that Costa Rica has undertaken in the past 30 years. We then describe our case study, which combines ethnographic and survey data with a land cover change analysis from 1986-2014. We focus on the parcel-level to examine the relationship between land use decisions, forest regrowth, and multiple indicators of sustainability. By doing so, we demonstrate that the forest transition in Costa Rica is accompanied by new environmental and economic challenges in Costa Rica that fall short of sustainable development goals.
**Background**

*FFT and EKC—Empirical Evidence for Sustainable Development*

Key academic evidence supporting sustainable development policies has come from the Forest Transition Theory (FTT). FTT posits that over time forest cover in a nation declines up to a clear inflection point, after which net regeneration begins (Mather 1992, Grainger 1995, Mather and Needle 1998). Though FTT is based on historical trend data, research has focused on empirical drivers of this transition. Rudel et al. (2005) propose two main forest transition pathways—either forest scarcity drives demand for forest regrowth, or economic development diverts labor from rural agricultural landscapes. Angelsen and Rudel expand on this (2007), taking a von Thünen approach to understanding land values as a function of distance from a market center (Von Thünen 1966). Angelsen and Rudel (2007) posit that during the early development phase of a country, deforestation happens on all lands that are being pioneered, whereas during the forest transition phase marginal agricultural land returns to forest. Still other researchers have found that a nexus of economic and political factors, under the broader process of globalization, ultimately drives forest regeneration in developing countries (Lambin et al. 2001, Geist and Lambin 2002, Kull et al. 2007).

The connection between the FTT and economic growth draws on another core theory of sustainable development— the Environmental Kuznet’s Curve (EKC). The Kuznet’s Curve describes an inverted U-shaped relationship between economic growth and income inequality (Kuznets 1955) while the EKC describes a similar relationship between economic growth and the environment. Its interpretation is that as a nation develops environmental degradation occurs up to a point of inflection, after which environmental improvements begin (Grossman and Krueger 1994). To date, some of the best empirical evidence for the EKC comes from forest...
cover data, linking the EKC and FTT (Chowdhury and Moran 2012). This relationship is significant because it holds empirical evidence for sustainable development that is of critical importance to policy makers. The relationship between the EKC and the FTT suggests that financial incentives for forest cover can be successfully tied to economic development policies, resulting in a win-win for both conservation and development (Culas 2012).

Questions in FTT literature expand knowledge on the nature of the development / land cover relationship and the policy mechanisms best suited to promote and sustain a net increase in forest cover (Rudel et al. 2002, Angelsen and Rudel 2013). Researchers have questioned the quality of the forest that has recovered, and the ability of satellite imagery to adequately reflect the biodiversity and other ecosystem services produced by those forests (Angelsen and Rudel 2013, Melo et al. 2013). Researchers also have recognized the importance of scale – leakage may occur as a nation that has undergone the forest transition begins to import necessary goods from other places with net deforestation (Pfaff and Walker 2010, Walker 2012). As follow-up, this literature has identified the relationship between key indicators of development and forest cover at local (Schelhas and Sánchez-Azofeifa 2006, Daniels 2010), regional (Redo et al. 2012) and global scales (Lambin and Meyfroidt 2011). Others have questioned the relationship between forest recovery and national food security, suggesting that intensification of agriculture might allow this uncertain relationship to continue (Lambin and Meyfroidt 2010). In sum, the FTT and related EKC literature has provided scholars and policy makers with an important grounding in the relationship between forest cover and development, but has less frequently questioned whether increased forest cover coupled with increased development is, in fact, a win-win scenario (Meyfroidt and Lambin 2011).
Some scholars have built upon the FTT and EKC literature, posing difficult questions about the impacts of globalization and development on local communities, and implications for long-term sustainability. For example, Kull et al. (2007) find that forest cover on the Pacific Coast of Costa Rica has occurred in conjunction with globalization and ask whether globalization is a preferable alternative to the detrimental impacts of deforestation. Hecht (2005, 2010) uses evidence from El Salvador and the Amazon to question the impact of globalization on rural development, and the relationship between tropical forest cover and rural sustainability. Likewise, Dietz et al. (2012) suggest that more research needs to probe multiple indicators of development in order to understand the complex relationship between the biophysical environment and increases in human well-being. We contribute to this literature by offering an analysis of the forest transition in Costa Rica as seen “from above” in remote sensing imagery, and “from below” in ethnographic and survey data. Our analysis intends to build on FTT and related literature by offering further insight into the social-ecological challenges that may accompany forest transitions.

Study Area

Our study area is in a section of the Bellbird Biological Corridor (CBPC), Costa Rica. The CBPC is part of a network of mixed-use regions targeted for national conservation efforts by the Sistema Nacional de Areas de Conservación (SINAC). The conservation objectives for this network are to promote forest connectivity across privately held parcels, linking the private and public reserve systems (pers. comm. CBPC directorate, www.cbpc.org). We chose the study area to include the regions between the popular tourism destination of Monteverde, located at the Northern limit of the CBPC, and the Pan American highway. The study area stretches between 77 and 1800m in elevation, moving from transitional tropical rainforest/dryforest to tropical
lower montane rainforest (Holdridge 1979). The region is mostly composed of small farms (the mean in our sample is 29.3 ha) where landowners partake in cattle and dairy production, coffee farming, tourism, and some subsistence agriculture.

The study area has two “market poles” at the northern and southern extremes: Sardinal, a town near the Pan American Highway, and Monteverde, a district that includes Santa Elena and San Luis (see Fig. 4.1). Sardinal has off-farm income opportunities in several factories, and it is easily accessible from the capital of the province, the city of Puntarenas. Sardinal is also approximately one hour from the Central Valley, the economic center of the country. Many farms in the immediate Sardinal region are low production cattle ranches, owned by absentee landowners living in the central valley. Monteverde is remotely located, approximately one hour drive from Sardinal along gravel roads. It is an urbanizing region that has transitioned from a farming economy to a tourism economy over the last 30 years. The main tourist attraction in Monteverde is the Monteverde Cloud Forest Preserve, founded in 1972 (Burlingame 2000). Farms in Monteverde tend to produce either milk, which is sold to the Monteverde Cheese Factory, coffee, or they are involved in tourism. Some farms in Monteverde are residences and landowners work off site and complement income with home food production. The central area is the district of Guacimal, which is rural and agrarian. Most farms in this region produce milk and/or beef cattle. Although the road to Monteverde passes through the center of town, there is negligible tourism in the Guacimal district.

Costa Rica has experienced dramatic policy shifts over the course of the last half-century. Prior to the 1980’s, the Costa Rican economy primarily rested on the large agricultural exports of coffee, banana, and pineapple, with numerous small scale farms contributing slightly to the net food production of the country (Booth et al. 2010). In the 1980’s, Costa Rica, along with many
other Latin American countries, defaulted on international debt and, as a result, was coerced to undertake structural reforms that undercut the social welfare state and removed protectionist measures (Capitán 1997). These policies included the removal of subsidies for agricultural products and the promotion of nature tourism (Edelman 1999). Costa Rica simultaneously implemented a series of forestry laws that closed the frontier, prohibited deforestation on private lands, and established incentive structures for afforestation and reforestation (Brockett and Gottfried 2002). These policies have often won praise among conservationists, who have depicted the shift from a net deforesting country to a net reforesting country that occurred in tandem with these policies as a victory for sustainable development (Evans 1999, Kleinn et al. 2002). We examine the social and forest cover changes that accompany these national policy changes.

**Data and Methods**

We compare ethnographic, survey and satellite data to examine landscape change between 1986 and 2014 within the context of smallholder land-use decisions and local experiences of national development policy. The survey and ethnographic data sets were constructed from semi-structured interviews completed in 2014, and participant observation between June 2011 and July 2015 (two years total). Participant farm boundaries were mapped in 2014 to evaluate forest cover change within farms as depicted in satellite imagery. We classified Landsat satellite imagery to examine forest cover change within farms over a 28 year time period that coincides with economic restructuring in Costa Rica. Given the settlement patterns of the region, with farm clearing occurring prior to 1986, and the confirmation from landowners that any changes in farm boundaries resulted in subdividing a larger farm, we assumed that farm boundaries in 2014 are representative of landholding patterns across the time period studied. This
was corroborated by stated tenure among participants, which averaged 46.83 years with a standard deviation of 17.03.

Sample Selection

We constructed the sampling frame to target farmers living along the main road network between the Pan American highway and Monteverde, a popular tourism destination. We compiled an exhaustive list of active farmers in the region using records from the Costa Rican Ministry of Agriculture (MAG) and the Monteverde Cheese Factory. We deleted duplicate farms for a sampling frame of 210 farms, and randomly selected 100 landowners for participation. Though 87 landowners were interviewed, only 61 farm boundaries could be mapped and are included in the regression analyses. Text analysis from the other 26 interviews, as described below, informs the interpretation of regression analyses. Participant observation on farms and in community activities informs the qualitative interpretation in the discussion section.

Qualitative data

Qualitative data derived from landowner interviews was used to create variables for inclusion in the multivariable regression. Landowners were asked to participate in an interview that included an orally administered survey and semi-structured interview questions. The survey questions identified their demographic characteristics, income sources, and general land uses. The survey was followed by open-ended semi-structured interview questions documenting land use histories, reasons for retaining forest cover (or reforesting) on farms, experiences with agricultural policy, tourism growth, development changes, and conservation initiatives. In most cases, interviews occurred on participants’ farms and were conducted in Spanish, the native language of all participants. Responses were audio recorded, transcribed, and coded for themes in MAXQDA 11. We used grounded theory to identify themes according to repetition, word
frequency, word co-occurrence, and key words in context (Ryan and Bernard 2000). When appropriate, we transformed some codes into binomial variables and examined them during regression analysis.

We explored the relationship between these codes and forest regrowth, paying particular attention to ideological codes such as opinions of conservation and environmental challenges. The final model includes the variables that were consistently significant and produced the best fit model. The only code used in the final regression model is a binomial variable constructed from responses to the question, “Do you have any opinions of the [national] payments for environmental services (PES) program?” This program pays landowners for conserving forest cover on their farms and is part of the Costa Rican national conservation strategy. We coded the people who responded with a clearly positive opinion of the program (19.67% of the sample) +1 for the variable PES Attitude. This code is included in the final regression model shown below.

We used the frequency of relationships between codes (co-occurrence), ranking of code importance, and document cover to establish a conceptual model in MAXQDA11 about the driving factors of forest cover change in the region and challenges to sustainability. We examined frequency of topic association to evaluate the pervasiveness of the relationships identified among the sample population. We verified the strength of the relationships identified through informal interviews and participant observation. In the results and discussion below we have included key quotes that describe the conceptual model, representing general sentiments repeated across the qualitative data.

Farm Boundaries and Land Cover Change Maps

Farm boundaries were mapped using a GPS receiver under the direction of the landowner, when feasible, at the time of interview. For some farms (16.4%) it was not possible
to walk the entire boundary due to treacherous terrain, in which case geographic characteristics such as rivers and ridges were identified on the map and used to establish farm limits. Public cadaster maps were available to verify GPS points and confirm farm boundaries for 27.9% of the farms.

We obtained LANDSAT 30-meter resolution satellite data from 1986 and 2014 to construct a land cover change map for the study area. The 1986 image was captured by the Thematic Mapper sensor onboard the Landsat 5 satellite on January 21. The 2014 image was captured by the Operational Land Imager (OLI) sensor onboard the Landsat 8 satellite on February 19 (available at http://earthexplorer.usgs.gov).

We atmospherically corrected the images by using the Quick Atmospheric Correction tool in ENVI 5.1 (Exelis, Tysons Corner, Virginia, USA; http://www.exelisvis.com/). We then constructed a Wide Dynamic Range Vegetation Index (WDRVI) to measure the amount of forest cover in our study area. The WDRVI is a modification of the Normalized Difference Vegetation Index (NDVI) that has been used to track changes in biomass changes across dates (Sader and Winne 1992). The WDRVI overcomes the saturation seen in NDVI in areas of high biomass by enhancing the dynamic range while using the same bands as the NDVI, enabling a more robust characterization of phenological characteristics (Gitelson 2004).

\[
WDRVI = \frac{0.2 * \rho_{NIR} - \rho_{RED}}{0.2 * \rho_{NIR} + \rho_{RED}}
\]

For Landsat 5, the Near Infrared Band (NIR) corresponds to band 4 while the Red band corresponds to band 3. In Landsat 8, the Near Infrared Band (NIR) corresponds to band 5 while the Red band corresponds to band 4. We used a supervised classification to characterize each pixel into one of two categories: Forest and Non-Forest. Once classified, we imported the data into ArcMAP 10.1 (ESRI, Redlands, California, USA; http://www.esri.com/) for further
analysis. We then resampled the classified study area to 5m raster resolution. We used the percent of pixels classified as forest cover within each farm boundary in 1986 and 2014 to construct the percent change dependent variable in the regression model.

