ABSTRACT

RAIMONDI, ALICIA LIBERTA. Determinants and Impacts of Tourism Participation: Assessing Ecotourism in a National Forest of the Brazilian Amazon. (Under the direction of Dr. Erin O. Sills).

The Amazon is widely known as the 'lungs of the Earth' and the protector of extraordinary biodiversity. Of the two-thirds of the Amazon forest biome located in Brazil, 19% had been deforested by 2011. To constrain deforestation, Brazil has placed 44% of the Amazon into protected areas. Brazil initially followed the North American or 'Western' model of protected areas, but in the past two decades, many more multiple-use and human-occupied protected areas have been created in the Amazon. This reflects a global trend of incorporating indigenous or traditional populations into protected area management. To offset the effects of restrictions on resource use, many market-based policy tools have been developed, including community-based ecotourism. This thesis discusses the determinants and impacts of local participation in ecotourism in the Tapajós National Forest (TNF) of the Brazilian Amazon, drawing on a household panel survey and participant observation.

One key determinant of local participation is whether the government promotes the community as a tourism destination, e.g. in publicity materials. Thus, I also explore what factors lead to government endorsement of a community. Communities are more likely to be endorsed by the government if their residents are more politically empowered and if the community received more tourists in the final year of formal ecotourism development (in an ICDP).

In the TNF, tour agencies and government agencies steer tourists toward particular communities, and then households in those communities decide whether to participate in tourism. I employ household survey data from 216 households interviewed in 1997 and again

in 2006, to identify determinants of both formal participation (in an externally funded ecotourism project, or ICDP) and informal participation (in entrepreneurial activities that tap into the tourist market). The likelihood of a household participating in both types of tourism is positively and significantly related to greater forest dependence (measured by diversity of non-timber forest products collected), after controlling for government endorsement of particular communities. Households who arrived in the community more recently are also more likely to participate in tourism. Turning to impacts, I find positive attitudes for future tourism development and few other significant impacts from local participation. Participating households perceived an improvement in wellbeing due to tourism, however traditional asset wealth indices did not correlate with these perceptions.

These results could help planners and ecotourism developers to understand local participation in tourism. However, as is typical of ICDPs, ProManejo did not immediately establish tourism infrastructure and capabilities in the communities. Thus in 2006, the TNF was still in the earliest stage of ecotourism development, which Butler (1980) termed "exploration." This could explain why participation in tourism during this time period had few of the hypothesized positive impacts on household welfare or conservation-compatible livelihoods. To better assess patterns and predictions based on statistical analysis of the household survey data, I visited communities with the most tourism about 5 years later. Based on qualitative fieldwork, I review and update my assessment of local participation in tourism. It appears that the local elite, who host tourists in their homes, are capturing the majority of tourism benefits. However, other forms of participation needing little financial capital, such as guiding and handicraft production, are more spread out among locals. It also

became clear that residents attribute improvements in their quality of life to more recent interventions, which built on the groundwork laid by ProManejo.

Determinants and Impacts of Tourism Participation: Assessing Ecotourism in a National Forest of the Brazilian Amazon

by
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A thesis submitted to the Graduate Faculty of
North Carolina State University
in partial fulfillment of the
requirements for the degree of
Master of Science

Natural Resources

Raleigh, North Carolina

2013

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BIOGRAPHY

Alicia Raimondi received her undergraduate degree in Mathematics from the University of North Carolina Wilmington in 2008. She decided to pursue her interests in natural resource conservation in the Department of Forestry and Environmental Resources at North Carolina State University. During her time at NCSU, Alicia was an officer in the student chapter of the International Society of Tropical Foresters. She also spent 6 months studying at Universidade Federal de Viçosa in Brazil. In 2013, she earned her M.S. in Natural Resources.

ACKNOWLEDGMENTS

I would like to sincerely thank my advisor, Dr. Erin Sills for her guidance and never ending patience. Thank you for introducing me to a whole new world of possibilities and to the beautiful country of Brazil. I am thankful for the insights on tourism 'involvement' offered by Dr. Duarte Morais and the inclusion in his department's Research Circle. After almost 15 years working in the Tapajós National Forest, I am thankful for Dr. Tom Holmes' continued interest and support for my research. I'd also like to acknowledge all previous researchers, from whom I piggybacked my research on, specifically Dr. Simone Bauch.

I would be remiss if I forgot to thank Dr. Jackson Rego from UFOPA in Santarém, Pará Brazil. His kindness and generosity are second to none. To all my wonderful hosts in the Tapajós National Forest, I hope each of you enjoyed my company as much as I enjoyed yours. I am also grateful for the financial support provided by the Laarman International Gift Fund and FIPSE Ecosystem Services Grant.

Finally, I am especially thankful for all the support and encouragement from my wonderful family and friends. I appreciate your contribution.

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INTRODUCTION

As the global trend shifts from a North American or 'Western' model of protected areas, governments have created more multiple use and human-occupied protected areas such as national forests (Igoe, 2004). While national forests permit activities such as logging and resource extraction, they still restrict traditional activities such as agriculture. To offset the effects of these restrictions, various market-based policy tools have been developed, including promotion of ecotourism as an economic opportunity for local people. The International Ecotourism Society defines ecotourism as "responsible travel to natural areas that conserves the environment and improves the wellbeing of local people."

To understand the potential of ecotourism, it is critical to assess local involvement. The literature shows that there is a whole spectrum of local participation, ranging from exclusion to local ownership. While definitions of participation differ, local empowerment and control are consistently identified as important for successful ecotourism development (Scheyvens 1999; Wunder 2000; Tosun 1999).

This thesis discusses the supply side of ecotourism in the Tapajós National Forest (TNF) of the Brazilian Amazon, drawing on a household panel survey and participant observation (See Figure 1). I discuss measures of community and household involvement in tourism, determinants of participation, and impacts of that participation. The first section describes Brazil's protected area system, with a focus on tourism and the Tapajós National Forest. This is followed by the three main sections with findings on (1) government's role in tourism development (2) motivations for household participation and (3) impacts of

participation on local populations. Multivariate regression analyses are employed to model (1) the probability of participation as a function of socio-economic and behavioral explanatory variables, and (2) wellbeing and behavioral impacts of participation, controlling for and considering the effects of other variables that affect both participation and outcomes.

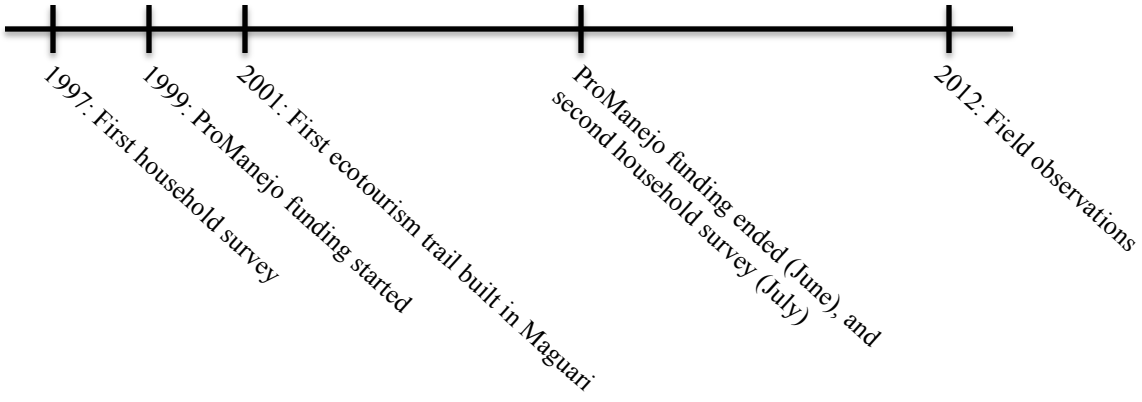

Figure 1 Timeline of research and tourism activities in the Tapajós National Forest

PROTECTED AREA MANAGEMENT IN BRAZIL

The Tapajós National Forest (referred to as FLONA do Tapajós or TNF in this thesis) is located in the Brazilian state of Pará along the eastern bank of the Tapajós River. The national forest was established in 1974 by the Brazilian government and encompasses approximately 600,000 hectares. Although human population had been recorded in this area as early as the 1800's, it was not until 1994 that legislation gave current residents the legal right to live within the national forest limits. These rights were further specified in the National System of Units of Conservation (SNUC), which was finally created in 2000 after many years of delay.

NATIONAL SYSTEM OF UNITS OF CONSERVATION (SNUC)

SNUC identifies two forms of protected areas: full protection and sustainable use (see Figure 2). Full protection areas are separated into 5 categories: 1) ecological stations, 2) biological reserves, 3) national parks, 4) national monuments, 5) wildlife refuges. Sustainable use areas are separated into 7 groups: 1) environmental protection areas, 2) areas of relevant ecological interest, 3) national forests, 4) extractive reserves, 5) fauna reserves, 6) sustainable development reserves, and 7) private reserves of natural heritage. National parks, which are protected for the primary purpose of preserving natural ecosystem, are often visited by national and international tourists. However, management plans for sustainable use areas may also permit visitation. National Forests (Flonas), like the Tapajós National Forest discussed in this thesis, are created for multiple sustainable uses of timber and non-timber

products as well as scientific research in predominantly native forests. Traditional populations are permitted to live within Flonas and tourists are permitted to visit under the conditions of the unit's management plan. Management plans must be approved by both representatives of the traditional resident population and by the government (state or federal, depending on the unit's governing agency).

The TNF is a sustainable use protected area, allowing communities to continue traditional practices of subsistence agriculture, fishing, and forest product extraction, in designated zones. The TNF Management Plan, developed by IBAMA in 2004, zoned the national forest into 4 use categories: 1) intensive, 2) semi-intensive, 3) semi-restricted, 4) restricted. Restrictions on forest use range across the zones from accepted timber exploration to zero human interference permitted (See Figure 5).

As of December 2010, protected areas (or "conservation units") in the Brazilian Amazon accounted for 2,197,485 km^2 (43.9%) of the region (see Table 2). Brazil classifies conservation units by level of protection (full protection or sustainable use) and authority (federal, state, or municipal). Sustainable Use Conservation Units encompass 62.2% of the area under protection. IMAZON/ISA (2011) cites three reasons for the proliferation of Sustainable Use Conservation Units: 1) economic options from resource use, 2) pressure from organizations concerned with local populations, and 3) government support of forest management for logging.

A large number of Conservation Units were designated during the first 3 years of the Amazon's Protected Areas Program (ARPA) from 2003 to 2006. Figure 3 and Table 3 show

cumulative area growth in protected areas by type and governing body through the years, with the largest number of protected areas added between 2003 and 2006. The ARPA program focused on creating and consolidating protected areas as well as investing in the financial sustainability of the Conservation Units.

From 1989 to 2007, the Brazilian Institute of the Environment and Renewable Natural Resources (IBAMA) was responsible for all environmental policies, including the management of conservation areas. In 2007, the Chico Mendes Institute for Biodiversity Conservation (ICMBio), a new governmental agency, was formed specifically to create, protect, manage, and enforce policies in all federal protected areas, including sustainable use areas and full protection areas. ICMBio is the governing agency that grants access to researchers and visitors alike. While managing tourism is not one of ICMBio's most central roles, the agency recognizes the importance of facilitating visitation for education and leisure by improving trails, building visitor centers, and promoting recreational activities.

In 2008, the federal government acknowledged tourism as a potential tool for achieving financial sustainability of conservation units. The Ministry of Environment and Ministry of Tourism created the Working Group for Fomenting Tourism with Environmental Sustainability. Its objectives are to evaluate and propose ideas for promoting sustainability in tourism development.

INTEGRATED CONSERVATION AND DEVELOPMENT PROJECT (ICDP)

The forest management project known as ProManejo was part of the PPG7 Pilot Program for the Protection of Tropical Forests. PPG7 was mainly financed by the World

Bank, United Kingdom (DFID), the German Organization for technical cooperation (GTZ), the Brazilian government, and the German development bank (KfW). The principal objective of ProManejo was to provide financial and technical support for sustainable forest management initiatives, including community-based microenterprises like ecotourism discussed in this thesis. The Amazon-wide activities started in July 1999 and finalized in June 2006. ProManejo consisted of four main components: 1) strategic studies, 2) promising initiatives, 3) monitoring and control of development, and 4) management of the Tapajós National Forest (TNF). The TNF component was intended to create a management model that would later be applied to other parts of the Amazon (IBAMA 2004). The TNF Management Plan includes six sub-components: Conservation Unit Management, Forest Research and Information, Protection of Natural Resources, Sustainable Management of Natural Resources, Community Development Incentives, and Public Use.

A previous study by Bauch (2010) in the Tapajós National Forest found that ProManejo's environmental goals of reducing agricultural land and cattle ranching were not furthered by community-based enterprises (including ecotourism). Participation in these enterprises did however increase household income, but not other indicators of wellbeing like counts of assets (Bauch, 2010).

STUDY AREA

Of the four populated areas inside the national forest, this study includes 19 communities in the riverine zone and one community in the forest zone. The forest community of Chibé split from the riverine community Tauari in 2000. Two other

communities included in the survey, Revolta and Santa Cruz, are located just outside of the TNF (see Figure 4), but are still affected by zoning restrictions on the use of the TNF. This study does not include private farms located along BR 163 on the eastern border of the forest or Aveiro municipality in the southwestern part of the forest (Cordeiro, 2004). In Figure 5, these populated areas are demarcated in pink.

Santarém is the largest city on the Amazon River between Belém and Manaus and is located at the mouth of the Tapajós River. The city's biggest tourist attraction is the beach town of Alter do Chão, located one hour southwest of Santarém along the Tapajós River. This laidback town is very popular for weekend getaways, especially during the dry season when the white sandy beaches are no longer below the water level. Bus transportation between Santarém and Alter do Chão is fairly regular and increases in frequency during peak times such as Carnival. In contrast, transportation from Santarém to some of the Flona communities is bi-weekly at best and not meant for touristic travel. All non-residents must have approval from ICMBio to enter the TNF by bus. However, tour groups that come by boat from Alter do Chão or Santarém are not subject to the same government checkpoint and can potentially evade the authorization process. Some tourism operators are based in Alter do Chão, and others in Santarém.