**Regression Model**

We modeled the relationship between forest cover change and farm characteristics using ordinary least squares (OLS) regression and geographically weighted regression (GWR). OLS is a global regression model that assumes homogeneity across the study area, while GWR allows for an examination of spatial variance (Fotheringham et al. 2002). We used OLS for variable selection, where we examined social, demographic, and biophysical variables that we hypothesized may be related to forest cover change on properties based on previous studies (e.g. Wear and Bolstad 1998, Satake and Rudel 2007, Daniels 2010, Brown et al. 2012). These included: environmental attitudes, education, land tenure, farm size, income source, distance along roads to Monteverde, agricultural practices, and terrain characteristics (slope, topographic wetness, roughness). We ran multiple models with different variable combinations and included in the final model the variables that were significant across models and produced the model with the highest $R^2$ and adjusted $R^2$. We modeled the OLS relationship as:

$$\%chg8614 = \beta_0 + \beta_1 River + \beta_3 Slope + \beta_4 Age + \beta_5 PES Attitude + \beta_6 Agriculture$$

where the details of variable calculations and transformations are provided in Table 4.1. We obtained the data for the slope and river variables from the Costa Rican ATLAS (Ortiz Malavassit and Soto Montoya 2008). We examined variables for multicollinearity and heteroscedasticity and no problems were found. Influential observations were minimal and did not significantly change relationships represented here. They were left in the regression analysis to preserve integrity of the data set and sample size. The GWR model used the same variables,
and estimated a regression model for every farm in the data set based on the location of the farms and the neighborhood of those farms (Fotheringham et al. 2002). Because we did not have prior information as to the geographical construction of neighborhoods, we used an adaptive kernel with Akaike Information Criterion (AIC) bandwidth to account for spatial clustering of farms across the study area (Charlton and Fotheringham 2009).

Table 4.1: Description of variables used in regression models.

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Variable Description</th>
<th>Measurement</th>
<th>Proxy For</th>
</tr>
</thead>
<tbody>
<tr>
<td>%Chg8614</td>
<td>Change in the percent of pixels classified as “forest” within farm boundaries across 1986 and 2014 images</td>
<td>5 m pixel from 30m land cover maps</td>
<td>Forest cover change</td>
</tr>
<tr>
<td>River</td>
<td>The distance from farm centroid to the nearest river, squared.</td>
<td>Meters</td>
<td>Forest recovery in riparian zones</td>
</tr>
<tr>
<td>Slope</td>
<td>The standard deviation of the mean slope across the farm</td>
<td>Degrees</td>
<td>Topographic variability</td>
</tr>
<tr>
<td>Age</td>
<td>The age of the primary decision maker on farm</td>
<td>Years</td>
<td>Ability to work farm</td>
</tr>
<tr>
<td>PES Attitudes</td>
<td>Indicates whether respondent stated that the national Payments for Environmental Services is a good program</td>
<td>Binary variable: 1 = positive opinion 0 = not positive</td>
<td>Opinions of government initiated conservation and development programs</td>
</tr>
<tr>
<td>Agriculture</td>
<td>Indicates whether sole income source is agriculture or pastoral</td>
<td>1 = agro pastoral income 0 = not agro pastoral income</td>
<td>Reliance on extractive land uses for income</td>
</tr>
</tbody>
</table>

We constructed Inverse Distance Weighted (IDW) Interpolation maps to visualize the spatial variation in predicted forest cover change and model fit across the study area and to conserve the anonymity of the farm locations. IDW is a simple and readily available interpolation method that approximates an unknown point based on the weighted average of
values at points within a certain cut-off distance from a given number of closest points (Mitas and Mitasova 1999). We ran IDW on ArcMAP 10.1 with the default settings, a search radius of 12 points and a power of 2 for the predicted dependent variable value and the coefficients of the GWR analysis.

**Results and Discussion**

*Land Cover Change Model*

The study area exhibits net forest regrowth between 1986 and 2014 (Fig. 4.1). We performed an accuracy assessment on the 2014 image using ground truth points collected in September 2014 – June 2015, and found that the classified map has 95.63% accuracy (Table 4.2). In 1986, 24.74% of the study area was classified as forest, which grew to 38.14% over the 28 year period. The forest cover in our sample of 61 farms likewise increased over the same period, from 30.15% to 40.24% forest cover. Forest cover change on sample farms has occurred in a non-uniform pattern, with a mean of 10.08% forest regrowth and a range of (-14.08 % – 53.39%).

The OLS and GWR results reveal 5 variables that significantly predict percent forest cover change on farms between 1986 and 2014 (Table 4.3). Two of the variables, River and Slope, relate to biophysical characteristics of the farm, while the other 3 variables, Age, Agriculture, and PES Attitude, express demographic and cultural attributes. The models have similar goodness-of-fit. The OLS regression has an $R^2$ of .36 and an adjusted $R^2$ of .31. The GWR has an $R^2$ of .44 and an adjusted $R^2$ of .31. Both of these models show the same general relationship among the variables predicting forest regrowth on a farm, but they vary in terms of coefficient strength.
Figure 4.1: Map of study area showing forest cover change across two time periods - 1986 and 2014. The location of major townships is shown. Insets shows the location of the CBPC within Costa Rica and the portion of the CBPC selected for the study area.

Table 4.2: Accuracy assessment for 2014 land cover map using 191 ground truth points taken within the study area in 2014-2015.

<table>
<thead>
<tr>
<th>Class</th>
<th>Correct</th>
<th>Mislabeled</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forest</td>
<td>91</td>
<td>5</td>
<td>94.51%</td>
</tr>
<tr>
<td>Non-Forest</td>
<td>92</td>
<td>3</td>
<td>96.74%</td>
</tr>
<tr>
<td>Total</td>
<td>183</td>
<td>8</td>
<td>95.63%</td>
</tr>
</tbody>
</table>
The biophysical characteristics of the landscape that best predict percent forest cover change on farms are the distance from rivers, and the topographic variability (Table 4.3). The variable River is significant and negatively related to percent forest cover. This indicates that farms that are closer to rivers have more forest regrowth during the time period studied than farms further away. The coefficient from the global (OLS) model indicates that for every meter closer the farm centroid is to a river boundary, the predicted amount of forest cover increases by .003%. The Slope standard deviation is positively related to percent forest cover. Farms that have more variable terrain have been significantly more likely to reforest during the 28 year period studied.

Table 4.3: Output from OLS regression and GWR showing the significant factors that relate to forest cover change on sample farms between 1986 and 2014. All variables were significant at a minimum of p < 0.05.

<table>
<thead>
<tr>
<th>Variable</th>
<th>OLS Coefficient</th>
<th>OLS Standard Error</th>
<th>Mean coefficient</th>
<th>Mean Standard Error</th>
<th>Coefficient Range (low / high)</th>
</tr>
</thead>
<tbody>
<tr>
<td>River</td>
<td>-1.28 x 10^{-5}</td>
<td>3.47 x 10^{-6}</td>
<td>-1.55 x 10^{-5}</td>
<td>7.20 x 10^{-6}</td>
<td>-2.22 x 10^{-5} / -1.12 x 10^{-5}</td>
</tr>
<tr>
<td>Age</td>
<td>.37</td>
<td>.12</td>
<td>.39</td>
<td>.14</td>
<td>0.29 / 0.54</td>
</tr>
<tr>
<td>Slope</td>
<td>1.87</td>
<td>.56</td>
<td>2.11</td>
<td>.67</td>
<td>1.43 / 2.86</td>
</tr>
<tr>
<td>PES attitude</td>
<td>7.02</td>
<td>3.45</td>
<td>6.82</td>
<td>4.21</td>
<td>4.12 / 8.94</td>
</tr>
<tr>
<td>Predicted</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>-16.22 / 25.94</td>
</tr>
</tbody>
</table>

Age of farm decision-maker, conservation attitudes, and agricultural uses, are the demographic and cultural variables that best predict percent forest cover change on farms between 1986 and 2014 (Table 4.3). The mean age of participants in the study was 52.92, with a
standard deviation of 12.45 years. Age in 2014 is positively correlated to forest regrowth on farms where older farmers have a higher predicted percent forest cover change on their landholdings. In the global model, each additional year of age increases the predicted percent forest cover change by .37%. While all study participants used their farms for some sort of activity (residence, tourism, cattle, home gardens), only 22.95% of the sample population indicated that they rely solely on farm production for income. The negative slope of the Agriculture coefficient indicates that sole reliance on agricultural or pastoral production decreases the predicted forest cover on a property by 8.53%. When respondents were asked whether they think the PES program is good for farmers and/or the environment, 19.67% responded positively. The resultant binomial variable, PES Attitude has a direct relationship to predicted forest cover, where positive opinions of PES increase predicted percent forest cover change by 7.02%.

**Variation in Drivers of Forest Cover Change**

The data demonstrate unequivocally that forest regrowth is occurring across the study area, but the GWR results reveal that coefficient strength and predicted forest cover vary spatially (Table 4.3). We used predicted forest cover change and GWR coefficients for each farm to construct interpolation maps and discovered a clear “North-South” division in variables that predict local forest cover change (Fig. 4.2). In the left column of Figure 4.2, it is apparent that predicted percent forest cover change varies across the study area, with high pockets and low pockets scattered throughout. The other columns show variation of coefficient strength in relation to the predicted forest cover. We took the absolute value of coefficients for this figure, so that high coefficients relate to a strong predictive value for the region, and not necessarily a higher percent forest cover change. Hence, the variables River and Age are the best predictors
for the middle of the study area (Guacimal), Slope and Agriculture are the best predictors for the lower half of the study area (Guacimal and Sardinal), and PES attitude is the strongest predictor of percent forest cover change in the upper study area (Santa Elena and San Luis). This suggests that there are different factors driving forest cover change throughout the study area. The qualitative data helps to explain the variation observed here.

Figure 4.2: Interpolation maps of predicted percent forest cover change and GWR coefficients. The Low to High gradients depicted are natural breaks in the GWR output for predicted forest cover and variable coefficients from Table 4.3.

In the northern study area, the district of Monteverde, the strongest predictor of forest cover change over the time period studied is the variable PES Attitude. This variable tags the people who expressed positive opinions of PES, which was only 19.67% the people interviewed.
Of this subgroup, no one was actively participating in PES, and only 1 person (0.08%) had attempted to participate in the program. Furthermore, 41.67% of this group said that they have absolutely no interest in participating in a PES program under any conditions. At first glance the relationship between PES Attitude and forest regrowth is surprising since it is clearly not related to participation in the program, indicating that the program is not directly impacting behavior. Careful text analysis of the PES opinions helps to disentangle the relationship between this variable and forest cover change.

A positive PES Attitude coincides with a positive association among conservation, income, and farm abandonment. There are two types of comments that characterize the positive feelings toward the PES program that are captured in the PES Attitude variable. One type of comment made by this group of people is that PES is likely to motivate others to conserve. For example, one person described a community member involved in the program—“he earns money, but the most important part is that he is conserving, selling oxygen but also conserving the stream bank. That benefits a ton of families that live downstream, which is something.” Here the speaker reflects two sentiments held in common among this group: (1) conservation is good, and (2) a landowner deserves payment for conservation. Buried in the positive PES attitude may also be a “hedging” of sorts about the possibility of future payment. If one already conserves on their land, the possibility of future payment for this action may be perceived as good. This coincides with the finding that many who participate in the PES program do so because they already conserve forest on their lands (Chapter 3).

The other common sentiment expressed among this group is an acceptance of farm abandonment in favor of competitive land uses in a global economy. A prime example of this is when one participant contrasted his land use decisions with those of his father, “If you were to
ask my father or someone a little older what they think, they would say no [PES is not good] because their idea is not to conserve – it’s to see how they can work the land to earn money. But if I had a 100 ha farm, of course I would let it return to forest because you can earn money more easily, and maybe even more money than if it were cleared.” A similar acceptance of farm abandonment was explicitly voiced by 73% of those who have a positive PES Attitude, and it contrasts sharply with farm abandonment concerns voiced among other participants.

The central-eastern region of the study area shows high predicted forest cover change and has experienced massive farm abandonment during the last three decades (Fig. 4.2). This area is made up of ghost towns: Amapala, San Antonio, Veracruz, Ojo de Agua, Acapulco, San Rafael. As little as 20 years ago, these towns were peppered with homesteads, but they have been abandoned in favor of migration to the Monteverde region, primarily to town of Santa Elena, or (to a lesser extent) the central valley. The rise of the tourism industry was described in interview data as a gold rush, “Many people sold their farms to seek out [tourism] in Santa Elena. That’s why it’s so crowded – there are people from Santa Rosa, Guacimal, and even from [lower San Luis]…now many of them are experiencing a great void because they sold their farms and moved there, for a job.” This description of the farm abandonment that has occurred carries a pervasive sentiment among the people who have remained. Many of these people see themselves as “fighting against” farm abandonment. They deplore the government policies that have promoted farm abandonment in favor of what they see as an inherently risky lifestyle in tourism or similar service industries – an exchange of the self-reliance of farm work for the dependency of external labor.