In 2004, the tourism infrastructure in the region was expanded to support the "Jungle Marathon," a seven-day, 100 or 200 km jungle run that begins within the TNF at Itapuama and continues to Alter do Chão. The annual Jungle Marathon brings hundreds of people to

the TNF. However, TNF residents have little interaction with the marathon runners, as they carry all their belongings on their back and race to the finish line.

Ecotourism

Tourism in the TNF began well before the ProManejo interventions (1999-2006). Tour guides (mostly from Santarém) would bring visitors to the rainforest, riverine beaches, and town centers of TNF. In exchange for showing tourists a household's land, guides would pay the household that they visited. Concerns about the distribution and use of that money eventually led most guides to shift to providing compensation to the community in the form of school supplies. Thus, households were already allowing outside tour guides to bring tourists to their lands in exchange for compensation to the community, long before they developed artisan stores, homestay capabilities, and visitor taxes.

With encouragement from ProManejo, each community formed as association sometime between 1999 and 2003. Local associations as of 2004 are listed below.

Table 1 Local associations involved in Pro-Manejo (IBAMA, 2004)

Name	***Community***	***Date Founded***
AMPRESDT	São Domingos	2000
ASCOMART	Maguari	1999
ASMORJA	Jamaraquá	1999
ASMOP	Pedreira	2001
ASCATIJÓS	Tauari	NA
ASCOPRATA	Prainha	2000
Association of Agriculturers of Itapuama	Itapuama	1999
Residents Association	Chibé	2003

Elected representatives from each community were tasked with conveying resident interests in regional and national forums. These same community representatives manage community visitor taxes (as of 2012, R$7/ USD$3.50 per visitor), schedule trail guides and homestay hosts on a rotating basis, as well as serving as the community contact with ICMBio. Tax revenues are supposed to be used for the betterment of the community, on items such as signs, community buildings, and trails.

In the beginning of ProManejo ecotourism development, residents helped to construct trails by clearing vegetation, creating handrails down steep declines, and building stairs to avoid soil erosion on steep inclines. Maguari was the first community to build an interpretive trail, identifying key native tree species. With the help of government, technical experts, and community members, trail construction started in September 2001. By December 2002, Maguari had an interpretative trail, central gazebo, trail map signs, and handcrafted wooden plaques (made by fellow TNF community Pini). As of 2007, six communities had developed hiking trails specifically for tourists (São Domingos, Maguari, Jamaraquá, Prainha, Paraíso, Itapuama). Trails often follow existing paths through the forest, passing by shifting agriculture plots and forest product extraction sites. Some hiking trails pass enormous old growth samaúma trees, while others reach viewpoints, caves, or lakes. Trail lengths range from 5.8km to 14.5km, passing through secondary and primary native forests. Other ecotourism activities possible in the TNF include canoeing, swimming, snorkeling, bird watching, and fishing.

Local guides have become mandatory for all forest treks, and they maintain the trails. Guides only speak Portuguese and vary in interpretative knowledge. Representatives are adamant that guides are called on rotation, but during my visit in February 2012, my guide was conveniently also my host and offered to guide me again the next day. Tourism operators agree that the guide rotation may be slightly skewed towards those providing the homestays.

Homestays are a fairly new concept in the TNF, starting after ProManejo funding ended. They are normally pre-arranged by ICMBio or through tourism agencies. Community representatives are contacted via their personal cell-phone and tourist arrangements are made. Thus, cell phones have made it possible to organize visits and verify that residents are able to receive visitors. Residents report that they started hosting visitors in their homes as early as 2006. Hosts provide 3 meals per day and unless invited, they eat after the tourists. Accommodations range from a 2-story open-air cabana overlooking the river to a resident's personal bedroom, and from modern bathrooms to outhouses. Depending on the family, residents share their traditions, foods, and culture with tourists. In my experience, the household that had the least prior experience with tourists shared the most local culture.

During my visit in February 2012, homestays included 3 homemade meals and a bed, at a cost of R$40 (USD $20) per person per day. A guided hike from the riverside community up to the primary forest cost R$40 (USD $20) per hike. Other activities can be arranged by tourism agencies, with variable prices, negotiated based on group size.

Visitation

In the thirteen years since ProManejo funded ecotourism projects began, many changes have occurred in the tourism flux, advertisement, and government policies, moving the TNF into a new "stage of tourism development" (Butler 1980). Based on Brazilian government immigration records, international tourism to the Amazonian states of Amazonas and Pará was stagnant during the period 1971-2005. Divino & McAleer (2009) forecasted (and confirmed with real data) an increase (10.4%) in international tourists between 2006 and 2007, implying a greater need for appropriate tourism development in the region. National policies, created in 2008 and 2009, promote sustainable ecotourism development and regulate tourism sector activities by focusing on socio-economic and environmental impacts (Divino & McAleer, 2009).

In February 2012, the government estimated 20,000 visitors, not including researchers, visited the TNF in 2011. Unfortunately, actual TNF visitation data is not available. In the 2006 household survey, residents were asked to report the number of tourists that visited their community in the TNF in the last year. The sum of the average number of tourists reported in each community was 302 people and the sum of the maximum number of tourists reported was 707. Even at the maximum number, this is a far below the government estimate of 20,000 visitors in 2011. The community representative from Jamaraquá estimated 148 visitors came to his community in January 2012 and of that 20-30 people per month stayed overnight. Extrapolating from his January tourism flux, I deduced that around 1776 tourists visited Jamaraquá in the last year. January is a school break month, but is also during

the region's rainy season and thus it should be an average tourism month. Some tourists do visit other areas of the TNF, including submerged forests and agriculture plantations along the road, and visitor numbers peak during the jungle marathon. However, it seems likely that 20,000 is an overestimate.

While there is currently minimal tourism in the TNF, tourism is growing according to interviewees and infrastructure development that I observed. There have been investments and promotion of the TNF by the government, tourism agencies, and travel media. The Tapajós National Forest is considered a pilot for ecotourism in sustainable use protected areas of the Amazon. Travel guidebooks tend to mention the TNF as an attraction near Santarém, but vary in descriptive and logistical details. The most recent edition of Lonely Planet provides details for self-reliant tourists as well as contacts for tourism agencies that organize tours to the TNF. The guidebook describes entrance permissions needed, applicable visitor taxes, and bus schedules (St. Regis et al., 2011). I used this information as a starting point for my own trip. However, international tourists with no Portuguese language skills would have a very difficult time arranging this trip themselves.

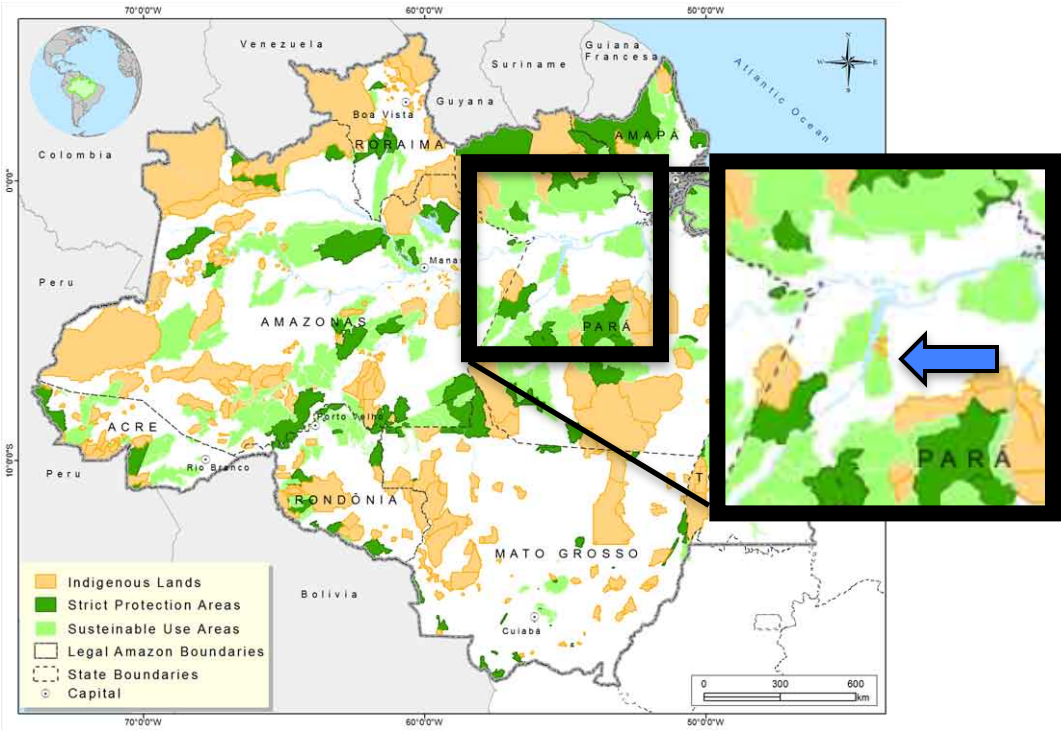

Figure 2 Protected Areas in the Brazilian Amazon (IMAZON/ISA 2010)

Table 2 Brazilian Amazon Conservation Units, Dec. 2010 (IMAZON/ISA 2011)

Category	Quantity	Official area * (km^2)	Area 2 ** (km^2)	% of the Area 2 in relation to the total Area of the Conservation Units	% of the Area 2 in relation to the total Area of the Amazon
Federal	**132**	**619,532**	**610,510**	**52.0**	**12.2**
Full Protection	**48**	**316,276**	**314,036**	**26.7**	**6.3**
ESEC	14	63,359	63,360	5.4	1.3
PARNA	24	215,808	213,567	18.2	4.3
REBIO	9	37,108	37,108	3.2	0.7
RESEC	1	1	1	0.0	0.0
Sustainable Use	**84**	**303,256**	**296,474**	**25.2**	**5.9**
APA	4	23,976	21,224	1.8	0.4
ARIE	3	209	209	0.0	0.0
FLONA	32	160,402	158,234	13.5	3.2
RDS	1	647	647	0.1	0.0
RESEX	44	118,022	116,160	9.9	2.3
State	**175**	**605,299**	**563,748**	**48.0**	**11.3**
Full Protection	**63**	**132,572**	**129,952**	**11.1**	**2.6**
ESEC	9	46,307	46,307	3.9	0.9
MONAT	2	324	324	0.0	0.0
PES	42	71,260	69,640	5.9	1.4
REBIO	5	12,578	12,578	1.1	0.3
RESEC	2	1,039	39	0.0	0.0
RVS	3	1,064	1,064	0.1	0.0
Sustainable Use	**112**	**472,727**	**433,796**	**36.9**	**8.7**
APA	39	195,472	160,593	13.7	3.2
ARIE	1	250	250	0.0	0.0
FLOTA	17	133,804	133,803	11.4	2.7
FLOREX	1	10,550	6,883	0.6	0.1
FLORSU	10	2,951	2,674	0.2	0.1
RDS	18	109,901	109,794	9.4	2.2
RESEX	26	19,799	19,799	1.7	0.4
Total in the Brazilian Amazon	**307**	**1,224,831**	**1,174,258**	**100.0**	**23.5**

* Area according to the legal instrument of creation, discounting the parts of the Conservation Units outside of the Brazilian Amazon.
** Area according to the legal instrument of creation, discounting the areas calculated by the SIG: The parts of the Conservation Units outside the Brazilian Amazon, the maritime areas of the Conservation Units, and the overlap among Conservation Units.

Full Protection: Ecological Station (ESEC), National Parks (PARNA), Biological Reserves (REBIO), Ecological Reservations (RESEC)
Sustainable Use: Environmental Protected Areas (APA), Areas of Relevant Ecological Interest (ARIE), National Forests (FLONA), Sustainable Development Reserves (RDS), Extractive Reserves (RESEX)

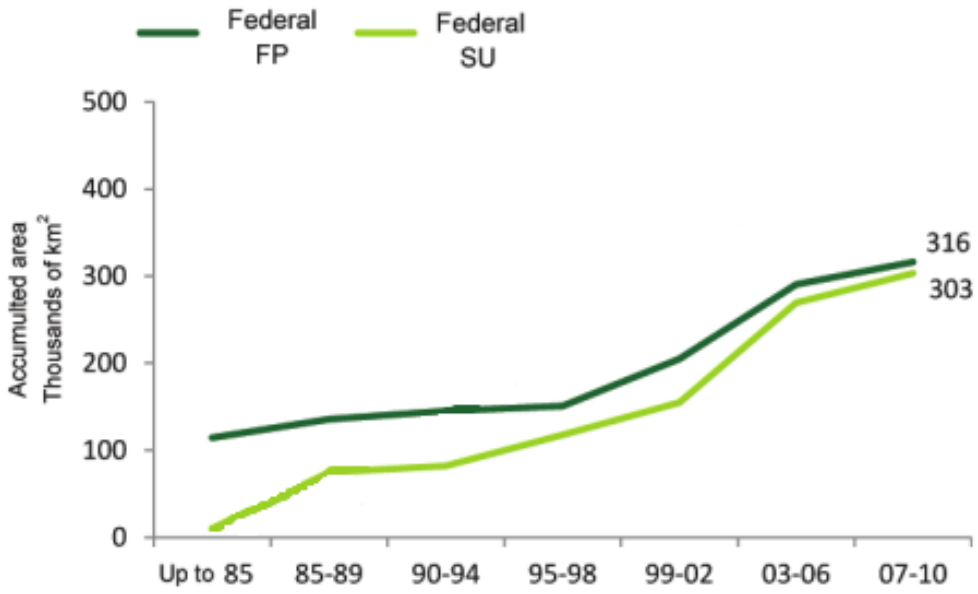

Figure 3 Growth of Conservation Units in Amazon (IMAZON/ISA 2011)

Full Protection (FP): Ecological Station (ESEC), National Parks (PARNA), Biological Reserves (REBIO), Ecological Reservations (RESEC)
Sustainable Use (SU): Environmental Protected Areas (APA), Areas of Relevant Ecological Interest (ARIE), National Forests (FLONA), Sustainable Development Reserves (RDS), Extractive Reserves (RESEX)

Table 3 Area of Conservation Units in Brazilian Amazon (IMAZON/ISA 2011)

Period	Conservation Units created				Total
	Federal		State		
	FP	SU	FP	SU	
Up to 03/15/1985	114,465	10,150	5,047	0	129,662
from 03/15/1985 to 03/15/1990	21,292	64,590	26,494	70,536	182,912
from 03/15/1990 to 12/31/1994	9,404	7,437	2,301	67,465	86,606
from 01/01/1995 to 12/31/1998	5,780	35,537	8,518	75,208	125,042
from 01/01/1999 to 12/31/2002	54,190	37,252	12,483	18,112	122,037
from 01/01/2003 to 12/31/2006	85,491	114,562	70,914	216,151	487,118
from 01/01/2007 to 30/06/2010	25,655	33,728	6,163	25,908	91,454
As of 2010	**316,276**	**303,256**	**131,919**	**473,379**	**1,224,830**

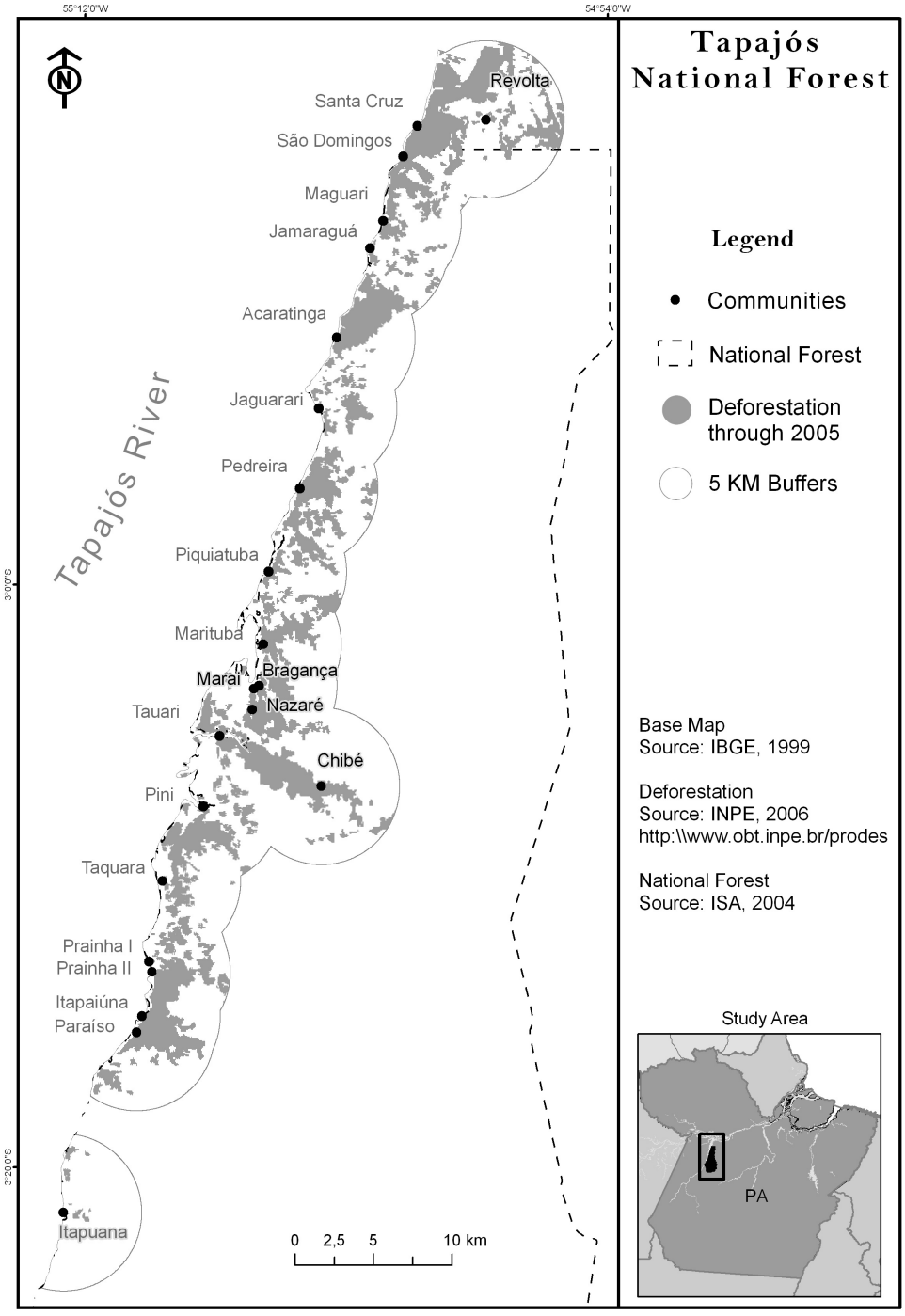

Figure 4 Map of Tapajós National Forest

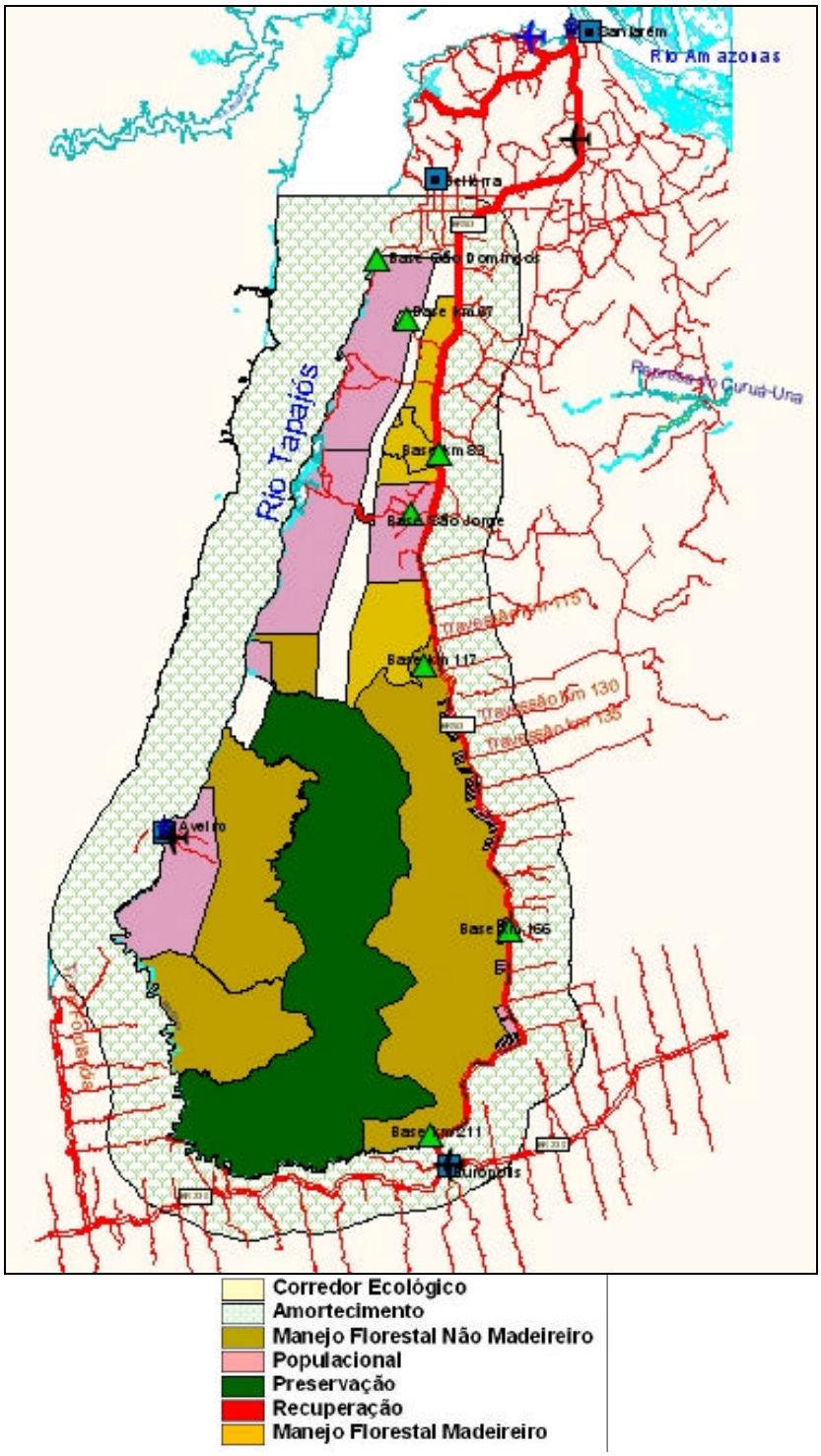

Figure 5 TNF Land Use Zoning (IBAMA 2004)

METHODS

DATA COLLECTION

This thesis is based on (i) a household panel survey conducted in 1997 and 2006, and (ii) semi-structured interviews with key informants and personal observations in 2012.

Household Panel Survey

The first wave of the panel survey was part of a U.S. Forest Service study of ecotourism and other sustainable development alternatives for the Tapajós National Forest. A random stratified sample of 320 households in 20 communities was surveyed in 1997 (Pattanayak & Sills 2001). In 2006, 355 households were interviewed, using a similar survey instrument (Weber, Sills, Bauch, & Pattanayak 2011; Bauch 2010). In both panel surveys, interviews were conducted by a group of hired and trained Brazilians at the interviewee's homestead. Interviewers sought to interview both one male and one female head of household. Full datasets from 2006 were used in the first chapter of this thesis to increase the sample size by 64% (139 households). All tables using full 2006 datasets are marked with n=355 in the table caption.

For purposes of comparison, this thesis uses responses from the 216 households that were interviewed in 1997 and again in 2006. The loss in households surveyed stemmed from relocation, availability, death, and unclear relationship ties. In the 2006 survey, 24% of households participated in tourism in 2006. In the households surveyed twice, 25% of households participated in tourism in 2006.

Semi-structured Interviews

In February 2012, I visited the Tapajós River region, including Santarém, Alter do Chão, and the National Forest, for two weeks and interviewed people from the tourism sector, government, non-governmental organizations, and communities. These were semi-structured interviews, following an interview guide with questions about the socio-economic and environmental impacts of ecotourism, tourism flow to the region, attractions at most popular local tourist sites, and types of household participation. I developed the interview guide to address questions that arose in preliminary analysis of the household survey data. I conducted the interviews in either Portuguese or English, depending on preferences of the respondent. Interviews were not recorded and respondents were informed that their responses were confidential. The Internal Review Board (IRB) at North Carolina State University approved the study (IRB#2480 from February 2012), including written consent forms and interview guides. Due to the relaxed and informal nature of the TNF residents, most of these interviews were conducted as conversations over multiple days and occasionally included family members of the interviewee.

Interview respondents were selected based on knowledge of tourism and availability during the two weeks that I was in the field. I visited three communities in the TNF that are known to have differing tourism flows: Maguari, Jamaraquá, and Acaratinga. Maguari has an artisan workshop and store that makes and sells products from locally extracted latex in both outside the park in Alter do Chão and within the park in Maguari. Jamaraqua is a popular spot for tourism agencies to bring their overnight guests, staying in an open-air cabana built

specifically for tourists. Acaratinga is Jamaraqua's neighbor but is separated by a poorly maintained dirt road and not a frequent host to visitors. These communities are in the northern part of the forest, accessible by bus from the port city of Santarém and by boat from Alter do Chão and Santarém. Interviews were conducted with elected representatives from Maguari, Jamaraquá, and Acaratinga. Representatives communicate with government, tourism operators, and NGOs on a regular basis. Community representatives are also responsible for handling ecotourism logistics, such as assigning mandatory local guides on a rotating basis and purchasing items for the community using fees collected from tourists. A majority of tourists visit the TNF through pre-arranged tours and arrive in communities by boat. Tour packages commonly include hikes in the forest, snorkeling in the streams, swimming in the river, wildlife viewing, and homestay and/or camping in the woods. I did not take an organized tour to visit the TNF; I arrived by bus. The buses are used for locals to buy or sell goods in the port city of Santarém as well as attend school in Belterra, a small town located just outside the national forest. It was clear that I was the only foreigner on the bus. In Maguarí, I stayed in the same place as a tourist would stay and visited the forest on a guided hike just as tourists would. I ate meals with my hosts, but only after insisting I not eat before the rest and alone at the table. In Acaratinga, I stayed with a host family that hosted researchers in the past and did not traditionally host tourists. This community also has a walking trail, but due to the rain we stayed in the center of the town. I helped prepare a home for the new teacher, met my host family's friends for coffee, visited their manioc shed, and watched novelas (Brazilian soap operas) before bed.

I selected interviewees in the tourism business, government, and NGOs based on recommendations from previous and current researchers in the area as well as government employees. Again, my sample was limited by availability of potential respondents in Santarém or Alter do Chão during the two weeks that I was in the field. In total, I conducted 10 interviews with 3 community representatives (president or vice-president), 5 tourism operators (varying levels of tourist interaction- guides, promoters, and salesmen), 1 government official (ICMBio), and 1 non-governmental organization.

Self Reflection

This research topic was primarily driven from my own interests in protected area tourism as a self-identified backpacker and ecotourist. Due to this bias, initial hypotheses and survey questions may reflect idealistic goals and expectations. In preparation for fieldwork, I studied Portuguese for one semester at NC State University and took a four-week intensive language course at the Universidade Federal de Viçosa in Brazil. Previous knowledge of the Spanish language and ecotourism locations in Central America was also helpful in preparation for my own fieldwork. I arrived in the Amazon in the days surrounding Carnival, a popular holiday that is often celebrated for 4-7 days. Due to the popularity of travel during this time, transportation and communication with prospective respondents was often delayed. My trip to the TNF was part research, part tourism. I participated in all tourism activities and questioned residents on an ongoing basis. Field notes were taken in a notebook during interviews but many observations and informal conversations were recorded in my notebook

at the end of every night. I shared stories about my family and listened to stories of theirs. I tried all foods prepared by my hosts, including beef, which I rarely eat.

STATISTICAL ANALYSIS

Based on literature review and interviews with key informants, I developed several alternative definitions of "participation in tourism" and hypotheses about its determinants and impacts. To test these hypotheses, I estimate multiple regression models, evaluating them by considering both their explanatory power (adjusted R^2 or pseudo R^2) and the statistical significance (α = 1, 5, and 10%) of coefficients. The names, definitions, and descriptive statistics of all dependent and explanatory variables included in models estimated for this thesis are provided in Table 26. Below, I briefly describe how I defined participation in tourism, relationship with the forest, attitudes towards tourism, and wellbeing, with more details provided in the relevant sections of the thesis.