Farm abandonment shows up in the regression model in several ways. The variables Age and Slope both impact the model more strongly in the lower half of the study area, and they are
linked to a reduction in the total land in agricultural production. The older generation, less able to perform farm labor and without a younger generation to replace them on the farms, is decreasing the amount of land in production. In one community meeting, the topic of youth leaving farms to seek education and “better opportunities” was broached. A young woman lamented that her parents’ generation does not have “anyone to inherit the farms.” An older man quickly retorted, “we have people to inherit the farms, we just do not have anyone to work them!” This claim was met with murmurs of agreement from around the room. As the younger generation has moved into the service industry, the older generation works farms less and less.

The variable Slope reveals further farm abandonment—the abandonment of variable terrain in the face of labor limitations. One of these limitations has come through restrictions on fire use. Fire elimination was used to describe landscape changes in interviews (34.2% of interviews). The 1996 Forestry law (1996) criminalizes forest fires and requires permits for controlled burnings. The sentiment regarding fire use was universal—informants described fire use as the way “the older generation” managed their lands. Fire use was seen as critical to soil fertility, but is now thought to cause erosion. Fire use once provided a low-cost mechanism to annually clear regrowth, and also, according to informants, frequently cleared unintended areas. It is possible that without this labor saving device, forest has regrown on steep slopes and other marginal agricultural lands that were previously cleared, as has been observed in other social-ecological contexts (Coughlan 2014).

As farm land has been abandoned throughout the study area, the remaining farms dedicated solely to agriculture have intensified to compete in the global economy. The variable Agriculture, indicating agro-pastoral production as the sole source of income, is most strongly correlated with low forest cover in the southern section of the study area (Fig. 4.2). The farms in
the southern section also tend to be larger farms dedicated to cattle production. The relationship between agricultural income and forest cover shown in this model is expected: reliance on income from agriculture leads to agricultural expansion and intensification, which generally decreases forest cover.

Finally, the distance from River is a determining factor in the decision to allow forest regrowth. This variable stands out in the lower study area, in part because it reflects an active decision to reforest (or allow afforestation) along stream banks in these areas. This likely is tied to water perceptions among agriculturalists. The upper section of the study area is the watershed upon which the rest of the study area (and the regions below it) depend. Water access, quantity, and quality were constant concerns in the lower study area. In interviews, farmers were asked if they have forest cover on farms, and, if so, to explain why. Of all the reasons given, the overwhelmingly most popular answer was that farmers allow forest cover near springs and rivers to protect the water source (35.47% of all responses). Because water is seen as a limiting factor to agricultural production in the lower study area, it is not surprising that there is a more notable differential forest growth proximal to streams.

*Sustainable Development? Moving beyond the forest*

Understanding the relationship between sustained environmental health and increased human well-being that is implied by sustainable development goals, requires moving beyond an examination of forest cover change into the broader impacts of tourism growth and farm abandonment on social-ecological sustainability. Participants were asked to discuss the environmental, economic, and cultural impacts associated with the tourism industry (Table 4.4). Not all participants had experience with the tourism industry, so these responses are limited to the opinions of those living in and near Monteverde (Santa Elena, San Luis, and parts of
Guacimal), and the general impressions from farmers in the lower half of the study area. The strongest association that people have with tourism is economic benefits, with 24.3% of responses commenting on increased income as a result of tourism. Participants also made a strong association between tourism, conservation, and development. In this context, responses often indicated ideas such as “conservation would not be possible without tourism,” or “conservation allows for tourism income,” or “without tourism we would not have the facilities that we have today.” Respondents also indicated that tourism growth was a main motivation for farm abandonment in the region. They stated that tourism drove farm sales in the southern section of the study area, and that it caused farmers to stop producing in the northern section of the study area. Though some were accepting of these changes, as discussed previously, others found them to be problematic for long term economic sustainability.

Table 4.4: Frequency of responses to the question, "Has the tourism industry benefited the local community and/or environment of the region?" Out of 79 recorded interviews, 140 tourism trade-offs were listed. The frequency of appearance of each trade-off is listed.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economic Benefits</td>
<td>24.3%</td>
</tr>
<tr>
<td>Conservation</td>
<td>16.4%</td>
</tr>
<tr>
<td>Development (education, infrastructure)</td>
<td>16.4%</td>
</tr>
<tr>
<td>Farm Abandonment</td>
<td>10.0%</td>
</tr>
<tr>
<td>Drug Abuse</td>
<td>8.6%</td>
</tr>
<tr>
<td>Economic Instability</td>
<td>7.1%</td>
</tr>
<tr>
<td>Living Expenses and debt</td>
<td>7.1%</td>
</tr>
<tr>
<td>Increases in crime</td>
<td>5.0%</td>
</tr>
<tr>
<td>Water Pollution</td>
<td>4.5%</td>
</tr>
</tbody>
</table>

Individuals also spoke frequently about the economics of tourism (Table 4.4). Tourism in Monteverde is, at times, quite lucrative. Study participants recounted that tourism has brought increased income to the region and infrastructure changes such as schools and paved roads.
(Table 4.4). As one person said, “[if it hadn’t been for tourism], we wouldn’t be as advanced as we are now. Monteverde wouldn’t have banks or good hotels. It wouldn’t have a high school.” On the other hand, the industry is unstable. Monteverde tourism primarily arrives from the United States, and as one participant learned in the 2008 global economic crisis, “when you are in economic trouble, the first thing to go is [travel].” This is particularly problematic when many farmers indicated that they mortgaged their farms to build cabins for tourism. The 2007-2008 economic crash in the United States left a trail of abandoned construction sites and foreclosed properties that persist to this day. Further, though economic benefits are typically positive in a community, their impacts can be complicated. Informants that participated in the full “boom” of the tourism industry (2000-2005) shared stories of the negative impact it had on their communities and families. One person explained that going from milking cows to tourism was too much for many of them—some have passed away from drugs and alcohol; some have lost their families, their inheritance. Such people have explained to me that they did not know how to handle these economic changes, and life was, possibly, better before tourism.

Likewise, farm abandonment has impacted both the economic stability and the culture of the region. Changing land ownership has removed the safety net that may have provided a buffer against a volatile tourism industry. One person, when asked whether farm abandonment and associated increased forest cover is positive for the area, replied, “It is obviously bad. It’s bad because we used to work a lot here. People were hard workers and they lost so much potential. Tourism came in and people stopped working. Now people want to return but they don’t have [workable] land anymore.” Implicit in this statement is that people want to return because tourism economic benefits have possibly not lived up to the illusion that they created. Also, land
use restrictions, changing land values and changing work values may make returning to work the land nearly impossible.

Tourism is linked to other problems in the Monteverde zone, such as drug abuse and theft (Table 4.4). These are related issues. Tourism creates demand for drugs. One person explained, “there is always someone [in town] who doesn’t work on horse tours nor in taxis nor in the diner, but rather over by the bar selling marijuana, cocaine, etc.” But it is not only the tourists that consume. Many are concerned about drug consumption amongst youth. Informants expressed that drugs have changed the nature of their community, because they change people’s mentality. One person recounted, “Drugs change people – for one young man to kill another—it’s almost nothing to him…it’s a shame. And now people need to be careful in their house, secure everything, because people with drugs, the hoodlums, they come at night. It has happened to me several times – terrible.”

Though tourism is compatible with forest regrowth in the region, it appears to be detrimental to water quality and quantity throughout the study area. Participants mentioned water pollution as a negative impact of tourism (Table 4.4), and participant observation indicated that water pollution and extraction is one of the biggest threats facing the community. Untreated grey water routinely dumps into streams. Poorly regulated septic tanks leak into rivers. The Costa Rican Ministry of Health has little power to change this – the first author witnessed several instances of attempted shut downs on polluting businesses that were countered with examples of a neighbor who pollutes the same or worse. Though several conservation institutions have pushed for water treatment facilities, to date no progress has been made. This jeopardizes the downstream water supply in Guacimal and Sardinal. In that region farmers continually spoke to me of a diminishing water supply. They claimed that springs have been drying up, and that the
Guacimal river (fed by streams leaving Monteverde) is not safe for human use. It is certain that tourism alone is not responsible for these changes, but it is also suggestive that the concentration that accompanies development, while good for forest cover, carries environmental impacts that reduce or even erase the gains from forest recovery.

*Relationship among the local forest transition, development, and sustainability*

This study supports the idea that the forest transition in Costa Rica has resulted from the particular ways in which Costa Rica has embraced the global economy in the late 20th and early 21st centuries (Schelhas and Sánchez-Azofeifa 2006, Kull et al. 2007). Tourism was embraced at a time when the country was coerced to limit agricultural subsidies under International Monetary Fund (IMF) structural reforms. These reforms included decreased agricultural subsidies that drastically downscaled the Consejo Nacional de Producción, an entity that previously provided a guaranteed market for domestic produce (Edelman 1999, Brockett and Gottfried 2002). The elimination of protectionist measures for national products translated in practice to decreased viability for small agricultural producers in favor of industry and tourism (Rivera 2010), and products that have a *comparative advantage* in an international market, such as coffee, cashew, pineapple, and other tropical fruits (Capitán 1997).

Forests are critical to Costa Rica’s new national development strategy. The nation is marketed as a “green” tourism destination under nationally endorsed slogans such as “Costa Rica: no artificial ingredients,” (Rodríguez 2013) or more recently the “SaveTheAmericans” campaign depicting singing sloths saving overworked US citizens from their monotonous lives (www.savetheamericans.org). Under this alignment of tourism with conservation, rural agriculturalists theoretically convert to environmental stewards for the international nature consumer (Budowski 1976, Whelan 1988), relieving them from their presumed role as
deforestation (Myers and Tucker 1987). Financially, the relationship is clear—tourism has provided an income source that is dependent upon intact forest for its product. However, the relationship between development and sustainability is more complicated.

The path from farms to forest is not direct, suggesting that “development” and “forest cover” are not the only results of a forest transition. Figure 4.3 provides a depiction of the relationship between development policy and forest conservation. Development policy has encouraged farm abandonment while simultaneously promoting nature tourism. This dual process has boded well for forest conservation. In the case of farm abandonment, the limited profitability of farms coupled with decreased labor availability has translated to increased forest cover. Legal restrictions on land clearing, accompanied by financial incentives for conservation under PES programs, have facilitated this transition. Meanwhile, nature tourism, as experienced in the study area, has a reciprocal relationship with forest cover because of the potential for forest conservation to generate tourism income.

Farm abandonment and tourism, while undoubtedly good for forest regrowth, have an uncertain relationship with other indicators of social-ecological sustainability. Farm abandonment is related to changes in community values and changing landownership. As farms, farming knowledge, and community networks are lost, residents become more dependent upon a global, often volatile economy. Tourism also has many downsides. While it contributes to economic gain, it is unstable, and frequently requires economic participants to enter into debt. Tourism also brings with it new social problems, such as rising crime and drug abuse. And finally, tourism may create new environmental problems, such as water pollution. The mixed impacts of farm abandonment and tourism, call into question the benefits of forest conservation.
Figure 4.3: Conceptual model on the relationship between development policy and forest cover, as mediated by tourism and farm abandonment factors. Each of these factors has social-ecological impacts not revealed by metrics of forest conservation but relevant to sustainability goals, as indicated by downward arrows.

**Conclusion**

Sustainable development challenges are often reduced to economics and forests, where sustainability is characterized as the ability to balance livelihoods with forest cover. Under the “right” circumstances, economic growth can coincide with forest recovery, but these indicators might carry hidden costs. We demonstrate through a case-study from Costa Rica that the national forest transition has occurred as part of complex globalization processes. These processes have resulted in increased economic gains at a local level, as well as increased forest cover – potential indicators of success for sustainable development. But this economic growth has carried with it social impacts that may not bode well for the sustainability of the social-ecological system.
Further, economic development under the current global paradigm translates to dependence upon international systems for basic needs, which can increase local vulnerability.

It is essential to understand all of the factors related to the forest transition in any context in order to evaluate the implications of that transition for long term social-ecological sustainability. FTT scholars have suggested that governments might do well to, “speed the transitions up, or, once they have begun, insure that the transitions continue” (Rudel et al. 2005). This conclusion is well founded if taken from the perspective of forest cover alone (as the authors do), but it does not consider the political context of the forest transition. This context, in turn, is critical for evaluating the connection between forest cover and sustainable development. If the broader goal of policy under the auspices of sustainable development is to improve human well-being while sustaining environmental resources, then it becomes critical to fully conceptualize how forest transitions relate to multiple indicators of sustainability. We suggest that future research engage with the complexity of development policy and potential impacts on multiple aspects of sustainability.