Community Participation in Tourism

Due to the small sample size (<10 households) of some communities, statistical analyses of differences between communities were not viable. Instead, I created 3 participation groupings based on responses to tourism operator suggestions (high and low), government identified ecotourism communities (advertised or not advertised), and self-identified in community meetings (ProManejo ecotourism project or no ecotourism project). It is important to note that discrepancies exist between households claiming to participate in ecotourism development and government acknowledged communities. More detail is provided in the next section. Dummy variables were created for community groupings.

Community participation was modeled as a result of population in 2006, proximity to main city, and percent of deforestation in 2005. A previous study by Bauch (2010) provided population data (See Table 25). The proximity variable was created by numbering communities based on their distance to the main city of Santarém, furthest (20) to closest (1). Percent deforestation, measured within 5km of a community center, was estimated by IMAZON, based on Landsat images (INPE, 2011). These variables were used in multiple logistic regression models to test the likelihood of government advertisement.

To better understand the government-community relationship, likelihood of government endorsement in advertisement was modeled as a result of community participation variables (population, proximity, and percent deforestation) as well as percent of empowered households and tourist visitation. Percent of empowered households was created by adding the number of households who participated in formal ecotourism development meetings and divided by the number of households surveyed in the community. Tourist visitation was similarly created by dividing the number of households who saw tourists in the last year by the number of households surveyed in the community. Government promotion of ecotourism communities was used in multiple logistic regression models to control for outside influences on selection of community to visit.

Household Participation in Tourism

Household level participation was deconstructed by temporal participation in tourism.

- Participation in 1997
- Participation in the 9 years between surveys

- Participation in 2006

Participation in 1997: I created 2 definitions of participation in 1997. Two forms of direct participation have been identified as: selling of goods and provision of services. The third form of participation I considered was the tourist visitation to a family's property (manioc shed or agriculture fields). Tour guides who operated in the 1990's told me they would, with the permission of the communities, visits the forests where many agriculture fields were.

Participation in the past 9 years: Survey questions from the 2006 questionnaire revealed tourism participation for the past 9 years, as it pertains to a formal ecotourism development project or participation as a forest guide. The survey did not provide data on the sale of goods or provision of other services to tourists in the 9-year period.

Participation in 2006: This variable takes into account stated current participation in ecotourism development and forest guides. Also embedded in this variable is the direct participation (selling goods/ providing services) reported in the last year (2006). 12 of the 216 (5.6%) households did not report participation in the past 9 years, but did participate in the last year/ currently. These households participated in 2006 via selling goods/ providing services outside of the formal avenues that directly asked about participation in the past 9 years (ecotourism development and forest guide).

T-tests and chi-square tests were employed to find differences between participating and nonparticipating households. In chi-square tests, Cramer's V was used to report the strength of that association. Cramer's V values are on a scale of -1 to 1, -1 indicating a strong

negative association, 0 indicating a weak association, and 1 indicating a strong positive association.

Variables Considered

Behavioral and wellbeing variables from 1997 were used to predict participation between 1997 and 2006 (Table 27) as well as 2006 participation in tourism (See Table 28). Participation in the last 9 years was used as an explanatory variable for changes in behavior, attitudes, and wellbeing proxies defined below.

Attitudes

I tested 6 variables to represent a household's attitude toward tourism (See Table 26). Questions were posed about family situation or community situation changes within the last year and then since tourism came to the community. The question of change in the last 9 years was asked at the end of the survey after multiple development projects were discussed. Responses were coded 1(better) or 0 (same or worse). Satisfaction in life was coded 1-5 (very satisfied – very dissatisfied). The final question posed, asked if households wanted more tourism in the future (yes/ no).

Forest Relationship

I created and tested different variables to represent a household's relationship with the forest in 1997 and 2006. First, counts of non-timber forest products (NTFP) collected, used, and sold (0-11 NTFPs). NTFPs include various resins and seeds to make traditional oils. Second proxy used is andiroba seed/ oil collection, use, and production of goods (yes or no).

Andiroba oil is an important traditional medicinal oil made from seeds of native trees. The seeds are boiled and squeezed in a wood press to extract the yellow oil. The oil is applied topically to heal wounds, reduce pain, and repel insects. Third, counts of staple crops (manioc, beans, rice, and corn) planted, consumed, sold, and purchased (0-4 crops) as well as quantity per capita (in kilograms). Fourth, harvest frequency of fruit (acai and bacaba) and building/ handicraft materials (straw and timber). The frequency of harvest is a scale of 1-5, weekly (1) to never (5). Lastly, the number of trips a household went to the forest to collect NTFPs. This variable was only available in the 1997 questionnaire.

Wellbeing

To measure wellbeing, I employ various measures of household wealth. Ownership of assets is a commonly used indicator of wealth (Vyas 2006). I employ the first principal component of household asset ownership as created by Bauch (2010). The underlying data are reports of assets owned by and functioning in households in 2006 and 1997. The first principal component was calculated to maximize the variance of the linear combination of household assets across both years. Using the weights for the first principal component, Bauch (2010) created an index of household asset wealth for 1997 and 2006 as well as an index of change computed by taking the difference of the two years. A low score indicates low socio-economic status and a high score indicates high socio-economic status (Vyas 2006). Variable descriptions and a list of assets included in the statistical analysis can be found in Table 35.

Second, I consider house quality in 1997 and 2006: best quality versus poor quality. House materials were ranked based on their costs and were confirmed desirable or undesirable by community members. Building materials were ranked in order of desirability/ cost for floors (cement, wood, or dirt), walls (cement, wood, thatch, mud, or combinations of each), and roofs (tile, wood, tin, or thatch). Respondents, during the 2006 interviews, remarked that the most desirable combination of building materials are cement floors, cement walls, and tile roofs. Best house quality was defined as using 2 or more of the 3 best building materials.

Third, I consider size of agriculture plots and all land ownership. Land ownership in 1997 and 2006 were the final proxies of household wellbeing. Households responded yes or no to ownership of agriculture, agroforestry, pasture, and rubber plots.

Change Analysis

Subtracting a household's response in 2006 by a household's response in 1997 created change variables. Applicable variables were condensed to three levels, indicating a decrease (-1), maintenance (0), or increase (1) of behavior, attitude, or wellbeing. Large count variables, with normal distribution, were treated as continuous variables and not condensed.

ROLE OF GOVERNMENT IN COMMUNITY PARTICIPATION

What is community participation and how is the government involved? Community participation is often defined as a community simply receiving tourists, but many researchers consider communities to be participating only if they are working with the government to plan and manage tourism (Tosun 1999; Mitchell & Reid 2001). This is commonly referred to as community-based tourism (CBT). As Tosun (2005) explains, there are typically 3 stages to community participation in the tourism development process. Firstly, external and/or internal entities pressure a central government or local elite to develop participatory planning strategies. Secondly, action through law or regulation is taken at the central government level. Finally, local bodies of government restructure to include participatory development. In many cases, outside agents with technical expertise and financial capital, such as governments, NGOs, and international donor agencies, develop management plans, bring their plans to communities as a courtesy, and call it community-based tourism management. This form of CBT is often criticized for a lack of genuine local participation.

Tosun (1999) posits three types of community participation in tourism planning: coerced, induced, and spontaneous. Both coerced and induced participation are mostly top-down approaches that indirectly involve communities, while spontaneous participation involves authentic, direct participation starting in the community. This is an idealistic and rare form of participation. However, Mitchell & Reid (2001) found a unique island community in Peru that displayed elements of Tosun's (1999) spontaneous local participation through their initiation, management, and ownership of tourism businesses in the 1970s.

Access to the island was limited by a locally-owned and community-sanctioned monopoly on transportation services up until the 90s when the Peruvian national government enacted anti-monopoly policies. Mitchell & Reid (2001) characterized the 20-year period of tourism development while the monopoly was in place as having a highly integrated tourism economy and a strong, all-encompassing civil society. As the outside tourism sector began to grow on Taquile Island, residents noted that community control over tourism development began to decline. This example illustrates common concerns about how government and the commercial tourism sector influence community participation.

Looking at how the tourism sector influences community participation, Wunder (2000) defines participation in relation to large tourism agencies: wage employment, semi-autonomous, and autonomous. In his study of villages in the Ecuadorian Amazon, one village entered into an agreement with a tourist agency for exclusive forest access and restricted hunting in exchange for employment as well as health and education services. Residents signed a letter of agreement with the tourism agency but they have no control over tourism development. This type of 'paternalistic' tourism operation closely resembles elements of Tosun's (1999) coerced and induced participation, although in this case, the initial agreement was made willingly by the village. Again, community participation may be best understood as a continuous spectrum of control over tourism development in various arrangements with outside agents including government and tourism operators. As Mitchell & Reid (2001) and Scheyvens (1999) stress, resident empowerment in tourism development, measured by the

degree of power in decision making, is crucial for influencing decisions that are otherwise typically made by a select few, such as tourism agency staff.

Socio-political theory has also been applied to understand the role of government in tourism. Seaton (1997) suggests that relative deprivation theory explains the effects of tourism on resident behaviors and attitudes in socialist Cuba. Relative deprivation is a resident's perception of deprivation in comparison to tourists, which can be transmitted through, created, or produced by tourism. Theory suggests that government-controlled tourism induces less relative deprivation than commercial tourism in highly non-egalitarian societies, but it could perpetuate political hostility, the state rather than the commercial tourism industry is blamed for perceived deficiencies. Seaton (1997) found that both hostility towards and emulation of tourists is less common in socialist societies or in government-controlled tourism, because residents blame government for their relative deprivation and lack of potential for individual advancement.

In summary, the literature suggests that control of tourism development is important in defining government, tourism industry, and community relationships (Tosun 1999, 2005; Mitchell & Reid 2001; Wunder 2000). Limited local control over planning and management, more common in socialist and egalitarian societies, can foster feelings of political hostility, leading local people to blame the state rather than the tourism industry for their relative deprivation (Seaton 1997).

DEFINING PARTICIPATION

I have identified three forms of community participation: government-identified participant communities (from 2007 advertisement), self-identified participant communities (from 2006 surveys), and tourism agency preferred communities (from 2012 interview). Each of these classifications may help to explain different elements of tourism development in the TNF. Government-identified communities are selections based on relationships between the government and local communities. Self-identified communities are in part dependent upon government relationships, due to funding sources, but may also shed some light on perceptions of 'participation' by residents. Finally, tourism agencies in the TNF have a great deal of power in directing tourists to their preferred communities. These three classifications have been broken down in Table 4.

Table 4 Participation in Ecotourism Development Projects (n=355)

Community	Government-identified as Ecotourism Community[1]	Self-identified as Ecotourism Community[2]	Tourism Agency Preference of Ecotourism Community[3]
Itapuama (1)	Yes	Yes	
Paraíso (2)	Yes	Yes	
Itapaíuna (3)			
Prainha II (4)			
Prainha I (5)	Yes	Yes	
Taquara (6)			
Pini (7)	Yes	Yes	
Chibé (8)		N/A	
Tauarí (9)	Yes	Yes	
Nazaré (10)			

[1] Government identified ecotourism communities in 2007 brochure.
[2] Community representatives identified ecotourism projects at community meeting.
[3] 2012 interviews uncovered tourism agency preferences based on infrastructure and proximity to main cities.

Table 4 Continued

Marai (11)			
Bragança (12)			
Marituba (13)			
Piquiatuba (14)			
Pedreira (15)			
Jaguararí (16)			
Acaratinga (17)	Yes	N/A	
Jamaraquá (18)	Yes	Yes	Yes
Maguarí (19)	Yes	Yes	Yes
São Domingos (20)	Yes		Yes

The first community participation definition was defined as communities advertised in a 2007 government printed ecotourism brochure. The brochure included descriptions of physical attractions and cultural festivities. During my follow-up interviews in 2012, the government representative regarded these 9 communities as participating ecotourism communities.

The second measure of community participation was realized in 2006 community meetings with key informants. Seven communities in the TNF (Itapuama, Paraíso, Prainha I, Pini, Tauarí, Jamaraquá, and Maguarí) indicated that they were involved in ecotourism development projects within the last 9 years. Acaratinga and Chibé did not host community meetings with researchers to discuss ecotourism development in the community, so these communities were removed from analysis. Only Prainha I and Jamaraquá indicated continued participation in ecotourism development in 2006. Perhaps the ambiguity of the question, first asking about funded projects and then asking about continued involvement a few months after funding concluded, confused respondents. When asked which project the community

would most like to implement or maintain, only Maguarí expressed interest in ecotourism development. However, the community also said that selecting one project among all that were implemented was too difficult because the community was so large and diverse. It is interesting to note that during my visit to the TNF, tourism agencies bring visitors to the Maguarí forest. Residents and agents say they have the best forest of large old growth trees amongst the most trafficked communities (São Domingos, Maguarí, and Jamaraquá). Maguarí also has an eco-leather shop where residents sell items such as purses, shoes, notebooks, etc. made from latex extracted from TNF rubber trees. This product has been very successful for Maguarí community members. Production currently involves 18 local families, while items are being sold locally as well as regionally in Alter do Chão's artisan market.

The final definition of community participation considered was developed by the tourism industry. Tourism agencies suggest a high and low visitation grouping, admittedly heavily driven by travel distance to Santarém. One tourism agency also said they brought tourists to the highly visited communities due to tourist amenities and attractions available, such as tourist-specific guesthouses and large samaúma trees in the primary forest.

While performing chi-square analysis between household-level data and community-level data may misrepresent the community sample size, a connection between past participant households and community participation was found significant in government-identified, self-identified, and tourism agency-identified ecotourism communities. This relationship suggests that participating households are (1) residing in participant communities

and (2) are acknowledged by local government and tourism agencies that promote tourism nationally and internationally.

Table 5 Past Participation and Community Participation

Ecotourism Participation During ProManejo		Government-Identified Ecotourism Community (n=201, chi-sq= 0.006)		Self-Identified Ecotourism Community (n=194, chi-sq = 0.003)		Tourism Agency Suggested Grouping (n=201, chi-sq = 0.085)	
		No	**Yes**	**No**	**Yes**	**Little/ No Tourism**	**Developed Ecotourism**
	No	82	69	95	52	118	33
	Yes	16	34	19	28	33	17
	TOTAL	98	103	114	80	151	50

The household questionnaire, community questionnaire, and government brochures/reports introduce conflicting perceptions of projects funded through ProManejo and in turn community participation. Inadvertently, this raises many questions on resident perceptions of ecotourism projects and ProManejo in general.

Hypothesis

The objective was to test the hypothesis: Communities who are larger, more accessible, and with larger forests are more likely to participate in ecotourism. The theory is that larger, more proximal communities have more to offer tourists given their advanced phase of development (Morais et al. 2006), and communities with larger forests will be more attractive to tourists (Wunder 2000). Multivariate models were constructed to test for likelihood of community participation as identified by the government, local communities,

and tourism agencies, using explanatory variables such as: number of households, distance to the port city Santarém, and percent deforestation within 5km of each community center.

Multivariate models that estimated community participation were not significant for government-identified communities or self-identified communities. Due to small sample sizes, estimating a model of tourist agency preferred communities was not possible. However, in t-tests we find that proximity to the main city is significantly less for non-ecotourism communities than ecotourism communities (See Table 6). Tourist agencies admittedly visited communities more proximal to the main city due to high fuel costs and tourist-specific overnight accommodations available.

Table 6 Explanatory Variables for Community Participation

		Non-Ecotourism Community			Ecotourism Community				
Variable (2006)	Type[1]	N	Mean	Std Dev	N	Mean	Std Dev	T-value	Sign
Population	G	11	31.6	14	9	30.0	17.8	0.23	
	C	11	32	14	7	28	19	0.51	
	T	17	29.4	14.5	3	39.3	21.1	-1.03	
Distance	G	11	10.8	4.4	9	10.1	7.6	0.26	
	C	11	9.7	5.2	7	12	7.2	-0.87	
	T	17	12	5.0	3	2.0	1.0	3.35	***
% Deforestation	G	11	33.2	6.1	9	32.5	12.6	0.16	
	C	11	36	6.0	7	30	13	1.22	
	T	17	31.9	2.7	3	38.5	8.3	-1.13	

ADVERTISEMENT AND PARTICIPATION

In this section, we are discussing the role of government in community participation. The Brazilian government and ProManejo investors have played a large role in ecotourism

[1] Government-identified Communities (G), Self-identified Communities (C), Tourism Agency Identified (T)

development in the TNF and it is important to understand this relationship. The project has built trails, trained guides, and promoted tourism. Promotional mediums such as websites and brochures were developed by outside agents. Local communities do not have access to the tourism market outside of their contacts with the national government (IBAMA/ ICMBio) and tourism industry (travel books and tourism agencies). The government representative I spoke with suggested that in the future, communities could potentially use the Internet to accept or reject accommodation requests, allowing locals to communicate directly with tourists.

Hypothesis

The objective was to test the hypothesis: Government is more likely to promote tourism in communities that are larger, more accessible, large amount of forest to show visitors, already receive tourists, and are involved in the ProManejo project. Multivariate models were constructed to test for likelihood of government promotion, using explanatory variables such as: number of households, distance to the port city Santarém, percent of deforestation within 5km of community, percent of households in each community that saw tourists in the last year, and percent of empowered households, defined as involvement in ProManejo ecotourism development project, in each community.

Again using the brochure as a measure of government involvement in tourism development, we created a model to estimate the impact select variables had on the likelihood of community inclusion in the brochure. The model was significant, however only resident tourist sighting was significant within the model. This model suggests that inclusion

in the government brochure is most dependent upon current tourism flux. Communities already receiving tourists, with assumedly basic tourist infrastructure and familiarity with tourist market, are most likely to be promoted by the government for their eco attractions. See Table 7 for model estimates. It is important to note that due to missing information at the community level, only 17 of the 20 communities residing within the TNF were included in the model estimation.

Table 7 Logit Model Estimate for Government Endorsement
(*** significant at 1%; ** significant at 5%; * significant at 10%)

	Government Endorsed Ecotourism Community (n=17, pseudo R^2 = 0.57)			
Parameter	**Est.**	**Std Err**	**Chi-Sq**	**P-val**
Intercept	-5.83	7.75	0.56	
Population in 2006	-0.09	0.12	0.64	
Distance to Santarém	-0.05	0.22	0.06	
% Deforestation in 5km buffer	0.05	0.14	0.15	
% Households that saw tourists in last year	10.9	6.36	2.92	*
% Households empowered by involvement	5.79	6.84	0.72	

Bivariate t-tests were also performed to test the variable means between ecotourism communities and non-ecotourism communities (See Table 8). In this case, the greater proportion of empowered households surveyed in each community (arguably stronger relationship to government) and the greater proportion of households that reported tourists in the last year were significantly more likely to be included in the ecotourism brochure than not. It is interesting to note that the more exogenous variables, such as population, distance, and percent of land deforested, were not significantly different between ecotourism and non-ecotourism communities. This suggests that the government selected communities based on

its current relationship to tourism and/or participation in tourism development, seemingly promoting the appropriate communities.

Table 8 Explanatory Variables for Government Endorsement
(*** significant at 1%; ** significant at 5%; * significant at 10%)

	Non-Ecotourism Community			Ecotourism Community				
Variable (2006)	N	Mean	Std Dev	N	Mean	Std Dev	T-value	Significant
Population	11	31.6	14.0	9	30.0	17.8	0.23	
Distance	11	10.8	4.4	9	10.1	7.6	0.26	
% Deforestation	11	33.2	6.1	9	32.5	12.6	0.16	
% Seen Tourist	8	0.40	0.23	9	0.75	0.16	-3.7	***
% Empowered	8	0.09	0.12	9	0.34	0.24	-2.8	**

This chapter has explored the concept of community participation, defined in the literature as a community simply receiving tourists to local control over management decisions. For the most part, the TNF case study did not find distance to the main city, percent forest cover, or population significantly different in ecotourism and non-ecotourism communities. Tourist agencies identified community participation by the level of tourists they receive, which as you can imagine is (1) largely a product of their selection or guidance and (2) driven by travel costs. More proximal communities are easier and cheaper to get to, helping to explain the significant difference in distance in tourist agency identified ecotourism communities compared to non-ecotourism communities.

For the future, I believe actual visitation data would be interesting to test as a continuous variable predicting the likelihood of community participation. Unfortunately, there is no mechanism currently in place to keep track of visitation.

HOUSEHOLD PARTICIPATION IN TOURISM

A substantial portion of the ecotourism literature describes household attitudes towards tourism development (Harrill 2004), but there has been less research on which households choose, or have the ability, to participate in ecotourism (Stronza 2001). In order to assess this, researchers first have to define what it means for a household to participate in tourism.

Many researchers describe participation in terms of level of resident participation (Liu et al. 2012, Van Schaardenburgh 2002, Hunt 2009, Stronza 2005). Liu et al. (2012) defines participation as having at least one member directly working in tourism operations, but notes that non-participating households may also receive indirect benefits from tourism. Van Schaardenburgh (2002) argues entrepreneurship and direct/ indirect employment in tourism industry as ways in which locals participate in tourism. Hunt (2009) and Stronza (2005) categorize participation in eco-lodges as (a) direct employment, (b) indirect employment, and (c) local resident. Hosting visitors, providing guide or transportation services, wage employment, and selling goods are common forms of direct and indirect employment for households living within or near protected areas (Gurung 2011; Bascomb 2008; Belsky 1999; Almeyda 2010a; Stronza 2005; Hunt 2009). Participation in tourism is generally considered a supplement income in addition to other livelihoods (Salafsky 2001; Wunder 2000).

Regardless of how we define participation, the determinants of household participation generally vary based on stage of development. Butler (1980) proposed the

"Tourism Life Cycle" as a description of the stages of tourism development: exploration, involvement, development, consolidation, stagnation, decline/ rejuvenation (Butler 1980). By separating the literature into Butler's (1980) framework, our goal is to better understand the relationship between stage of development and the participation decision. To group case studies into these stages, I used the indicators listed in Table 24. I reviewed a wide range of literature on tourism to better appreciate current themes and understandings. However, I focused on studies of tourism in lesser-developed nations with a bias towards cases where residents live within or near protected areas. Tourism has only been incorporated into protected area management plans in the recent years. Therefore cases in the more advanced stages of development (stagnation, decline, and rejuvenation) were not encountered.

As the name indicates, the *exploratory* phase of tourism development is the earliest stage, characterized by minimal and/or irregular tourist visitation (Butler 1980) and anxieties about development (Bascomb 2008; Gurung & Seeland 2011). Bascomb (2008) reported that deterrents to involvement in tourism in Guatemala included lack of forest, lack of language skills, and fears about children's safety. Gurung (2001) studied trekking tourism in Nepal, reporting fears of greed and disease as deterrents to tourism development. In the earliest stage of the Tourism Life Cycle as defined by Butler (1980), local populations are naturally skeptical of development due in some part to their limited knowledge of the industry (Bascomb 2008; Gurung & Seeland 2011).

The *involvement* stage of Butler's (1980) Tourism Life Cycle is characterized by (i) the existence of tourist facilities and transportation, (ii) some advertisement, and (iii) defined

tourist season. Studies suggest that gender relationships, close proximity to community center, and appropriate capital (both natural and physical) are clear explanatory variables for participation in tourism (Swain 1989; Stronza 2005; Hernandez et al. 2005; Almeyda 2010a; Almeyda 2010b; Gurung & Seeland 2011). Hernandez et al. (2005) found that Escudo Jaguar, a 'community' ecotourism development organization in the involvement stage, systematically excluded residents who owned less than 50 hectares of land in Mexico. Participant households residing in a remote trekking village of Bhutan were owners of pack animals, important physical capital to provide needed porter-pony services (Gurung & Seeland 2011). In Mexico, participation in decision-making requires natural capital (Hernandez et al 2005) while physical capital is required to provide tourist services (Gurung & Seeland 2011). While each author took a different approach in his and her definition of participation, capital is required for participation in the second stage of development.

As the Kuna Yala of Panama became more in charge of tourism development characterized by the involvement stage, gender roles modernized allowing women to participate in leadership positions, traditionally held by males (Swain 1989). In Peru, Stronza (2005) defined participation by direct employment an ecotourism lodge, but found that few women participate. She attributes the limited participation to distance to the eco-lodge and gender-based household responsibilities (Stronza 2005).

As a tourist destination approaches the *development* phase in Butler's (1980) Tourist Life Cycle, gender roles continue to evolve (Stronza 2005; Almeyda 2010a, 2010b). Studies in Costa Rica of two privately owned eco-lodges found similar characteristics among

employees (Almeyda 2010a, 2010b). Almeyda (2010b) found that younger, newer residents, both male and female, are more likely to be employed at the Punta Islita eco-lodge compared to their neighbors. Almeyda (2010a) used the same methodology to study the residents near the Lapas Rios Eco-lodge on the less touristy Osa Penninsula, Costa Rica. Here younger females or newer male residents were more likely to be employed at the eco-lodge than their neighbors. Lodge employees with direct customer contact lived on the peninsula for fewer years than employees with no customer contact (Almeyda 2010a).

Also in the development stage, a study in China's Wolong Nature Reserve found that participating households are more likely to have higher income, larger number of laborers, higher levels of education, closer proximity to tourism attractions, and kinship relationship with community leaders. However, percentage of non-agriculture income was not a significant predictor of tourism participation in the development stage (Liu et al. 2012).

In the *consolidation* stage, the literature suggests that gender specific participation roles, motivated newcomers, and greater capital are explanatory variables for participation in tourism (Belsky 1999; Van Schaardenburgh 2002). In Belize's Gales Point Village, Belsky (1999) finds gender specific forms of participation, where women are largely involved as B&B operators while the men participate as tour guides. In Cahuita, Costa Rica, Van Schaardenburgh (2002) postures that tourism development is initiated by foreigners and is dependent on young, educated locals and foreigners. Older Cahuitan residents and indigenous populations are resentful of tourism development and see it as a threat to their way of life (Van Schaardenburgh 2002).

As in the development stage (Liu et al. 2012), participant households in the consolidation phase are more likely to be well off (Belsky 1999). Belsky (1999) finds that ecotourism guides must own a fully fueled boat and life jackets while B&B operators require a furnished extra bedroom. Due to the high costs of entering the ecotourism market, the option was not viable for poor households. As tourism to Gales Point Village started to consolidate due to many outside factors, the market reinvented itself. But again, it was the households with greater capital that were able to participate (Belsky 1999).

Tourism destinations in Butler's (1980) earliest stage of development are characterized by anxiety and unfamiliarity with the tourism industry (Bascomb 2008; Gurung & Seeland 2011). Studies in the involvement, development, and consolidation stages suggest complementary participation between men and women in a household (Stronza 2005; Belsky 1999) and greater measures of wealth (natural, physical, and financial). In the development and consolidation stages we see that higher educated, younger and/or newer residents are more likely to become involved in tourism (Liu et al. 2012; Almeyda 2010a, 2010b; Van Schaardenburgh 2002).

Ecotourism is commonly thought of as an economic incentive for rural communities and households to change their use of natural resources, including land uses that require deforestation. However, participation in ecotourism may also help explain land use choices. Thus, in order to assess the impacts of ecotourism, it is important to understand the participation decision. Forms of tourism participation include: attending tourism

development meetings, selling goods, guiding and transportation services, as well as hosting tourists.

CASE STUDY

Originally, ecotourism development was not an organized affair until community projects were developed during the period of ProManejo funding from 1999 to 2006. Since development, differences between community ecotourism growths have increased. Butler (1980) explains the idea of a Tourist Area Cycle of Evolution in 6 developmental steps: exploratory, involvement, development, consolidation, stagnation and rejuvenation or decline (See Figure 6 below).