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CHAPTER 5

WHY EXCHANGE VALUES ARE NOT ENVIRONMENTAL VALUES: IDENTIFYING THE PROBLEM WITH NEOLIBERAL CONSERVATION

Allen, Karen. To be submitted to *American Anthropologist*. 
Abstract

In recent years, political ecologists have critiqued neoliberal conservation due to the inability of market-based conservation policy to adequately engage with social values. These scholars assert that neoliberal conservation policies tend to have ineffective outcomes and reinforce existing power relations. In this paper, I build on this research by using a combination of quantitative and qualitative data from research in the Bellbird Biological Corridor, Costa Rica. I demonstrate that social values for sustainable land uses do not align with monetary exchange values for ecosystem services and as a result, neoliberal conservation policy in the region has a perverse impact on long-term sustainability. Ethnographic and quantitative data from this research show that landowners engage differently with neoliberal conservation mechanisms across the study area, and market fluency is one of the factors shaping this interaction. Results further show how policy that primarily emphasizes an exchange value view of environmental benefits ultimately undermines ecological sustainability by promoting the short-term values of “competitive land uses.” This research highlights that the process of integrating ecosystem services into marketable goods renders neoliberal conservation policies inadequate, and subject to volatile market fluctuations. I suggest that conservation policy should reinforce multifaceted social values toward sustainable landscapes, rather than promote economic incentives that reduce environmental benefits to a simplistic exchange value.

Look, niña – I’m going to make this simple for you,” he tells me. It occurs to me that I am now a niña and not to be flattered by it, since we are probably the same age and he is no longer laughing. There is a slight edge to his voice. I note that the tone has quickly changed from his lighthearted jokes about me not heeding his warning over the phone that “the road down to his farm is rough,” after I arrived wondering aloud how I was going to get my truck back up the cliff face I had just driven down. He looks at the papers he has just shuffled through, questions from a carefully designed economic stated choice experiment. “I will choose to ‘maintain
my current land use’ for all of these options. I don’t have any interest in a program like this,” he pauses, and I can see that he wants to be stern, but not to offend. “Now,” he continues, “let’s have food and we can continue to talk about anything else you wish to discuss.”

This interview occurred during the field research in the northern section of the Bellbird Biological Corridor in Costa Rica (Corredor Biológico Pájaro Campana: CBPC). In the last few decades, farmers in this area of the have been experiencing a dramatic shift in the landscape; farm land has been returning to forest and agriculture has been giving way to tourism. This pattern of forest regrowth has won the country international acclaim as a conservation success story, where key individuals in the national government have promoted policies to protect primary forests and instigate the recovery of secondary forests (Wallace 1992, Evans 1999). Increasingly, the policies undertaken to continue Costa Rican conservation efforts are part of a broad array of internationally promoted market-based conservation initiatives that have been critically termed neoliberal conservation.

In this paper, I present results of 23 months of field research spent between June 2011 and July 2015 investigating the ways in which farmers in the CBPC value conservation forest uses, and how neoliberal conservation policies engage with those values. I frame this research within the literature on neoliberal conservation, defining neoliberal conservation and briefly summarizing the relevance of anthropological theory to the topic. I then describe the research and use the results to demonstrate how contemporary neoliberal conservation policies reinforce a particular value system of (monetary) exchange values. Finally, I suggest that by targeting exchange values, neoliberal conservation may be undermining more enduring ethics-based approaches to conservation. The mixed-methods approach reveals how economic modeling techniques can help to translate anthropological insights on the failings of neoliberal
conservation to a broad community of academics and policy makers, thus answering Charnley and Durham’s (2010) call for environmental anthropological literature rooted in theory that speaks directly to policy.

**Background**

*Market-based conservation mechanisms*

The term neoliberal conservation is rooted in the market-based policy mechanisms that aim to promote conservation by incorporating the natural environment into market transactions. Such policies have come to dominate environmental policy in the last 30 years (Freeman and Kolstad 2007). Market-based conservation mechanisms attempt to use market signals to influence conservation behavior by either altering prices or creating markets for environmental goods (Pirard 2012). Increasingly, these market-based mechanisms attempt to reduce complex ecological systems to tradeable commodities, and in doing so, ensure their long-term conservation (Boyd and Banzhaf 2007). Popular cutting-edge examples of these mechanisms include: payments for environmental services (PES) meant to trade environmental benefits on an open market (Wunder 2005), wetland mitigation banking that allows for the removal of a wetland in one location in exchange for rebuilding a wetland elsewhere (Robertson 2004), and emissions cap-and-trade systems that allow individuals, companies, and even countries, to exchange pollution permits (Field and Field 2002).

These mechanisms have their theoretical grounding in environmental economics, which asserts that environmental degradation in a market economy is due to market failure. From this perspective, environmental costs are externalities, or external to market-based decision making, and therefore the market fails to efficiently regulate environmental resources (Hanley et al. 1997). To correct market failure, externalities must be incorporated into market decisions so that
polluters begin to bear the cost of ecosystem degradation, while environmental stewards receive monetary compensation for safeguarding these ecosystem benefits (Field and Field 2002, Pattanayak et al. 2010). Under this paradigm, the environment produces “ecosystem services,” or services such as water filtration and carbon sequestration that benefit humanity (Daily et al. 1997), and economists assert that the accurate valuation and incorporation of these services into markets is the best hope for environmental protection (de Groot et al. 2002, Farber et al. 2002).

*Neoliberal Conservation*

Neoliberal conservation is rooted in critical literature that examines the irony with which politicians and academics propose that the solutions to environmental ailments caused by unchecked capitalism are found within the tenets of capitalism itself (McAfee 1999). Such literature has pointed to the political convenience and public deception of an ideology asserting that further growth in a capitalist system can protect natural resources, as long as those resources are accounted for by markets (Büscher 2012, Fletcher 2012). Scholars have examined the ways in which large conservation organizations have bought into this ideology under the apparent hope that markets will open up new conservation frontiers (Igoe and Brockington 2007). Within this critical literature, scholars use the term *neoliberal conservation*, to refer to the ideology in which nature is purportedly saved “in and through the expansion of capitalism” (Büscher et al. 2012).

Despite the frequency of its use, there is a lack of clarity within the literature as to what neoliberal conservation actually means. Sometimes it rests on the definition of *neoliberal* as *market-based*, in which the logic of markets is presumed to result in a more efficient and effective means of natural resource conservation (McAfee and Shapiro 2010, Arsel and Büscher 2012). Others have argued that neoliberal policies tend to undermine state authority, but market-
based conservation clearly depends on state intervention for its success (Castree 2006, Igoe and Brockington 2007, Roth and Dressler 2012). To understand this discrepancy, it is important to briefly look at the history of neoliberalism.

Neoliberalism at its root is the “new liberalism,” or the revitalization of liberal free-market ideologies in the late 20th century that had dominated thinking in the 19th and early 20th centuries. The prefix ‘neo’ arises because liberalism was interrupted by the Keynesian economic interlude in the mid-20th century. John Maynard Keynes, in contrast with liberal economists in the first half of the 20th century, believed that state intervention was central to economic development. He argued that the state, in the face of economic lulls, must assume the role of stimulating the labor market (Hunt 2002). Though Keynesian economics is widely credited for rescuing the United States from the Great Depression, by the 1980s it largely had fallen out of favor. Neoliberalism reflects a return to the belief that minimal state intervention and the strengthening of free markets ultimately leads to the most efficient allocation of resources (Harvey 2005).

Market-based conservation has taken on a new force under this paradigm, and can only be recognized as truly possible when neoliberalism reigns, despite state involvement in the process. Neoliberalism makes possible the global commodity exchange in which a forest in Bolivia can offset carbon emissions from global power producers (Brown et al. 2000), and a filled wetland in Florida can be “banked” in the next county, or even several states away (Ruhl and Gregg 2001). Under a neoliberal paradigm, international lending institution policies and multilateral trade agreements mandate that participating countries remove protectionist measures, while countries refusing participation in global markets face potential economic exclusion (Shadlen 2008, Rivera 2010). Deprived of protectionist measures, countries must restructure
themselves to face international competition, orienting exports according to comparative advantage (Capitán 1997). Seen from this perspective, the opening of green markets in less developed countries becomes effectively mandated by free-trade, as international lending organizations determine the course of conservation, and conservation becomes the competitive edge in a global economy (Grandia 2007).

State regulating bodies have always been crucial to the development of markets. Historic and archeological evidence suggests that markets were historically implemented by state authorities to finance state activities, contradicting the claim in economics that markets spontaneously occur (Graeber 2011). Likewise, market-based conservation mechanisms are necessarily implemented by the state in their nascent phase because there is no other way for them to form (Pagiola et al. 2002). Economic theory argues that once green markets take shape, the state role in market-based conservation mechanisms should diminish to maximize efficiency (Wunder et al. 2008). It remains to be seen how the state role will evolve as market-based conservation mechanisms mature, but the presence of state mediation in green markets does not negate the fact that these markets exist because of neoliberal ideology. Hence, from a historical and theoretical perspective, the preeminence of market-based conservation mechanisms today is made possible by neoliberalism, making the term neoliberal conservation appropriate.

Rational actors and embedded value systems

Critics of neoliberal conservation draw support from research within the social sciences that shows the dominance of capitalism to be a historically contingent process, and not a natural reflection of human values (Büscher et al. 2012). Neoclassical economic theory, which forms the foundation of environmental economics, holds that humans are rational economic actors that seek to maximize individual well-being in all interactions, and that this is reflected in market
exchanges, and ultimately, monetary exchange values (Gowdy et al. 2009, Gómez-Baggethun et al. 2010). Max Weber observed in *The Protestant Ethic and the Spirit of Capitalism*, that, “For though the development of economic rationalism is partly dependent on rational technique and law, it is at the same time determined by the ability and disposition of men to adopt certain types of practical rational conduct” (Weber 1976). The argument follows that capitalism functions by training individuals in market-mentality, or “practical rational conduct” (Dalton 1961). This observation, that there is nothing innate about rational economic behavior, has been echoed throughout anthropological and institutional economics research (Polanyi 1957, Sen 1977, Ostrom 1998). The argument is essential to a critique of neoliberal conservation because it contests the logic that places market-like structures as an inevitable solution to resource allocation problems (Hardin 1968).

Anthropology has produced extensive research demonstrating that values are embedded in social systems that both create values and give meaning to values (Polanyi 1957, 1977, Munn 1986). Hence, human values are shaped within society and are as diverse as social systems themselves (Malinowski 1961, Sahlins 1972, Mauss 1990). Scholars of neoliberal conservation build on this understanding to argue that the problem of environmental degradation is not that the exchange value of the environment is external to market decisions, which are in turn a natural progression of human economic expression, but rather, the problem is the very expansion of market-mentality, promoted by neoliberal structures, into all aspects of life (Robertson 2004, Fletcher 2010, McAfee and Shapiro 2010). It follows that further expansion of capitalism into the environment, a core tenant of neoliberal conservation measures, is doomed to worsen environmental troubles.
Anthropologists repeatedly have demonstrated that neoliberal conservation, in the form of ecotourism, integrated conservation development programs, payments for environmental services, and ecosystem service banking, among others, are problematic because they fail to engage with the full complexity of human-environment relationships (West 2005, Sullivan 2006, Velásquez Runk 2009). Anthropologists argue that neoliberal conservation runs the risk of training communities in environmental market-mentality—to think of the environment in cost-effective terms, and in doing so, replace the multifaceted values that for millennia have formed with diverse social-ecological systems (Vivanco 2001, West and Carrier 2004, West 2006). The argument follows that, rather than distilling environmental values to exchange values for incorporation into policy, effective environmental policy must begin to incorporate multifaceted value systems into design (Brondízio et al. 2010, Kosoy and Corbera 2010, Chan et al. 2012).

**The Bellbird Biological Corridor (CBPC)**

The socially and economically variable region of the CBPC provided an ideal setting for evaluating how individuals engage with neoliberal conservation mechanisms, and the extent to which exchange values encourage economically rational environmental decision-making in conservation land uses. The CBPC is a 667 km² mixed-use region that forms part of a national biological corridor network (www.cbpc.org). This network is designed to direct conservation efforts, such as payments for environmental services (PES), across mixed-use landscapes under the expressed purpose of increasing ecosystem service production and providing continuity of habitat (SINAC 2009). I conducted research in a sub-region of the CBPC that stretches between two market poles with a wide swath of rural area in between (Figure 5.1). Monteverde, at the northern pole of the study area, is one of Costa Rica’s most popular tourism destinations, and home to the Monteverde Cloud Forest Preserve, a 10,500 ha private cloud forest preserve.
established in 1972. Sardinal, at the southern extreme of the study area, is a short drive from the Pan American highway (and consequently several other towns) and home to a Cargill chicken hatchery that employs much of the region. The area between these two poles consists of small farms (average in sample is 36 ha) dedicated to cattle ranching, dairy production, and coffee plantations. The distance between Monteverde and Sardinal is only 32 km, but travel time on the poorly maintained gravel road is approximately 1.25 hours.

Over the last 30 years, residents of the region have experienced many changes within the context of national neoliberal reforms. These changes include the boom of the nature tourism industry in Monteverde, agricultural abandonment, the promotion of PES on farm land, and the sales of two national businesses (Pipasa and the Monteverde Cheese Factory) to international companies (Cargill and Sigma). The Costa Rican economy throughout most of the 1900s rested on coffee, banana, pineapple, beef, and subsistence farming. However, the Latin American debt crisis of the 1980s resulted in the International Monetary Fund (IMF) mandating reforms that removed protectionist measures, consequently decreasing the viability of small-scale agriculture (Edelman 1999). This coincided in time with the “discovery” of Costa Rica by international biologists that were active in the establishment of Costa Rica’s elaborate network of public and private reserves (Evans 1999). Banking on the comparative advantage of Costa Rica as an ecotourism destination, Costa Rican policies supported the expansion of the tourism industry in the 1980s and 1990s, marketing the nation as a conservation-minded tropical paradise (Campbell 2002). PES began in 1997 and, coinciding with the newly cultivated green image of Costa Rica, offers monetary compensation to landowners in exchange for ecosystem services provisioning (Pagiola 2008). Costa Rica continues to provide a testing ground for PES, carbon neutral certifications, ecotourism, and other neoliberal conservation measures.
Figure 5.1: Map of the study area within the CBPC. Inset shows the location of the CBPC in Costa Rica. The map base layer is from National Geographic World Map and shows major roads and province boundaries. Content may not reflect National Geographic's current map policy. Sources: National Geographic, Esri, DeLorme, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp.
Embedded values and Exchange values in the CBPC

In this research I sought an answer to the question: does neoliberal conservation reinforce exchange values for land uses and weaken ethics-based conservation values? I carried out fieldwork between June 2011 and July 2015, where I combined an economic stated choice experiment with semi-structured interviews and participant observation (see Chapter 3 and Chapter 4). The use of mixed methods here demonstrates how exchange values overly simplify conservation values, and why they are ultimately detrimental to long-term conservation efforts.

Stated choice experiments are commonly used in environmental economics to estimate preferences for ecosystem services and the associated exchange values (Champ et al. 2003). In a stated choice experiment the respondent answers a series of carefully designed questions, choosing between alternatives of a hypothetical scenario. Each question then changes the alternatives slightly, with each alternative typically having an associated cost or payment. I designed a choice experiment where each respondent answered 12 of these choice questions, and alternatives offered respondents payments for placing part of their land into a program that limited land uses in exchange for ecosystem services payments (Figure 5.2). This design mimicked the national PES program, but questions offered higher payments to compete with alternative land uses. At the time of data collection, Costa Rica’s PES program offered an average of $64 per ha per year, but choice experiment alternatives offered up to $425 per ha per year. One of the alternatives in each question was the “status quo” option. This provided the opportunity for the respondent to “opt out” of the alternatives presented, effectively asserting a preference for the current conditions.
The results from the choice experiment suggest that market integration of individual farmers facilitates the ability to translate conservation values to exchange values. I analyzed the stated choice experiment responses elsewhere using a multinomial logistic regression and found substantial heterogeneity of responses across the population (Chapter 3). Here I reproduce one component of these results, an extreme reaction to the choice experiment, termed a “protest response,” that is relevant to the idea of market integration. A protest response occurs when the respondent chooses the status quo alternative for every choice situation presented. The logic of identifying these as “protest responses” is that the respondent is not reacting to the particular differences in combinations of alternatives that are the purpose of the choice experiment design, but rather to something larger about the choice experiment as a whole. Protest responses may reflect an objection to the idea of how the hypothetical program would be financed, a protest against (often government) intervention, or a lack of comprehension among choice respondents.
about the required task (Adamowicz et al. 1998). In the case of the current choice experiment, a protest response occurs when the respondent chose the status quo for all 12 choice questions.

The choice experiment elicits values for land uses and ecosystem services, but it does so using a specific rational economic perspective on values that is not ubiquitous across the study area. Here, I contrast the response of an individual who embraces the choice experiment, with one who exhibits the protest response. This first individual likes the choice experiment alternatives:

This alternative is interesting…about 25% of my land, maybe a little less…[pauses while thinking]--I mean, it would be neat to get money for protecting the environment. Well, I am already doing that and no one is paying me anything.

Note how the respondent takes his time, carefully considers his options, and seems to choose according to the idea of increasing his well-being. This contrasts with a protest respondent:

Look, you probably noticed that I don’t really want anything to do with [PES] because I feel like – the right way to get us to have forest on our property isn’t by paying us for the forest. It is by making us aware that forest is necessary – that forest is something we need, that we need to educate ourselves to care for the forest not because it benefits the government, but because it benefits us and those that come after us.

In the second response, the rational economic approach to the choice experiment is less clear. The respondent is not weighing the alternatives, but rather rejecting the choice experiment all together because the idea of paying for forest cover does not fit in his world view. In doing so, he exhibits what Amartya Sen describes as “commitment” or a case where, “you think [something] is wrong and you are ready to do something to stop it” (Sen 1977). Sen contrasts commitment with rational economic choice, the idea that individuals act to maximize their well-being or utility. Returning to the above interview, the farmer expresses a duty to reject the choice experiment, independent of whether he would personally gain by participating in a PES program.
I tagged protest responses with a binomial variable (34.5% of respondents), and I analyzed the likelihood of exhibiting a protest response as predicted by demographic characteristics of respondents with a binomial logistic regression. The factors that best predict protest responses are whether the respondent: (1) has a minimum high school education, (2) lives in a market region, (3) is older or younger, and (4) primarily derives income from off farm sources (Table 5.1). Respondents with at least a high school education, who live in a market center, are younger, and work off farm to receive income, generally prefer the choice experiment alternatives. Those who have less education, live in more rural areas, are older, and who rely on farm production for income tend to exhibit the protest response. I argue below that each of these factors is directly related to market integration, and reducing conservation land uses to a monetary exchange value is more difficult for those with less experience working in markets.

Table 5.1: Parameter estimates for binomial logit on protest responses. High school, region, and off farm are binomial variables. High School indicates a minimum high school education, Region indicates whether respondent lives in a market center, and Off Farm indicates whether income source is primarily generated from off farm employment. Age is age of respondent.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Odds Ratio</th>
<th>Standard Error</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>High School</td>
<td>-2.343</td>
<td>.096</td>
<td>1.098</td>
<td>.033**</td>
</tr>
<tr>
<td>Region</td>
<td>-1.646</td>
<td>.193</td>
<td>.758</td>
<td>.030**</td>
</tr>
<tr>
<td>Age</td>
<td>.047</td>
<td>1.048</td>
<td>.027</td>
<td>.082*</td>
</tr>
<tr>
<td>Off Farm</td>
<td>-1.108</td>
<td>.330</td>
<td>.545</td>
<td>.042**</td>
</tr>
<tr>
<td>Intercept</td>
<td>-1.760</td>
<td>.172</td>
<td>1.480</td>
<td>.234</td>
</tr>
</tbody>
</table>

Note: **, * indicates significance at 5%, and 10% level, respectively

First, I begin with the role of formal education in acculturating farmers to market mentality. Formally educated individuals had an easier time conceptualizing their land uses in the cost-efficient terms demanded by the choice experiment. Early in my field research, I
attended a meeting organized by the Costa Rican Ministry of Agriculture in Guacimal. An agronomist working for an international company selling hybrid seeds gave a presentation on “improved grasses” for pastures. I spoke with him before the meeting, and he explained to me that the local agriculturalists “don’t know anything” about how to run a farm. “They do things,” he explained, “because their grandfathers did them.” During the meeting another agronomist spoke, opening his talk with, “how many of you know how much it costs to produce a kilo of milk? I’ll give a fish dinner to anyone that can tell me how much it costs them to produce a kilo of milk.” The room was quiet. The attitude of these agronomists is clear – these farmers might know how to grow food, but they do not know about cost-efficient production. From the perspective of the agronomists, farmers without formal education do not know farm business.

Formal education teaches individuals to make efficient, rational economic decisions, and it is fairly new to this study area. Only 27.6% of the respondents have a high school education. Many participants discussed how education is a double edged sword – how it changes the values of youth and makes it so that they do not value farm labor anymore. One older participant told me that his children have “followed in his footsteps” and continued to work on the farm, but his grandchildren chose to study. He said, “I don’t know what they are going to do. There are so many students, and not enough work. So I suppose it is good to study, I more or less agree with that, but they should go back to work on the farm.” Another informant lamented to me that education is taking everyone away from production. “The day will come when there is money but nothing to eat.” He blamed this on the attitude toward farmers, that farming is not a valued vocation in society. “Nowadays they say that if someone doesn’t study they are dumb—that farmers are ignorant.”\(^5\) Those who have been formally educated are aware of this contrast as well. After presenting the results of this research to agriculturalists in the community of

\(^5\) *Que ser un campesino es un maicero.*
Monteverde, we had a discussion about what kinds of values promote conservation. One listener spoke up, “I would like to learn from [the older generation] about this because I come from the university system, where everything is about production. There needs to be a balance in other areas.”

The logistic regression reveals that older research participants also tend to protest the choice experiment. Older farmers have seen dramatic changes in their lifetimes – from no electricity and running water on their farms, to cars, roads, and the introduction of a cash economy. At one point, I interviewed a father and son together. We talked about the transition the father experienced from working in an agricultural economy, to working in a farm economy. Amidst the son’s enthusiasm for the tourism business, the father described, “It has been a hard change, going from my work to this. It took a lot out of me...because I didn’t have any experience working in this. It was like learning how to work all over again. I would get in a tractor, work under a cliff, like it was nothing, like it was a car—happy. But not now, now it’s different. It is a big change for me.” The dramatic changes experienced in a generation seem to result in differences in values.

The Region variable shows that those who protest the choice experiment tend to live rural areas, supporting the idea that protest responses reflect a difference in market integration across the population. Those living and working in market centers are more accustomed to market transactions; just as formal education introduces individuals to ideas of efficiency and effective market behavior, so too does market exposure. This is in part because living in Monteverde has taken people out of an agricultural economy and into the tourism one. One agriculturalist described tourism as creating stress for the agriculturalists. He said, “They ask themselves, ‘Am I being left behind?’ Maybe one farmer will say, ‘no, I’m happy with what I’m doing.’ But when
he goes out to buy something, he is going into an economy that isn’t agricultural, so everything is more expensive.” This person described that a farmer living in a market economy has to change his mentality when living in a market center because global competition renders subsistence farming and small scale production economically untenable.

The combined factors discussed here are indicative of market integration, and a related market-mentality among a subset of the population, a conclusion further suggested by the use of language. I coded interviews for specific uses of business terminology in the context of competitive markets, identifying terms such as “business,” “marketing,” “commercial,” “sales,” “earning,” and “cost-effective,” that were used to describe decision making and land uses. I then explored the statistical relationship between business terminology and choice experiment responses (Table 5.2). I used a chi² test of categorical variables and found a significant relationship between the use of business terminology during an interview, as signified by a binomial variable, and protest responses. Those who do not protest the choice experiment are significantly more likely to use business language during the interview. These people are also more likely to live in a market center, and to describe the alternatives chosen in the choice experiment as “cost effective.” The ability to “speak business” translates to thinking about ecosystem services as business. This is a necessary skill for rational economic actors to receive monetary benefits in a market-based conservation setting and, simultaneously, it is a necessary skill for making an economically rational choice in the stated choice experiment.
Table 5.2: The tendency to use business terminology throughout the interview is significantly related to participation in the choice experiment (no protest response), living in a market center, and describing alternatives of the choice experiment as “cost effective.” The table shows the p-value of a chi2 analysis.

<table>
<thead>
<tr>
<th></th>
<th>No Protest Response</th>
<th>Living in Market Center</th>
<th>CE as “cost effective”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business Language</td>
<td>.027 **</td>
<td>.080*</td>
<td>.019**</td>
</tr>
</tbody>
</table>

I have claimed thus far that not everyone in the study area thinks of conservation land uses in the market terms demanded by the choice experiment, which begs the question—what are the other ways that people value forests in the region? Of the people interviewed, 74.7% reported that at least part of their farm is dedicated to forest cover. I asked each of these individuals to explain why they allowed forest cover on their farms, and then coded responses into categories (Figure 5.3). The overwhelmingly most common reason for allowing forest cover is that farmers associate forest with water protection. This association appears to be deeply rooted—many people describe their forests as intentionally maintained by their ancestors to protect water sources. This finding coincides with the findings of other researchers who have noted that Costa Ricans consider forest cover to be beneficial for maintaining water sources (Schelhas and Pfeffer 2005, Vivanco 2006, Newcomer 2007). Since these farmers depend directly on water for survival, they see the forest cover as directly benefiting them through water conservation. One informant stated, “I think water is a factor that is super important in agricultural production. If there isn’t water you can’t produce anything. So water conservation is essential. All farmers have to think about it.” Farmers have other reasons for maintaining forest cover: erosion protection, shade for homes and cattle, windbreaks from powerful cross-continental winds, and future sources of wood, among other reasons (Figure 5.3). These multiple values are not easily distilled
to an exchange value; it was a challenging task for many of the respondents when answering the choice experiment, and it can be an equally challenging task for ecologists charged with reducing complex ecosystems to measureable ecosystem services (Robertson 2004).