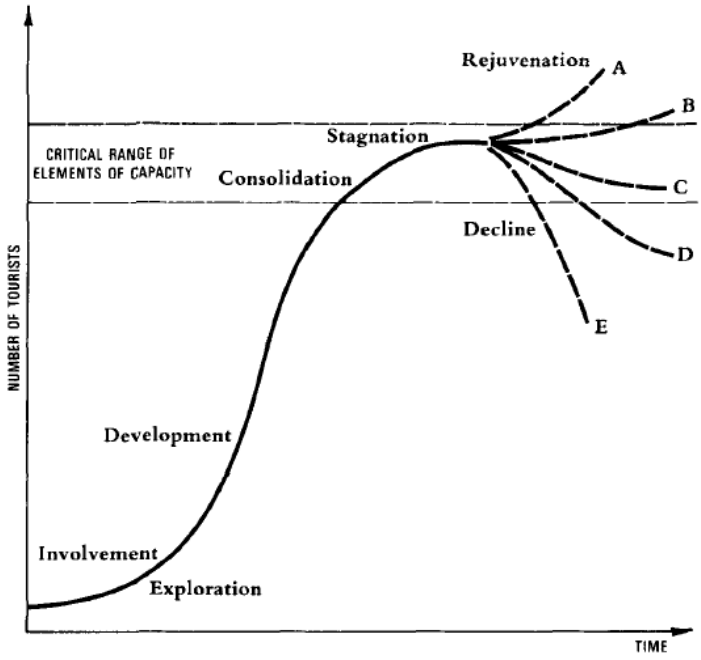

Figure 6 Tourism Area Cycle of Evolution (Butler 1980)

Using indicators of Butler's (1980) Tourism Area Cycle (see Table 24), TNF tourism in 1997 was in the exploratory stage, characterized by small numbers of tourists (60% of households reported zero or one tourist visit to their community in the last year), no tourist-specific facilities, and few socioeconomic benefits attributed to tourism (low tourism income). In 2006, most communities were still in the exploratory phases, however Jamaraquá and Maguarí received regular weekly tourism. Fast track 15 years later to 2012 and I would argue the same communities have entered the involvement state. In the years proceeding ProManejo, handicraft stores and guesthouses were built to accommodate tourists. Tourist travel coordinated by government and tourism agencies that are also advertising the TNF. Unfortunately, I did not visit all the communities to make these observations but I was able to visit 2 communities (Jamaraquá and Maguarí) in the Involvement stage and 1 community (Acaratinga) still in the exploration stage.

Visitation

Community visitation preceding the 2006 survey was not consistently reported by respondents. The range in responses can be attributed to proximity to tourism related areas, like the community center, river, or ecotourism trail. The majority of communities reported one tourist visit in the past year. You'll notice that in 2006, Maguari and Jamaraqua were the most visited, followed by other communities that were selected to appear in the government brochure.

Table 9 Average Frequency of Tourist Visits Last Year (n=355)

Community[1]	# Obs.	Mean[2] Last Year	Std. Dev.	Median
Itapuama (1)	5	16.8	2.68	18
Paraíso (2)	6	2.83	4.49	1
Itapaíuna (3)	22	6.18	8.27	1
Prainha II (4)	15	6.47	8.45	1
Prainha I (5)	11	6.45	8.14	1
Taquara (6)	12	7.75	9.06	1
Pini (7)	17	11.47	8.48	18
Chibé (8)	11	2.09	5.30	1
Tauarí (9)	29	11.66	8.16	18
Nazaré (10)	18	3.33	6.76	0.5
Marai (11)	10	11.0	16.56	1
Bragança (12)	5	14.6	22.2	1
Marituba (13)	12	0.33	0.49	0
Piquiatuba (14)	33	4.62	7.69	1
Pedreira (15)	31	9.71	8.71	18
Jaguararí (16)	20	4.90	7.77	1
Acaratinga (17)	11	5.00	7.24	1
Jamaraquá (18)	12	46.3	12.2	52
Maguarí (19)	30	37.0	18.78	52
São Domingos (20)	18	14.8	15.2	12
Santa Cruz (21)	13	6.62	14.7	1
Revolta (22)	11	0.18	0.40	0

Table 9 establishes the fact that tourists are visiting each community surveyed, however due to the abundance of research in the national forest, some households may have identified a researcher as a tourist, and thus these numbers are not too trustworthy.

[1] Green highlighted communities were listed in the government ecotourism brochure printed in 2007.
[2] Question: Tourists come to the communities in the Flona to get to know it and tour. Did tourists visit your community in the last 9 years? –Responses coded as follows: No tourists = 0; Once per year = 1; Once per month = 12; Sometimes per year = 18; Once per week = 52.

Table 10 Number of Tourist Visits Last Year (n=355)

Community[1]	# Obs	Mean[2]	Std Dev	Min	Max
Itapuama (1)	5	1.60	1.52	0	3
Paraíso (2)	6	3.17	5.91	0	15
Itapaíuna (3)	19	0.79	0.79	0	2
Prainha II (4)	13	0.85	0.99	0	3
Prainha I (5)	10	2.00	1.33	1	4
Taquara (6)	8	1.75	2.76	0	8
Pini (7)	14	3.43	3.16	0	10
Chibé (8)	6	0.67	0.82	0	2
Tauarí (9)	27	1.96	1.45	0	6
Nazaré (10)	8	1.00	0.76	0	2
Marai (11)	8	1.38	0.92	0	3
Bragança (12)	5	1.00	0.00	1	1
Marituba (13)	5	1.00	0.71	0	2
Piquiatuba (14)	17	1.65	0.86	0	3
Pedreira (15)	28	1.79	1.03	0	4
Jaguararí (16)	11	1.64	1.29	0	4
Acaratinga (17)	10	1.50	0.85	1	3
Jamaraquá (18)	11	168.18	152.76	50	360
Maguarí (19)	30	96.46	95.58	2	300
São Domingos (20)	13	9.69	11.68	0	40
Santa Cruz (21)	7	1.40	1.14	0	3
Revolta (22)	2	1.00	1.41	0	2

Many households reported no tourists last year, but their distance to tourist attractions, most notably the river beaches, may explain this observation. Upland wood inhabitants may not go to the river every day to see tourists like households that live along the main road, especially in large communities like Maguarí.

[1] Green highlighted communities were listed in the government ecotourism brochure printed in 2007.
[2] Question: Last year how many tourist visits did your community receive? Sample for this table includes only 73.9% (263 households) who reported tourists visiting community in the last 9 years.

DEFINING PARTICIPATION

Time period and involvement typology (informal or ProManejo involvement) differ among definitions of tourism participation. In 1997, 12 (6%) of the 216 households participated informally in tourism by selling goods and/ or providing services to tourists. From 1997 to 2006, goods sold to tourists changed. In 1997, a handful of households sold mandioca flour to tourists. Mandioca is a staple in this regions diet, eaten at almost every meal. In 2006, households sold mostly handicrafts (jewelry and latex products), oils, and some mandioca flour to tourists. Palm tree leaves and seeds (fruit and tree) were commonly used to make handicrafts while tree seeds were used to make medicinal oils. Palm tree leaves were also used as building materials for homes and community meeting areas. During my visit in 2012, I noticed artisan shops focused on latex-based goods (purses, notepads, etc.) as well as jewelry made from seeds.

In 2006, 55 (25%) households participated in the same informal form of tourism as in 1997 and/ or were involved in formal ecotourism development projects and/ or guiding services (as part of the ProManejo development initiative). Focusing on ecotourism development, defined as participation in community meetings, there are no new households participating in 2006 that weren't participating in the previous 9 years (see Table 11). So, why are there no new households participating? Most likely this is because all the households that had an interest in ecotourism had already participated during initial development meetings. Another important observation is the number of households that worked in development decreased between 1997 and 2006. Twelve of the 58 (21%) households

participated in the past are not participating in 2006. Perhaps due to limited actual tourism in the communities, participation in planning hasn't been found important or interesting by residents.

Table 11 Household Participation in Ecotourism Development Project (n=355)

Current Participation[1]		Past Participation in Last 9 Years[2] (fisher's test: p-val =<0.0001)		
		Yes	**No**	**Grand Total**
	Yes	46	0	46
	No	12	297	309
	Grand Total	**58**	**297**	**355**

In 2006, 14 communities had ecotourism guides between 1997 and 2006 (See Table 12), however only 9 of those communities reported guides in 2006. Seven of the 9 communities with guides in 2006 were also included in the ecotourism brochure printed in 2007. However 2 others (Piquiatuba and Pedreira) were not endorsed, leading us to question why. In the previous chapter, greater tourism flow was the most significant explanatory variable for government endorsement. Responses to survey questions suggest infrequent visitation, which may explain exclusion. Other theories are communities hosted one-time research visitors for an extended time or the late entrance to ecotourism market excluded theses neighboring communities from government advertisement. During the ProManejo

[1] Household coded as currently participating in 2006 if answered yes to the following question: Is your family participating in ecotourism development now?

[2] Households coded as participating in ecotourism project in past 9 years if answered yes to the following question: In the last nine years, there were several projects in the FLONA. Did your family participate in the ecotourism development project at the time?

intervention, most communities lost between 1-2 guides. Only 2 communities had the same number of participating households in the past 9 years as in the current year.

A few residents worked as ecotourism guides before ProManejo funding began, confirming the presence of tourists before government intervention. While Maguari was the first community to build an ecotourism trail in 2001, other communities followed suit soon after. While the average of most communities suggest that guiding tourists was not common until the early 2000's. Some household members that work as ecotourism guides did not begin until 2004-2006, which I will later discuss as a potential reason for minimal impacts found empirically.

Table 12 Ecotourism Guides[1] (n=355)

Community[2]	# Obs	# HH with Guide in Past 9 Years	Average Start Year	Earliest Start Year	Latest Start Year	# HH with Guide 2006
Itapuama (1)	5	4	2004	2004	2004	1
Paraíso (2)	6	2	2001	2000	2002	1
Itapaíuna (3)	22	1	2005	2005	2005	0
Prainha II (4)	15	0				0
Prainha I (5)	11	1	2003	2003	2003	1
Taquara (6)	12	0				0
Pini (7)	17	3	2002	2001	2004	2
Chibé (8)	11	1	2005	2005	2005	0
Tauarí (9)	29	5	1997	1976	2005	5
Nazaré (10)	18	0				0
Marai (11)	10	1	1997	1997	1997	0
Bragança (12)	5	0				0
Marituba (13)	14	0				0
Piquiatuba (14)	33	7	2006	2005	2006	6
Pedreira (15)	31	7	2005	2003	2006	6

[1] Question: Has anyone from your family participated as an ecotourism guide in the last 9 years? In which years? Is he/she currently participating?
[2] Green highlighted communities were listed in the government ecotourism brochure printed in 2007.

Table 12 Continued

Jaguararí (16)	21	0				0
Acaratinga (17)	11	1	2005	2005	2005	0
Jamaraquá (18)	12	6	2002	2000	2006	5
Maguarí (19)	30	6	2002	2000	2004	4
São Domingos (20)	18	2	2001	1997	2004	0
Santa Cruz (21)	13	0				0
Revolta (22)	11	0				0
Grand Total	**355**	**47**				**31**

Of the 355 households surveyed in 2006, only 47 (13%) had at least one member of their family receiving income as an ecotourism guide or have had someone in the past. Only 66% (31/47) of guides who participated in the past are currently participating in ecotourism as guides, seen in Table 12. The other 34% of households are no longer participating as guides. Again, just like in development, the likely reason is the low steady demand for ecotourism guides.

Participation in 1997 and 2006 was not significantly related, nor was it related to formal participation in the last 9 years (See Table 13). However in Table 14, when participation of tourism was tested between 2006 and 1997 (including households who had tourists visit their properties), a mild positive association was found (Cramer's V = 0.12). Participation in 1997 was significantly related to participation in the proceeding 9 years (Cramer's V = 0.17). Including property visits, 1997-participation more than doubled to 15% (32) of households. It is clear and not surprising to uncover that 1997- participation is a predictor of current participation and past participation.

Table 13 Participation in Tourism, Excluding Property Visits (n=216)

Participation in 1997 (2 forms)[1]		Total	Past Participation in Tourism in Last 9 Years[2] (p-value = 0.15)		Current Participation in Tourism in 2006[3] (p-value = 0.20)	
			No	Yes	No	Yes
	No	204	159	45	153	51
	Yes	12	7	5	8	4
	Total[4]	216	166	50	161	55

Table 14 Participation in Tourism, Including Property Visits (n=216)

Participation in 1997 (3 forms)[5]		Total	Past Participation in Tourism in Last 9 Years[2] (p-value = 0.01)		Current Participation in Tourism in 2006[3] (p-value = 0.09)	
			No	Yes	No	Yes
	No	184	147	37	141	43
	Yes	32	19	13	20	12
	Total[4]	216	166	50	161	55

In Table 15, we have constructed a frequency matrix for past participation (1997-2006) and current participation (2006). Keep in mind that 2006 participation is defined as household participation in ecotourism development projects, guiding services, as well as any sale/ service provided to tourists. Past participation was defined as household participation in

[1] Household coded as participating in 1997 if answered yes to either of the following questions: In the last year, did tourists buy anything from your family? Did anyone in your family do any work or service for tourists?
[2] Household coded as participating in past nine years if answered yes to either of the following questions: Has anyone from your family participated as an ecotourism guide in the last 9 years? In the last 9 years, did your family participate in an ecotourism project?
[3] Household coded as currently participating in 2006 if answered yes to any of the following questions: In the last year, did tourists buy anything from your family? Did anyone in your family do any work or service for tourists? Are any members of your family participating in an ecotourism development project?
[4] Total number of households interviewed in both years is 216.
[5] Household coded as participating in 1997 if answered yes to either of the following questions: In the last year, did tourists buy anything from your family? Did anyone in your family do any work or service for tourists? Did tourists visit your manioc shed, yard, or fields?

ecotourism development projects and/ or trail guide services in the past 9 years. The relationship between past and current participation is highly significant (p-val <0.0001), confirming out suspicions that households participating in the past are also likely to be the households participating currently. Given the strength of the relationship (Cramer's V = 0.76), it is also likely that households who were formerly participating in ProManejo ecotourism projects are now also selling goods or providing services to tourists. This suggests a growing understanding of the tourism market and continued adaptation.

Table 15 Past and Current Participation Frequency (n=216)

Participation in Last 9 Years[1]		Current Participation[2]		
		No	**Yes**	**Total**
	No	154	12	166
	Yes	7	43	50
	Total	161	55	216

Table 16 is a representation of household participation during 3 stages: pre-government intervention, during the ProManejo funding eras, and post-government intervention. You'll notice that ecotourism communities promoted in a 2007 brochure were only a selection of the communities that reported household involvement in 2006.

[1] Household coded as participating in past nine years if answered yes to either of the following questions: Has anyone from your family participated as an ecotourism guide in the last 9 years? In the last 9 years, did your family participate in an ecotourism project?

[2] Household coded as currently participating in 2006 if answered yes to any of the following questions: In the last year, did tourists buy anything from your family? Did anyone in your family do any work or service for tourists? Are any members of your family participating in an ecotourism development project?

Table 16 Number of Households Who Participated in Tourism (n=216)

Community[1]	# Obs	1997 Participation[2]	Participation During 1997-2006	2006 Participation
Itapuama (1)	4	1	3	3
Paraíso (2)	6	1	3	3
Itapaíuna (3)	13	2	1	3
Prainha II (4)	6	0	0	0
Prainha I (5)	8	1	2	1
Taquara (6)	0	0	0	0
Pini (7)	12	2	2	3
Chibé (8)	6	2	1	0
Tauarí (9)	16	2	4	4
Nazaré (10)	12	0	0	1
Marai (11)	1	1	0	0
Bragança (12)	1	0	0	1
Marituba (13)	8	0	0	0
Piquiatuba (14)	20	5	7	7
Pedreira (15)	20	0	6	6
Jaguararí (16)	11	1	1	1
Acaratinga (17)	7	2	3	4
Jamaraquá (18)	10	4	6	6
Maguarí (19)	24	6	8	11
São Domingos (20)	16	2	3	1
Santa Cruz (21)	9	0	0	0
Revolta (22)	6	0	0	0
Grand Total	**216**	**32**	**50**	**55**

HOUSEHOLD PARTICIPATION

Given the increasing number of tourists visiting the TNF, local participation in tourism within observed communities is rising and the residents that I spoke with welcome their presence. I observed a great deal of pride in their community, their forest, and their lives. Another community representative, who has been receiving tourists in his home since

[1] Green highlighted communities were listed in the government ecotourism brochure printed in 2007.
[2] Household coded as participating in 1997 if answered yes to either of the following questions: In the last year, did tourists buy anything from your family? Did anyone in your family do any work or service for tourists? Did tourists visit your manioc shed, yard, or fields?

2006, estimated that he houses 500 visitors per year. Maguarí and Jamaraguá, two of the communities I visited, received visitors regularly. They both have facilities specially built to attract visitors, including a two-story open-air cabana in Jamaraguá and a guesthouse in the making in Maguarí. One forward-thinking family had a sign on the main road advertising guesthouses, although they were not yet fully constructed.

Hypothesis

Drawing on the literature review, young and well-educated residents have been found more likely to participate in tourism in Costa Rica and China (Van Schaardenburgh 2002; Liu et al. 2012). In Belize and China, participating households tend to be related to community leaders, have many laborers, live within close proximity to tourist attractions, and be relatively well off (Belsky 1999; Liu et al. 2012). Residents without substantial physical capital, like motorboats or pack animals, were found to be excluded from participation in tourism in case studies in Belize and Nepal (Gurung 2011; Belsky 1999). Finally, one of the primary goals of ecotourism is to provide economic incentives for reducing non-traditional activities, such as cattle ranching or cash crop production (Wunder 2000). With this in mind and our understanding of the early stages of development, minimal economic benefits are likely due to irregular or minimal tourism. Therefore more traditional households are likely to be the first to become involved, given they have the least to lose. With these potential determinants of participation in mind, the following hypotheses were formed:

1. Households dependent on forest biodiversity are more likely to participate in tourism.

2. Participation in tourism is influenced by household socio-demographic characteristics.
3. Financially well off households are more likely to participate in tourism.

The objective of this section of my thesis is to identify the determinants of local participation in ecotourism in the case of the Tapajós National Forest (TNF). T-tests were performed on 1997 data as predictor variables of past participation (1997 - 2006) and current participation (2006). See Table 27 and Table 28 for a full list of behavioral predictors used.

Forest Relationship

This section will test the hypothesis that pro-conservation behaviors and sustainable forest use by households are determinants for participation in ecotourism. That is traditional uses of forests, that are already compatible with ecotourism objectives, will predict participation in the proceeding 9 years and more current participation. Diversity of NTFPs collected, used, and sold were used as a proxy for sustainable forest use and pro-conservation behaviors.

Of all the pro-conservation behavioral indicators tested (from 1997 survey data), only the diversity of non-timber forest products (NTFPs) collected and used was positively related to probability of participation (past and current). However, the sale of NTFPs was not significantly different. While collection and use of NTFPs better proxies pro-conservation behaviors, the sale of NTFPs was inconclusive in the NTFP market activity based on participation measures.

In both past and current participation measures, we failed to reject the hypothesis: households in 1997 who are more dependent on forests (use and collection of NTFPs) are more likely to participate in tourism. This is an important finding for planners and tourism developers, who can infer that forest dependent populations, or those living more tradition lifestyles, are more likely to participate in activities to conserve it.

Socio-demographics

In this section, I examine whether participation in tourism is related to socio-demographic characteristics suggested by the literature review, such as age, gender, education, and length of residence. Past participation (1997 – 2006) is not significantly related to any of these variables, indicating that there is no discernable social pattern found among formal ecotourism participation.

Conversely, there are significant differences between participating and non-participating households in 2006. Participating households have younger heads of household (both male and female) who have lived in the community for significantly fewer years. These results corroborate earlier findings about the involvement, development, and consolidation stages by Liu et al. (2012), Almeyda (2010a, 2010b), and Van Schaardenburgh (2002), suggesting younger households, with arguably less attachment to current ways of life, are more likely to participate in tourism.

Households who received remittances in 1997 are less likely to be participating in tourism in 2006, although there is no relationship with formal tourism participation during the past 9 years. Customarily, family members who have moved to urban centers send

remittances, and thus could indicate a greater familiarity and means of communication with Santarém. However, remittances also diversify cash income sources, thus potentially reducing the economic incentive to participate in tourism. Households who received remittances may have used them to further diversify economic activities, and thus may no longer have the need or the time to engage in tourism. Another possible explanation is that households receiving remittances have fewer family members in residence, decreasing their ability to spare a member for another potential income generating opportunity.

Households that reported tourist visits to their communities in 1997 were more likely to participate in the last 9 years. This suggests that households who visually see tourists are interested in further development. This finding may help explain the significant relationship between distance to river and 2006 tourism participation. In fact, tourists generally hang out on the beautiful riverine beaches during the dry season or in the community centers playing billiards when they aren't on hiking tours in the forest. To further explore the effect of distance to the river on past and current participation measures, I plot the bivariate probability function (see Figure 7 and Figure 8) estimating participation as a dependent of distance. The probability of past participation is not significantly related to distance, but current participation decreases significantly with greater distance to river. However, both plots show that the likelihood of participation decreases with distance to the river. In 2006, households participating (in that year) lived an average 7-minute walk to the river, in contrast to an average 17-minute walk among non-participating households. This may reflect the maxim "out of sight, out of mind," for both tourists (who visit the most accessible

households) and households (who do not perceive tourism as a worthwhile activity if they do not see visitors on a regular basis).

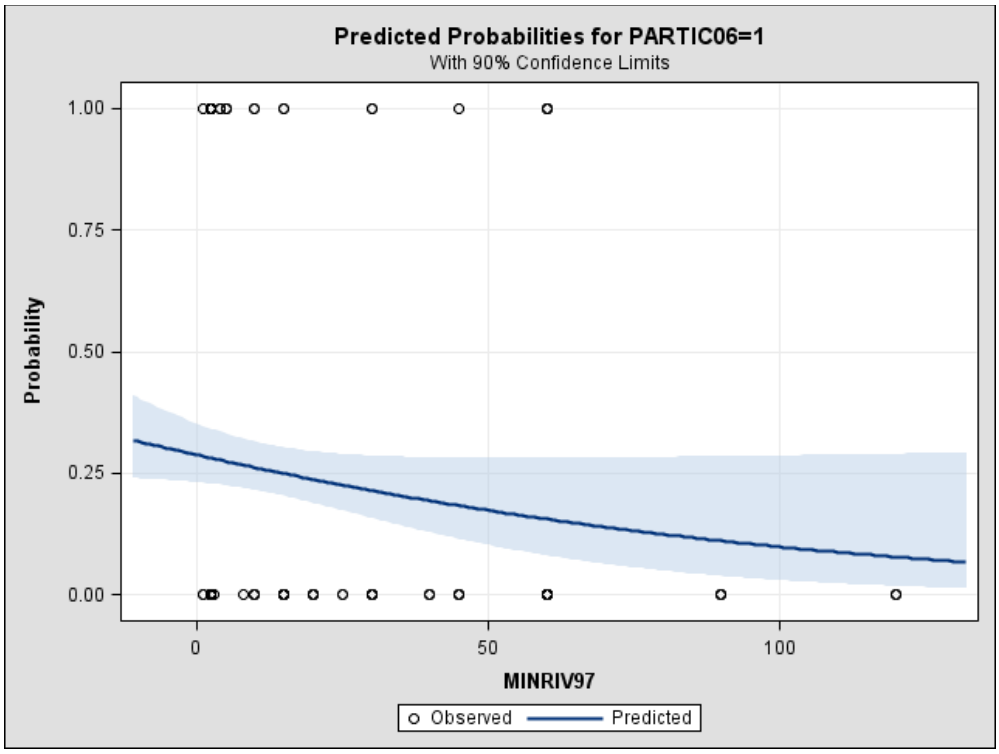

Figure 7 Probability of Participation (2006) as a Function of Distance

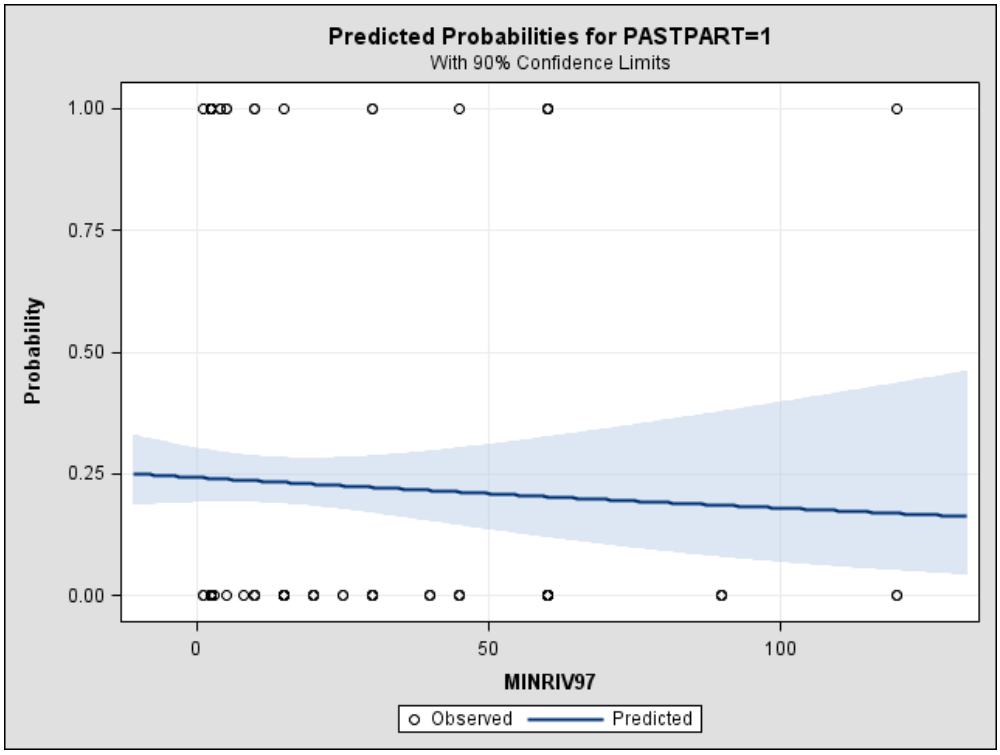

Figure 8 Probability of Participation (1997-2006) as a Function of Distance

Wellbeing

Literature suggests that households already well off, with greater financial, physical, and natural capital, are most likely to be the households participating in tourism (Belsky 1999; Liu et al. 2012; Hernandez et al. 2005). I tested four 1997 well-being proxies, including land ownership, livestock ownership, house quality and asset count, as explanatory variables for participation in the past 9 years and current participation.

In the literature, availability of financial capital was found to be a limiting factor for household participation during the development and consolidation phases (Liu et al. 2012; Belsky 1999). Monthly income in the form of a retirement pension collected from the

government was used to proxy financial capital. Households currently participating in tourism received significantly fewer pensions in 1997 that non-participating households. This relationship may be more illustrative of age rather than financial capital, which as we earlier showed suggests that participating households are younger therefore not eligible for retirement pensions. Data confirms the likelihood of retirement pensions among older heads of household.

Natural capital in 1997, such as amount of land in agriculture and ownership of pasture, agroforestry or rubber plots, was not significantly different between households using both measures of participation. However, increasing the confidence level to 15% results in the significant and positive relationship between pasture ownership and participation in tourism (1997-2006). Pasture in the TNF is primarily used for cattle production and is a growing concern. In the TNF, households have altered their agriculture systems to accommodate increasing cattle grazing needs, thereby limiting natural regeneration necessary between cultivation cycles. However, total number of cattle owned in 1997 was not significantly different in participant households. While not significantly less, participant households (1997-2006) did own fewer cattle in 1997 than non-participants. This relationship suggests that households were less dependent upon income from cattle production, however were wealthier landowners.

Other wealth asset indices, including liquid, physical, and house quality, were not found to be different between households using both measures of participation (past and current). Given the lack of relationship found between 1997 wellbeing and wealth variables

to participant households, the hypothesis was not substantiated. Household with greater capital, thusly more well off, were not found more likely to participate in tourism than their poorer neighbors.