Figure 5.3: Categories of forest values as described by respondents when asked to explain reasons for maintaining forests on properties. There were 172 reasons offered, and categories were broken down by the number of times a reason was given.

Some scholars have suggested that exchange values are an inadequate distilment of complex conservation values because of the problem of incommensurability (Kosoy and Corbera 2010). Martinez-Alier (1998) defines incommensurability as “the absence of a common unit of measurement across plural values, [which] entails the rejection not just of monetary reductionism but also any physical reductionism” (p. 280). Applied here, forests have plural values that are not always reducible to an exchange value so that farmers (and society as a whole) can put a price on them. For example, if the forest provides watershed protection, shade, and erosion protection for
me, but also provides watershed protection for my neighbor, how do I compare the value offered to me with the value offered to my neighbor? How do I compare the value of following in the footsteps of my grandfather by keeping mature forest on my property with the value of maintaining biodiversity? Some economists claim that these incommensurable values are reducible under the concept of utility – I will do whichever brings me greatest utility and money is an exchange metric that reflects this utility. But if, as the data suggest, thinking in terms of cost-effectiveness and money is learned through market integration, then one must equally learn to think of a forest as reducible to money, and then make decisions based on this money. How well does this bode for conservation?

This is a difficult question to answer, but one way of approaching it is by looking at complexity of environmental thought, and how it is reduced by the monetary valuation of the environment. In interviews, participants frequently said that concientización (awareness) drives conservation, contrasting this term with the idea of payment. I built a co-occurrence model between two codes that were identified in qualitative analysis: “conservation ethic” and “business.” The conservation ethic code is characterized by references to awareness and the importance of awareness to conservation, while the business code is the same code analyzed in table 5.2. This model depicts the overlaps between the conservation ethic code, the business code, and all other codes used in the data set, when there were a minimum of 2 overlaps between codes (Figure 5.4). Thus, the model gives a general idea of what other topics farmers were talking about at the same time that they discussed the themes of interest. This figure demonstrates visually how awareness is a more complex term than business in the sense that it is associated with more themes. Conservation ethic is associated with watershed protection, regulated fire use, multiple forest values, conservation organizations, reforestation, government
command and control policies, God, and self-reliance. In contrast, business is essentially associated with money: expenses, cost-effective conservation uses, selling oxygen (venta de oxígeno) under PES, and changes in agricultural practices under market pressures. Education is shared between these two codes – education can lead to environmental awareness, at the same time that it leads to market-mentality as discussed previously.

Figure 5.4: Code co-occurrence model for conservation ethic and business. All connections demonstrate at least two overlaps between codes.

Tourism, the pillar of the Monteverde economy, is clearly associated with business, and it also is associated with a conservation ethic. The themes of conservation ethic and tourism were not discussed simultaneously, but rather right next to each other, with one logically flowing from the other. For example, one informant said when talking about the changes experienced in the Monteverde region, “I feel like there is more awareness now, like people value more what they have around them. You know, like when there are tourism opportunities or students visit us, and
they are attracted to Monteverde because it is famous for being a healthy, peaceful home full of biodiversity.” This association is tricky. It implies that tourism is ultimately good for conservation ethic. Other scholars have explored this sense of “green identity” in Costa Rica, where Costa Ricans assume the role of land stewards for the foreigners who come to purchase the right to experience biodiversity, suggesting that the sense of stewardship is only superficial (Schelhas and Pfeffer 2005). I disagree. Though tourism is problematic because it promotes many unsustainable market behaviors (Carrier and Macleod 2005), I suggest elsewhere that most of the detrimental impacts of tourism in Monteverde have to do with the unilateral development that accompanies globalization (Chapter 4). What is demonstrated by this quote is more subtle than the direct impact of markets. I have been told many times by residents that they “didn’t realize how beautiful their home was until others told them that it was.” Tourism, by bringing others into contact with a rural mountainous zone of Costa Rica, has shown residents that there are people willing to travel across the globe to appreciate their backyard. The result is a reaffirmation of conservation values, an unexpected outcome of nature tourism more akin to the goal of environmental education.

Market-based conservation mechanisms by their very definition align conservation with business. Typically, when I asked respondents about their opinions of payments for environmental services (PES) they would say that they had never heard of the program. When I instead used the term “venta de oxígeno,” most people quickly recognized the program. Hence, the program itself is aligned with business in peoples’ minds. The same is true of tourism. As one informant explained to me, tourism taught residents of Monteverde that you could earn money with forests: “Sometimes I explain to tourists that when our grandparents arrived here, it never occurred to them that you could earn money from the forest. So they just cleared the forest,
burned it, and thought ‘let’s see how we can survive.’” This means that through education and acculturation, neoliberal conservation trained individuals to equate conservation with business. Conservation, under PES and tourism, has been proposed to both landowners and broader society members as a “cost-effective solution” to conservation ailments through which everyone can benefit.

**Prospects for neoliberal conservation?**

The predominance of exchange values across society has not historically boded well for conservation, and as conservation values are continually reduced to exchange values, the future of neoliberal conservation looks grim. Anthropologists have long observed that when markets are introduced into a system, the environment tends to suffer. Godoy et al. (2005) review anthropological literature on the impacts of market integration on natural resource uses among indigenous people, and find that the literature tends to demonstrate that increased market integration results in increased natural resource degradation. Bernard Nietschmann (1972) provides an excellent example of this phenomenon as he documents the induction of the Miskito indigenous people in Eastern Nicaragua into a market economy. He notes that increased integration into a market economy caused hunters who previously hunted diverse species to redirect attentions to hunting a few species that were in high demand. As a result, they rapidly drove the most profitable species to endangered status while abandoning the diverse livelihood activities that had previously sustained them. James Acheson (2000) points out that the impact of markets on natural resource conservation has to do with the nature of the market itself. He states, “One of the problems with capitalism is that it makes it necessary for owners and managers to orient themselves toward short term profits,” as he demonstrates how this attitude has led to degradation in forest plantations in Maine.
The conflict between short-term exchange values and long-term sustainability emerges in my research as well. I referenced this concept in a focus group with Monteverde landowners as a way to contrast some of the cultural changes I had witnessed in Monteverde with the idea of sustainable resource use. The group engaged with the idea, one person stating, “The challenge is to balance this short-term thinking—the economic reality that we live in today, that each of us has to pay [debts] at the end of each month—balance that short-term thinking with the hope that one day our children will have a better future.” What is interesting here is that the economic reality, though promising development through neoliberalism, is recognized as the antithesis of offering “a better future” for the speaker’s children. This comment flowed from the conversation because the group passionately engaged with the idea that values have changed, and not always for the better, with the process of development in Monteverde. A powerful take-home point from this conversation was that values changing is not necessarily a bad thing, but that the predominance of exchange values that is demanded by a market economy, particularly one in which most of the population has entered into debt in order to participate, erodes other value systems that are seen as critical to well-being, and ultimately, survival.

In what ways do these “short term” market values run counter to the “long term” scale implied by sustainability? Biodiversity is produced over millennia. Ecosystems, though resilient through disturbances, fall into irretrievable states if subject to sustained or extreme damaging events (Holling 1973). But markets, on the other hand, are constantly fluctuating, sometimes on the scale of days. If conservation is dependent upon market payments for its sustenance, as neoliberal conservation is training people that it should be, then what happens when the money runs out?
There are two examples from this research that suggest that tying conservation to markets is problematic for precisely this reason. The first example is from the economic downturn of 2008. Prior to 2008, business was booming in Monteverde tourism. The town was flooded with tourists pouring off the buses every day. One business owner from that time described to me that his generation did not know what to do with all that money. It seemed like the money would never end. So people took out loans from the bank, which was happy to finance tourism, the “golden goose” as people would say. Some spent this money on cars, drugs, alcohol, and women. This man described to me with tears in his eyes how he lost a hotel to pay debt, how he nearly lost his family, how the same has happened to others, and these former dairy farmers did not always have farms to return to. Thus far, the forests have endured, I suspect because of the hope that tourism will return to previous levels and because forests and conservation have become more deeply rooted in the identity of the region—the positive impact of tourism on conservation ethic. But in a global economy and a fluctuating market, how long can old growth forests survive when one tree is worth $2000 on the global market?

The second example shows what can happen to a farm under PES protection when the contract runs out. This is the case of 300 hectares of a much larger farm in the study area that was under PES contract until 2009. The story was told to me by nearby residents of the farm who were insulted by the veil of conservation laid over what they saw as “big business as usual,” and I verified the story with public data provided by the Fondo Nacional de Financiamiento Forestal (FONAFIFO), the government organization in charge of administering PES funds. After 2009, a section of the farm was carved out and sold to people who were not interested in PES. The new owners tried to harvest the trees, but since there are deforestation laws in Costa Rica, they were unable to do so. Instead, they set fire to the secondary growth forest and burned it to the ground,
subsequently planting it with teak (*Tectona grandis*), presumably to harvest for future wood production (Figure 5.4). I have heard of this strategy being used elsewhere in the study area because, though the government can prohibit wood extraction, it is nearly impossible to identify who started a forest fire. One of the neighbors described, “The government thinks that it is doing good, but what about the people who work in [PES]? They are cutting down the forests. They are taking the money and destroying the forests. So I don’t understand why they are spending the money.” While the particularities of this story are not clear, it provides interesting evidence that if the value of the forest is only monetary, it becomes easy to destroy that forest once the payments run out.

![Figure 5.5: Landscape of recently deforested and burned farm that had been under prior PES contract.](image)
Conclusion

Research with rural farmers in the CBPC of Costa Rica indicates that popular neoliberal conservation measures do not naturally align with conservation values. Rather, these mechanisms influence landowner values by encouraging landowners to translate complex conservation values to monetary exchange values so that they can effectively participate in conservation markets. Through this process, landowners’ values for conservation land uses change. I argue in this paper that this trend is not good for long-term conservation, as simplistic monetary exchange values undermine the social complexity necessary for sustainability.

The economic stated choice experiment demonstrates that some individuals are unable and/or unwilling to reduce conservation land uses to exchange values under the terms demanded by the experiment. Further statistical analysis of both interview responses and respondent characteristics reveals that interest in neoliberal conservation is facilitated by market-mentality, and that there is likely a reciprocal, reinforcing relationship between the two. Ethnographic evidence helps to explain results and provides a broader context for the possible failings of neoliberal conservation when forests are reduced to “competitive land uses.” The use of mixed-methods, involving empirical data collection and statistical analysis, has helped to identify the shortcomings of neoliberal conservation in ways that may be more convincing to policy makers than pure qualitative data (Charnley and Durham 2010). The message for policy makers is that neoliberal conservation likely will not work to further the stated conservation agenda.

The question still lingers – what could conservation do differently? I have heard this question brought up repeatedly by conservation practitioners – do they not need to work with the system? By demonstrating that neoliberal conservation measures do not naturally align with conservation values, this paper has implicitly argued that values are malleable. Hence, neoliberal
conservation encourages an exchange value view of conservation practices – strengthening these values while essentially discrediting others. Yet other conservation values exist. The challenge for conservation is to strengthen the long-term values that run counter to “most profitable use”—the values that say, as several informants told me, “I leave the forest standing because it would be a shame to cut it down.” Conservation once operated here, in the realm of awareness and education, but the movement, led by large non-governmental organizations and international lending institutions, seems to have abandoned these aspects in favor of efficiency and production. Rather than being a counter movement, which, at one point at least, it aspired to be, conservation runs the risk of being reduced to another facet of the global market.

References


So if I understand correctly, we just need to pay farmers more money and teach them that the government is trust-worthy. I had just finished an hour long presentation on my dissertation research to scientists, conservationists, and some local expatriates in the community of Monteverde. I had shown charts, provided quotes, and explained the challenges of market-based conservation that fail to engage with complex value systems. Then we had a discussion, and somehow this take home came through—not to everyone, but to a very vocal few who I know are people of good intentions, who work hard in conservation and mean well. But perhaps the listeners who voiced these ideas, which run entirely counter to the message of my dissertation, were not wrong. After all, I had just shown that values are malleable, that people’s values are changing, so why not push a little harder? Perhaps a piece was missing – a piece that was understood when I discussed these same ideas with community members who participated in this project, who jumped at the concept of short-term vs. long-term values and vehemently defended what had been lost to development, who were ready to say, “we need a different paradigm, somehow.” It is a common problem in environmental literature, critics talking past each other; those who choose to see the world in black and white finding impossible solutions out of the seas of gray. So I reaffirm here: this dissertation is not about a simple solution. It is about complexity. It is a little bit gray.

I first traveled to Costa Rica in 1996 as a volunteer working in “community development.” It took at least 5 hours to travel from the capital of San José to the town of Nicoya, something unthinkable today, since Taiwan financed a bridge in 2003 that stretches across the Tempisque River, rendering the sluggish ferry obsolete. I worked on a project with the Costa Rican Ministry of Health building toilets in a small village near Nicoya. At that time there was not much to Nicoya – the chain stores that are in every major Costa Rican town, a high school, and satellite beaches rarely visited by tourists. Last time I drove through Nicoya I barely
recognized it – a Burger King on the corner, two factories had sprung up, the foundation and scaffolding of a condominium promising expats the comfort of US life at half the cost. The changes evident in Nicoya in just one generation mirror nearly 100 years of development in the United States. These changes are not all bad, but, as this dissertation has shown, they are not all good either. Some solutions to poverty and environmental degradation have created new challenges.

This dissertation has sought to disentangle the relationship between landowner values, land use decisions, and market-based conservation mechanisms across the CBPC. It takes as a starting point that possible solutions need to understand the social-ecological system first. Without adequate understanding, policy may always have perverse outcomes. This conclusion will provide a brief summary and synthesis of the data analysis chapters 3, 4, and 5. I will then discuss the implications of these chapters both in terms of Costa Rican conservation policy and global market-based conservation policy. Finally, I will discuss areas of future research that build on the themes of this dissertation.

Chapter Summaries and Synthesis

The central question of this dissertation has been: how do the values informing private land use decisions vary across the study area and do market-based conservation mechanisms foster sustainability? Each chapter has sought to answer a piece of that question. Chapter 3 employed mixed-methods from anthropology and economics to compare different concepts of values, and relate these to the assumed values underlying market-based policy. Chapter 4 combined qualitative data with remote sensing to relate values and landowner characteristics to land use decisions and overall patterns of forest cover change. Chapter 5 tied these chapters
together by analyzing variability in values and drawing inferences on the relationship between MBCM and sustainability.

Chapter 3 contributes to a couple of relevant bodies of literature. The methods provide a novel approach to ecosystem services valuation that can help to incorporate multiple values into policy. Increasingly, scholars are seeking to combine techniques to assess ecosystem service values (Chan et al. 2012), as alternative valuation techniques provide depictions of values that are at times contrasting, and at other times complementary, but always helpful to understand complex social-ecological systems (Hattam et al. 2015). In the case of chapter 3, I combined a nonmarket valuation stated choice experiment (CE) with landowner interviews. The qualitative data drove model selection and interpretation—interview data indicated that there was heterogeneity among the population regarding government intervention in land use planning and conservation incentive programs. The latent class logit model constructed from the CE data served to illustrate this heterogeneity, further clarifying that landowner preferences for PES vary; some landowners preferred to receive payments for sustainable land uses while others rejected the concept entirely. Interview data explained why some landowners are resistant to PES, and helped to shed light on overall program shortcomings that could be used to improve future policy.

Chapter 3 also contributes to literature evaluating PES program efficiency by revealing that the current PES program is not functioning as an economically efficient means of conservation. Rather, it works to subsidize agricultural abandonment, a process which is likely occurring independently of PES payments. Though this finding has been suggested throughout the literature, the mixed-methods employed indicate that making PES more market-like will not correct efficiency, as some scholars have suggested (Engel et al. 2008, Ferraro 2008, Wünscher
et al. 2008). This is because PES are poorly aligned with landowner values. This chapter does not broach the topic of whether continued widespread use of PES to foster conservation may successfully train the population to view conservation as worthy of remuneration. I suspect that it will because studies have demonstrated that economic incentives impact values, often promoting “self-interested” behavior at the expense of morals (Bowles 2008). In later chapters I suggest that if this happens, it may not be good for long term conservation.

Chapter 4 contributes to literature on sustainability science and forest transition theory. Here, I examine common assumptions that are made about driving forces of landscape change by combining GIS analysis with survey and ethnographic data. I place this research within the larger implications of forest transition theory: namely that there is an underlying promise that continued economic development can be successfully coupled with environmental sustainability. The mixed-methods that combine landscape analysis with interview and ethnographic data provide alternative depictions of the landscape. While GIS analysis provides a generalized depiction of forest cover change coinciding with national policy changes, the interview data serves to explain some of the observed trends in terms of patterns of human behavior. This chapter was co-written with Steve Padgett Vasquez, who produced the forest cover change maps from LANDSAT data, and interpolation maps from geographically weighted regression results. We found that national policy has promoted farm abandonment throughout the study area, and this process has aided forest recovery. We also found that these changes, while positive for forest cover, have potentially detrimental impacts on long-term social sustainability. Further, forest cover ecosystem benefits may be counteracted by the negative impacts of land use intensification on the water supply.
Chapter 5 contributes to literature on neoliberal conservation that questions whether market-based conservation mechanisms ultimately reinforce an unsustainable economic system. In this chapter, I return to an analysis of the CE data. I examine the characteristics of CE participants and CE protesters using both quantitative modeling and text analysis and conclude that market-integration of participants is reflected in responses. I then move to a more conceptual analysis of value constitution – what kinds of values make up “exchange value” vs. “conservation values?” I find that conservation values are inherently more complex than exchange values, and that this is problematic for conservation, which depends on the long term stability of complex social-ecological systems. I conclude that conservation funds can perhaps be better used to reinforce multifaceted conservation values and community sustainability.

The main theme running through all dissertation chapters is that market-based conservation mechanisms are derived from a simplified understanding of human behavior, and as such, they tend to only be deemed “successful” when measuring simplified indicators of sustainable development. A complex view of the social-ecological system indicates that the successes of MBCM are limited, and there is reason to be concerned about their viability in the future. Though this dissertation engages with the appropriateness of MBCM for fostering sustainable development in a specific region of Costa Rica, the patterns observed in the CBPC may have broader global implications for neoliberal conservation.

In what ways are MBCM limited? Chapter 1 illustrates that if MBCM are held up to the very standard of efficiency under which proponents claim superiority, they actually fall short. In the case of PES in Costa Rica, for example, MBCM are not economically efficient nor are they particularly effective at encouraging reforestation. Some scholars have argued that perhaps the purpose of PES is not to drive reforestation but to foster compliance with existing deforestation
laws (Pagiola 2008, Daniels 2010). I find this argument odd given the theoretical underpinnings of MBCM. As shown in Chapter 2, their supposed strength over prescriptive and educational approaches is the efficiency standard (Field and Field 2002). Hence, whether such a program encourages compliance with deforestation laws is ultimately irrelevant, as numerous other programs could possibly do the same and may have the added impact of contributing to reforestation goals.

My ethnographic data suggests that legal restrictions and moral obligations, and not PES, discourage deforestation in the study area. Deforestation is a continual reality that is slowed by social monitoring and the risk of fines imposed on landowners. Portable sawmills and the lack of an organized conservation presence seemed to make deforestation especially prominent in the lower study area. Many landowners discussed with me selling trees on their land, and took care to differentiate between socially conscious deforestation (targeting older trees) and irresponsible cutting (in riparian zones). The accounts of PES participants, both current and former, did not differ from those of non PES participants. Though this finding is only suggestive, it is consistent with the evidence that economic incentives may actually decrease landowner morals and increase self-interested behavior (Bowles 2008).

Chapters 4 and 5 elucidate the limitations of MBCM as stemming from an ideology that overly simplifies social-ecological interactions. Chapter 4 continues with the theme of caution about MBCM by illustrating that scholars should be wary of using coarse indicators of social-ecological change to gauge sustainable development successes. This chapter warns that emphasis on broad scale patterns of land cover change may obfuscate social-ecological interactions that are critical for understanding sustainability. The argument is not that patterns of increased income and forest cover are not real, but rather that a new social instability is being created by
the observed social-ecological changes that are likely to produce new sustainability challenges. This chapter alludes to the theme engaged with more directly in Chapter 5 – that complex social-ecological relationships are better for sustainability. Chapter 5 warns that the impact of MBCM on behavior runs counter to the objectives of conservation because they reinforce self-interested profit-maximizing behavior that undermines ethical social responsibility. Taken together, these chapters refute the assertions of some sustainability scholars who claim that the reframing of conservation benefits as “ecosystem services” reinforces the idea that “win-win solutions” are realistic (De Groot et al. 2010). Rather, this dissertation supports the statement that conservation is about “hard-choices” (McShane et al. 2011) and goes even further to suggest that those hard choices may move beyond questions of “deciding what to save” (Leader-Williams et al. 2010) to larger choices about sustainability under the current global economic paradigm.

Alternative visions for conservation in a global era

Given the generally negative conclusions in chapters 3, 4, and 5 regarding the future of MBCM, the question surfaces: what is the path forward in the conservation movement? Though I am not arguing that all MBCM need be discarded immediately, I do see that at best their role is minor among a diverse set of conservation initiatives (Townsend and Masters 2015). My suggestion for future conservation based on this research is that it must reestablish itself as a counter movement—counter to globalization and market forces that strip society of the social fabric necessary for resilience. I recognize that this suggestion is a conceptual leap from the dissertation analysis and may seem naïve, given the substantial political and academic support behind MBCM, so I will take a moment here to justify this stance within the context of the dissertation, as well as the conservation movement.
Throughout fieldwork, and even in the final presentations to communities, I threw out questions about “how to save the world.” I asked most landowners, for example, “How would you promote conservation in the CBPC if you were able to design a program?” Interestingly, no one suggested direct payments to landowners, possibly because I was already asking them about PES and it seemed superfluous. Suggestions were nearly entirely about education and community support. One landowner suggested that the daily news should spotlight conscientious landowners. This is an interesting suggestion, given that televised news is a primary source of information transmission in Costa Rica. He then went on to tell me about a Guanacaste tree in his backyard that he saved because of a program on the news. He told a dramatic story about fighting to save this tree’s life:

[I saw that] the cows trampled [a Guanacaste tree near the house] every day, and at night the tree stood up again, begging for help. When I saw that report on the news I finished my coffee, grabbed my tools, and looked for a strong post that I then used to support that tree. And there it is today.

He took me out back to show the Guanacaste to me, posing for a picture with the 35-year-old tree. Another landowner told me that he would offer a surprise reward, like a lottery, for the best conservationist in the region, bestowing him/her with public recognition, and maybe a monetary incentive, for conservation behavior. Others described in detail an abandoned program that had been undertaken by the Monteverde Conservation League in the mid-1980s through the mid-1990s to encourage reforestation on farms in the district of Monteverde. This program helped landowners to reforest in areas they deemed important, providing trees, technical support, and sometimes volunteers to do so (Guindon et al. 2001). One person even plagiarized one facet of this program – suggesting that he would throw a yearly “conservationist day” party to acknowledge the stewardship work done by landowners. The message from these suggestions
was clear: landowners wanted acknowledgement for land stewardship, they wanted to be valued by society for work they felt that they already did. As one farmer described, “The small farmer is the first conservationist. He has to leave something for his future.”

There was so much positive talk among landowners about the Monteverde Conservation League’s discontinued education and reforestation programs that I began to research more about what the program had done and how it had been successful. Several conservationists and community members were integral to the establishment of the program. Some of them wrote up their experience:

Landowners were given direct input into the development and execution of the reforestation program through representation on the reforestation committee. The establishment of an annual reforestation day was also very effective in stimulating and maintaining landowner interest, as it provided recognition to landowners with the best projects. The annual event took place in different communities each year and was conducted in a festive atmosphere that respected and promoted local cultural practices. Landowner knowledge and experience were given value by consulting with them on how and when to plant trees, where to place windbreaks, how to establish living fence posts, and what native tree species to use for seed sources. (Guindon et al. 2001).

I interviewed several people directly involved with the reforestation project. One person explained that the key to the success of this program was basing conservation on landowner concerns and providing a connection between institutions and landowners. For example, there was a person at the Monteverde Conservation League who made monthly visits to farms. This contrasts with the PES approach, which does not have an outreach component, because it mistakenly assumes that payments alone will alter behavior to the benefit of conservation. Interestingly, the Monteverde Conservation League outreach programs were defunded right around the time that PES became effective (Guindon et al. 2001). Landowners asked me why there is not an institution, including possible government institutions, that have continued such a program – advising them in sustainable land uses and not merely seeking to “get rid” of them in
favor of conservation. Guindon et al. (2001) write, “…some farmers who participated in short-term projects feel ‘betrayed’ by the lack of project continuation and become less supportive of the organization” (379).

With little conservation funding available, PES needs to be viewed as directly competing for funding with grassroots, value-affirming approaches to conservation (Vatn 2010). Conservation funds are controlled by international donor institutions that function under a specific ideology, and increasingly that ideology has become more united with neoliberalism (Igoe and Brockington 2007). PES, for one, is partially funded by a Costa Rican petroleum tax, but it is also funded by “international donating agencies” (pers. comm. Forestry Regent). Landowners frequently suggested during interviews that they would like to see the Costa Rican government offer an extension program like the one run by the Monteverde Conservation League, and yet, government support has been thrown behind PES, which has an intentional lack of involvement with landowners. Though mediated by the government, PES is mostly “hands-off” because markets are supposedly self-regulating. Hence, the government’s role ironically perpetuates neoliberalism, and money is diverted from programs that are based on a holistic conceptualization of human values.

There is some discussion among scholars about the concept of “post-neoliberal” sustainable development (Radcliffe 2012). Some scholars have pointed to PES mediation by state institutions and claimed that it is not a strictly neoliberal conservation mechanism as it is continually shaped by the state (Fletcher and Breitling 2012). Such assertions beg the question: are post-neoliberal market-based conservation mechanisms possible? Radcliffe (2012) concludes in her analysis of post-neoliberal Ecuador that alternative visions for development are hindered by the legacy of colonialism and the inability of institutions to liberate themselves from residual
power structures. I feel that post-neoliberal MBCM would suffer the same fate as they are based on an ideology defined and developed within the very system that has rewritten social-ecological relationships across the world (Matulis 2015). There are alternative ways to imagine human-environment relationships, but it requires rethinking our current paradigm. MBCM are a patch on a broken system. They are “anti-political” in that they divert attention from the underlying causes of environmental degradation (Ferguson 1990, Nadasdy 2005): a culture of consumption, a disconnect between humans and the environment, and unsustainable values. True change will require a restructuring of social-ecological systems.

Where do we go from here? Future areas of research

If PES programs are not efficient, and are not supported by landowners, why do they exist? This is the central question for what I envision to be a follow-up manuscript to this dissertation. It would engage with the challenge of lack of continuity in conservation programs. Conservation has suffered from short funding cycles and continual changing of ideology so that programs often are thrown out before they have a chance to reach fruition (Guindon et al. 2001, Sayer and Wells 2004). Central to this issue are questions of power – who decides what works in conservation and what metrics are used to measure conservation success. Though some of these themes were subtly raised in this dissertation, the follow up manuscript would bring this theme to the forefront.

As it would have been impossible to analyze all data gathered during field research in this dissertation, I envision that this paper will be based on existing interview data that were not extensively incorporated here, including interviews with conservation practitioners and government officials in MAG and FONAFIFO. In addition, this manuscript would require archival research, examining the specifics of how PES was introduced into the Forestry bill of
1996, and the role of international lending institutions in the funding of the program. Based on the information revealed here, I suspect that PES exist because they are politically convenient and they serve powerful international and national interests and reinforce the status quo. This manuscript would also engage with the idea of post-neoliberal market-based conservation – critiquing the idea that PES mediated by the state potentially offers an alternative development paradigm.

This dissertation has also instigated my interest in a subsequent research project that would elaborate on the applicability of some of the conclusions reached here in different social contexts. I would like to build on this research by testing whether United States (US) residents have similar perceptions, attitudes, and exchange values for conservation programs as those witnessed in rural Costa Rica. This project would adapt methods used here to a US context by combining a mail survey targeting stakeholders of interest with follow-up interviews that probe survey responses. Parallel to the research undertaken here, I would use these responses to compare exchange value metrics for ecosystem services to other observable conservation values. Examining the environmental values of US residents would provide a context that stands in contrast to rural Costa Rica. In theory, US residents have participated more in a market economy than the landowners interviewed in this study. Therefore, I might expect to see that values in the US are more consistently in-line with market values than witnessed in Costa Rica. However, I suspect that since MBCM are fairly new across the world, I may see a similar lack of training among respondents to that observed in Costa Rica.

The purpose of this future research would be to continue to probe the extent to which exchange value is an adequate metric for conservation values in a market society. This dissertation is limited by the geographic scope as well as the methods undertaken. There are
innovative valuation methods involving deliberative valuation (Howarth and Wilson 2006, Spash 2007, 2008) and Q Methodology (Pike et al. 2014) that can combine to produce a more robust understanding of conservation values for informing policy (Hattam et al. 2015). I foresee that my research will continue to attempt to understand how conservation values are articulated by individuals and communities, and whether environmental policy successfully engages with those values to promote sustainable behaviors.

**Conclusion**

They came for the *arroz con pollo*. I knew that but was still flattered by the nearly 50 people in Guacimal that showed up to the final community presentation of the study results. I did not need to reserve a space anywhere – a woman opened up her *rancho* because it was for the community. I paid her to make the food because it seemed like the right thing to do. In San Luis nearly 30 people came to the *Centro Communitario*, more *arroz con pollo*. In Monteverde less than 10 people showed up at the Monteverde Institute. We ate spaghetti, which was a poor choice. The ones who came were mostly farmers. They seemed to feel bad about the absence of their peers, but we all knew that the others were too busy with tourism, that tourism life makes dairy farming seem laid back in comparison. And no one could remind each other in Monteverde—there is not a central meeting point, everyone does not know everyone anymore. We sat in the muggy May heat, just before the rains, and talked about saving the world.

“I think until we have a government that wants to help the small scale farmer, we are in trouble,” one man contributed.

Another man added. “The government ties my hands, they tell me how to raise my kids, and they tell me what to do with my land.”
Someone countered, “That’s not up to the government – it’s up to each of us to have *conciencia.*”

A woman chimed in, “Even if I wanted to save the world, what could I do?”

I pushed back, “You are not powerless. You have land. You have choices. You live in a democracy.” Perhaps against protocol, but in the end an anthropologist is another human in a community. Then the conversation shifted. I had never noticed before how culture can change instantaneously in a room. How an observation can make people both uncomfortable and relaxed at the same time, like a child caught trying to explain a half-truth to her mother. How a simple suggestion can change the way people act.

But then, I suppose that is the story of this dissertation.

**References**


A. Demographics

a. Are you male / female?

b. How old are you?

c. How long have you lived in the zone?

d. What is the size of your farm?

e. Are you the owner of the farm? If yes:
   i. Are you the sole owner or do you share ownership with other people?
   ii. Do you have a land title?
   iii. Do you have a cadastral plat?
   iv. Did you purchase the farm or did you inherit it?

f. How long have you lived on this farm for?

g. How many people live here?

h. Are there any children under 18 living in this house?
   i. How many?
   ii. Relationship?

i. What is the last grade you completed in school? _________

j. What are your principal sources of income? (Circle all that apply)

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6 Survey questions were filled out during interview by the author.
i. Agriculture

ii. Tourism

iii. Off-farm tourism employment

iv. Farm tourism

k. Who makes decisions regarding land uses on your farm?

i. Me alone

ii. My husband / wife and me

iii. My extended family and me

iv. My extended family without my input

v. Other ____________

l. Do you have any additional properties?

i. How Many?

ii. How large is each?

m. Did your parents work in agriculture?

n. What is your farm currently used for? (Circle all that apply)

i. Agricultural production for sale

ii. Agricultural production for home consumption

iii. Tourism

iv. Reforestation

v. Conservation

vi. Housing

vii. Other ____________

o. If your farm is used for agriculture:
i. What products are produced on the farm?

1. Milk / Cheese
2. Beef / cattle
3. Coffee
4. Beans
5. Sugar
6. Others ______________________

B. Would you tell me about the history of this farm? (Who first owned it, how did you come to live here, what it was used for previously, etc.)

C. Actual land uses:

a. Do you have any forest on your property? If so, who made the decision to keep forest and why? Do you plan on leaving the forest on your property?

b. Forested areas:

i. How old are forested areas on the property?

ii. Whose decision was it to keep / cultivate forest on the property?

iii. Do you use this forested area for anything?

iv. Do you plan on leaving this area as forest in the next 5 years?

1. Why or why not?

2. Would you consider increasing the size of the area?

v. Have you planted trees on your property?

1. Where?

2. Why?
c. Pastures / agricultural areas:
   i. What agricultural products have been cultivated in these areas?
   ii. Are these areas still in cultivation?
   iii. Do you foresee keeping these areas in cultivation / pasture through the next 5 years?
       1. Why or why not?
   iv. What are the biggest challenges you face in agricultural production?

d. Streams
   i. Do you do anything to protect water sources on your property?
   ii. Has the water quality on your property improved/ worsened over the last 20 years?
   iii. To what do you attribute these changes?

e. If you could do anything with your property, what would you do?
APPENDIX B

CHOICE EXPERIMENT SCRIPT

The next questions ask you to compare alternative land uses for your farm. Imagine that you are considering dedicating part of your farm land to a program that would pay you to undertake sustainable land uses in that part of your farm. Choose the alternative in each question that you most prefer. If you do not prefer either of the alternatives to your current land use, choose alternative C.

As you answer the questions, please remember:

- There are no “right” answers. We are interested in which scenario you think is the best alternative in each case.
- Consider that the money received per hectare may be in contrast to current land uses that also produce income.

Alternatives A and B require:

1. A 10 year contract with a subsequent renewal option.
2. A management plan that would NOT have any additional cost for you. This management plan would specify the permitted uses within the portion of your farm in the program, and the target environmental service.

CE was administered in-person and in Spanish. Scientific terminology was translated into colloquial terms and care was taken to answer all respondent questions prior to and during the survey administration. After this script, respondents were presented with 12 CE questions with 3 alternatives each: alternatives A and B and the status quo option (alternative C). The CE questions were randomized prior to each survey administration to limit the impact of learning on response.
3. The management plan would require monitoring to insure program compliance that would also not have any additional cost to you.

The alternatives for each question vary according to:

1. The percentage of the farm that would be dedicated to the described sustainable land use.
2. The permitted uses within the portion of the farm under the program.
3. The target environmental service of the program.
4. The amount of money received, in US dollars, per hectare per year for program participation.

Alternative C describes that you prefer to “maintain your current land use.” If you choose this option, you are choosing not to participate in the hypothetical program and to continue with your current land management plan.

**Definitions:**

**Percentage of Farm:** The percentage of the farm that would be included in the incentive program.

**Permitted Uses:** Indicates the possible uses that you could undertake on the land that is included in the program.

- **No Permitted Use:** You would need to fence off the land, under no additional cost to you, and you would not be permitted to use the land for anything, including tourism.
- **Organic Agriculture:** This requires that you undertake agricultural production in this area, eliminating all use of chemical fertilizers and pesticides. You could independently certify this area for marketing produce, but that would carry an additional annual cost.
- **Agroforestry:** You could use this area for agroforestry, combining a layer of trees with understory production. Possible understory uses include cattle grazing and coffee cultivation.

- **Forestry Plantation:** The area could be used for the cultivation of wood products. Harvesting cycles would need to be a minimum of 15 years and should avoid concentrated harvesting across the area.

**Environmental Service:** Indicates the purpose of the sustainable management plan in terms of ecological benefits.

- **Forest Cover:** The management plan would seek to maximize forest cover, concentration, and connectivity. The possible social benefits of forest cover include biodiversity protection, scenic beauty, and carbon sequestration.

- **Water Quality:** The management plan would seek to protect water quality in the region. This includes minimizing erosion, protecting water sources, and avoiding chemical and organic contaminants. Possible social benefits include improved water quality and quantity.

**Payment:** Amount received per hectare per year for participation in the described program. The amount is in US dollars.
APPENDIX C

DEBRIEFING QUESTIONS

1. Did the task presented to you in the Choice Experiment make sense?
2. Did the alternatives that you were presented with seem realistic?
3. Were there components of each alternative that you particularly liked / didn’t like? Can you explain what you liked / didn’t like and why?
4. Which attribute was the most important to you when making your decision?
5. Do you feel that your current land uses are environmentally friendly? Why or why not?
6. What is the biggest obstacle you face in employing environmentally friendly land-uses on your farm?
7. Does your neighbor employ environmentally friendly land uses?
8. Do you participate in any environmental or community development organizations? Do you have any opinions of these organizations?
9. Do you believe that the local environment has improved or worsened in the last 20 years? Why?
10. Do you have any experiences with or opinions of the PES program?
11. Do you have any experience with tourism?
   a. Does it benefit the environment?
   b. The community?

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These questions followed the CE administration and were used to reflect on the experiment as well as probe additional landowner experiences with sustainable development. Questions were translated into Spanish and colloquial terminology was used.
12. If you were to design a program to encourage environmentally sustainable land uses in Costa Rica, what would you do?