MODELING HOUSEHOLD PARTICIPATION IN ECOTOURISM

Most case studies in the literature do not model determinants of household participation, with the exception of Liu et al. (2012). In a study conducted in China's Wolong Reserve, Liu et al. (2012) tested various forms of financial, human, natural, physical, and social capital from households in the development phase to explain participation in tourism during the involvement stage. High income, high number of laborers, high level of education, kinship with community leaders or local government, low cropland acreage, and short distance to tourist attractions were significant predictor variables for future participation in tourism. Van Schaardenburgh (2002) argues age and length of residence as other explanatory variables, suggesting that foreigners move into the area with idyllic plans for tourism development upsetting local and more elderly residents.

I created models testing participation as a response to various explanatory variables from the literature, including age, years of education, distance to tourist attraction, number of laborers, family size, agriculture acreage, length of residence, and wellbeing. Age and education variables were of the head of household (in most cases was the male). The beaches along the river of the TNF are a tourist attraction and follow the main roads. Count of males and females in the household were used as a proxy of number of laborers, as well as involvement in complimentary capacities. Primarily, the liquid asset wealth index was used

to proxy wellbeing due to the asset composition (common household assets and livestock counts).

Modeling Past Participation

I tested data collected in 1997 as explanatory variables to formal participation between 1997-2006. The first model tests variables commonly mentioned in the literature as potential predictor variables for formal participation. The second model tests variables that were found significantly different in participant and non-participant households in the last 9 years.

Model 1: Literature-based

> **f (past participation)** = [financial capital (agriculture dependence, pension received), human capital (# family members, # of males in family, # of females in family, percent of males in household, head of household education level, head of household age), natural capital (# agriculture plots), physical capital (# min to river, liquid assets, physical assets), community attachment (length of residence), and controls (ecotourism community)]. (See Table 29)

After controlling for government endorsed ecotourism communities, several models were found significant, although the control variable was the most significant predictor of participation. The model with the largest pseudo R^2 included a large majority of the above variables (accounting for each type of capital), however only households with an increasing number of males, younger heads of household, residing in ecotourism communities were likely predictors of participation during the ProManejo intervention (p-val = 0.086, pseudo $R^2 = 0.093$). Traditional household roles were observed in the TNF, leading to predominantly, but not exclusively, male ecotourism guides and community leaders.

Model 2: Including Forest Relationship Parameter

> **f (past participation)** = [financial capital (agriculture dependence, pension received), human capital (# family members, # of males in family, # of females in family, percent of males in household, head of household education level, head of household age), natural capital (# agriculture plots), physical capital (# min to river), community attachment (length of residence), *forest relationship* (diversity of NTFPs collected), and controls (ecotourism community)]. (See Table 30)

Collection and use of non-timber forest products were the only variables significantly different between participant and non-participant households between 1997 and 2006. The significance suggests a forest dependent relationship and was added to a model with suggested predictors from the literature. Our most significant models where driven by higher NTFP collection or use while holding government-endorsed ecotourism community constant. Unlike the previous model that excluded forest relationship, this most recent model did not find number of males or age significant explanatory variables for participation. To better understand the relationship between NTFP collection, age, and number of males, we estimated a regression model for NTFP collection (adj-R^2= 0.12; p-val <0.0001). It turns out that younger heads of households and an increasing number of males in the household are significant explanatory variables for greater diversity of NTFPs collected (estimates = -0.04, 0.48 respectively). There is a stronger, positive relationship observed between household size (rather than number of males) and diversity of NTFPs collected, suggesting that larger households have the ability to work outside agriculture or livestock husbandry. With relation to household age, younger household heads are more likely to collect a higher diversity of NTFPs (adj-R^2= 0.03; estimate = -0.03; p-val = 0.006). In summary, it appears that after

accounting for number of males and age, diversity of NTFPs collected is still a significant explanatory variable for tourism participation.

Modeling Current Participation

The next 4 models estimate current participation in response to (1) 1997 explanatory variables and (2) 2006 explanatory variables. We chose to estimate models using data collected at different time stamps to address two concerns. However, estimating a model of participation using independent data collected 9 years before participation occurred is slightly concerning. Many things including socioeconomic status and household structure are likely to have changed during this time. However, when attempting to estimate a model that is dependent upon things happening at the same time, there is a potential for reverse causality.

Model 1: Using 1997 Survey Data

f (past participation) = [financial capital (agriculture dependence, pension received), human capital (# family members, # of males in family, # of females in family, percent of males in household, head of household education level, head of household age), natural capital (# agriculture plots), physical capital (# min to river), community attachment (length of residence), and controls (ecotourism community)]. (See Table 31)

While holding capital (financial, human, natural, physical) and ecotourism community constant, current participation was significantly and negatively dependent upon length of community residence. Age, gender, and family size were not significant in this model. However, we estimated a model of participation using only these variables along with community attachment and ecotourism community control. Due to the high correlation between age and length of residence, each variable was alternated in the estimated model. A

larger number of males and fewer years in the community (arguably less attachment) positively predict current participation, while holding government endorsed ecotourism communities constant (p-val= 0.0002, pseudo R^2= 0.089). In another similar model, participation was found to be dependent upon younger heads of household and larger number of males, while holding the same community control constant (p-val= 0.001; pseudo R^2= 0.072).

With the addition of informal involvement to our definition of current household participation, such as selling goods and providing transportation services, fewer years in the community became significant. While younger heads of household is a consistent explanatory variable of past and current participation, length of residence was found significantly related as well. If we hold family size, number of males, age, and community residence constant, current participation is more likely in households with fewer years in the community. This relationship may suggest the beginning of a migration to ecotourism communities for access to tourism markets.

Model 2: Including Forest Relationship Parameter (1997 data)

Using the same 1997 variables used to predict past participation, a model was created to test participation in 2006 as an outcome. Using pseudo R^2 to compare model strength, we found that by including all potential explanatory variables, as seen below, the model is actually weaker in explanatory power (pseudo R^2 = 0.117) than a simpler model.

f (past participation) = [financial capital (agriculture dependence, pension received), human capital (# family members, # of males in family, # of females in family, percent of males in household, head of household education level, head of household age), natural

capital (# agriculture plots), physical capital (# min to river, liquid assets), community attachment (length of residence), *forest relationship* (# of NTFPs collected), and controls (ecotourism community)]. See Table 30.

The strongest model of current household participation, using pseudo R^2 to compare model strength, includes human capital (# of males, head of household age), physical capital (# of min to river, liquid assets), community attachment, forest relationship, and community control (pseudo R^2= 0.134). Interestingly, both models find only 3 of the explanatory variables significant (community attachment, forest relationship, and ecotourism community control). That being said, it appears that if we hold all forms of capital and community residence constant, current participation (formal and informal participation) is likely in households that collect a higher variety of NTFPs and have lived in the community for fewer years. Unlike the previous model that examines past participation (formal participation only), the number of males and the household age is not significant. It was my experience that women were commonly involved in handicraft production (informal participation), thus accounting for an increasing variety of household types to become involved with tourism. Just as Belsky (1999) and Almeyda (2010a) reported, males and females are both likely to be involved in tourism, but perhaps not in the same capacities.

Model 3: Using 2006 Survey Data

Using 2006 as a case study, I estimated a model to explain current participation (2006) using explanatory variables found significant in the previous models.

f (past participation) = [financial capital (pension received), human capital (# family members, # of males in family, # of females in family, percent of males in household, head of household education level, head of household age), natural capital (# agriculture

plots), physical capital (# min to river, liquid assets), community attachment (length of residence), forest relationship (# of NTFPs collected), and controls (ecotourism community)]. (See Table 33)

The overall model was significant, however only length of residence in the community and the ecotourism community control were significant within the model. A household's close proximity to the river was significantly (to an 85% confidence level) more likely to explain current participation in tourism. Just as the literature found, the further a household is from a tourist attraction (Liu et al. 2012) and greater number of years in the community (Almeyda 2010a), the less likely it is to participate.

Model 4: Significance-based (2006 data)

In this newly estimated model, we are exploring the relationship between many variables that were found significantly different between currently participating and non-participating households. By including these potentially significant variables we hope to increase the models explanatory power, all to better understand the determinants of participation in tourism.

f (past participation) = [financial capital (pension received), human capital (# family members, # of males in family, # of females in family, percent of males in household, head of household education level, head of household age), natural capital (# agriculture plots), physical capital (# min to river, # cattle owned, liquid assets), community attachment (length of residence), forest relationship (NTFP collection and andiroba use), integration into cash economy (quantity in kgs of crops purchased and make/sell goods using NTFPs), and controls (ecotourism community)]. (See Table 33)

The model estimated above was significant, however only 8 of the 18 variables were significant within the model (pseudo R^2= 0.275). Households currently participating in

tourism had older heads of household, closer proximity to the river, used less medicinal (andiroba) oil, made or sold goods from NTFPs, purchased less crops per capita (kg), fewer years in the community, and were wealthier (but land-poor), all while holding ecotourism communities constant. By introducing the interaction between agriculture land and liquid assets, we are accounting for households who have become wealthier through greater agriculture production. Holding the interaction constant, liquid asset rich households were likely indicators of participation, significant to 15% confidence interval. The measure of wellbeing was close to being significant (we consider significant at 10%) and therefore warrants further attention in the future, suggesting more well off households are significant predictors of participation. However, a household is not likely to participate if they have both, high land asset and liquid assets. In 2006, homestay capabilities where not yet created, however guided tours of the forest and sale of local handicrafts were common participant activities. Physical capital (such as house size) will most likely play a larger role in participation as homestays are developed. To host guests, residents must have extra space in their homes and adequate furnishings to meet tourists' needs.

Two variables warrant further investigation—age and andiroba oil use. Earlier models found younger heads of household more likely to participate between 1997 and 2006. However, this model suggests the exact opposite. By holding years in the community constant, participation in 2006 is more likely among the older heads of household rather than younger. There could be many reasons for this finding, including less physical activity required in tourism participation (especially in handicraft production) compared to

agricultural production. Also, migration to a community for access to tourism market among older households may have increased participation likelihood. During my visit, I observed younger men leading hikes through the forest and middle aged men and women participating in tourism by hosting guests or working in the handicraft stores. Some young people take classes in Belterra, a small town outside of the forest with a college. As educational opportunities outside of the forest expand, observations and data suggest a change in the tourism participation demographic may occur. This relationship demands further research.

As we discussed earlier, dependence on a more diverse and sustainable use of the forests was found to be significantly more likely among households participating in ecotourism. Another measure tested was the use of andiroba oil, a common medicinal oil that traditional households use. Surprisingly, the use of andiroba oil was a strong predictor of non-participating households, suggesting a change in dependence on traditional medicines. During my tour of the rainforest, my guide identified many tree species with medicinal values, but admitted that they were rarely used. Instead, they used Western medicines bought outside the forest. This observation and statistical relationship suggest that households less dependent upon medicinal uses of the forest are more likely to participate. This is an interesting relationship that warrants further research.

Overall, themes have emerged from these models and indicate households practicing less consumptive uses of the forest may predict future participation in tourism. While socio-economic household characteristics were found significant in some cases, diversity of NTFP collection was repeatedly a strong explanatory variable for both participation types.

Government identified ecotourism communities have strong predictive power of participation, suggesting benefits from continued conversation between communities and local governments.

SOCIO-ECONOMIC IMPACTS OF TOURISM

This chapter has been formatted for submission to a scientific journal and therefore my repeat some of our earlier results. The following chapter was created as an addendum discussing environmental impacts of tourism in this national forest. To begin, I examine how participation in ecotourism in the Tapajós National Forest affects households and communities, considering their socio-economic wellbeing. Ecotourism is commonly defined as a form of travel that promotes conservation of natural areas and improves the wellbeing of local people (TIES 1990; Honey 1999). In general, studies have shown significant improvements to forest cover, environmental awareness, and local income due to ecotourism development in surrounding communities (Almeyda 2010b). Yet our objective is to study the effect of participation in ecotourism on households living within or surrounding a protected area.

We will commonly refer to empowerment throughout this article, where many researchers describe various forms as important elements in ecotourism development (Scheyvens 1999). Scheyvens (1999) created an empowerment framework to evaluate the effectiveness of ecotourism development, using economic, psychological, social, and political indicators. Economic empowerment is defined as bringing lasting economic gains to communities and shared widely among many households while disempowerment is characterized by financial benefits profiting a select few making entrance to market difficult for the rest. Psychological empowerment is characterized by an outside recognition of locale's uniqueness and employment opportunities for marginalized demographics.

Psychological disempowerment is the confusion and disillusionment brought by lack of benefits received to compensate for the limited access to resources. Social empowerment is characterized by unity where community funds are invested back into the community, while disempowerment is defined as social decay and eventual resentment among groups. Political empowerment is characterized by the inclusion of all relevant stakeholder interests in decision-making processes. Communities without these opportunities have been politically disempowered and are not included in the implementation or management decisions (Scheyvens 1999). In this study, we are primarily focusing on economic empowerment, yet briefly discussing elements of psychological, social, and political empowerment.

Household participation in tourism is changing traditional household roles. Women in Costa Rica, Nepal, and China have cited an improved quality of life as a result of tourism development (Almeyda 2010b; Nyaupane et al. 2006). In Peru, women are taking on traditional male roles—becoming involved in community meetings, working on the farm, and selling produce due to male tourism employment (Stronza 2005). In Nepal and China, Nyaupane et al. (2006) found evidence of social equality and increased market access for women, improving economic empowerment. In Mexico, a traditional male-only ecotourism development organization recently opened membership to women. However, these women are the wives of the current members and their active participation is not warmly welcomed (Hernandez et al. 2005). While there does not seem to be a discernable trend in female participation typology, tourism development in these regions has promoted psychological

and economic empowerment of women through employment opportunities and greater market access.

Many studies have found significant economic benefits due to household participation in ecotourism (Wunder 2000; Lindberg et al. 1996; Mwaiba & Stronza 2010), an important element for psychological and economic empowerment, as defined by Scheyvens (1999). In Costa Rica, Almeyda (2010a, 2010b) found that eco-lodge employees spent a significantly higher percentage of household income on transportation and recreation compared to their (non-employee) neighbors.

Nevertheless, new sources of tourism income for participating households have been shown to decrease income stability (Wunder 2000; Hernandez et al. 2005; Almeyda 2010a) and increase discrepancies of income distribution (He et al 2008; Alexander 2000; Walpole & Goodwin 2000), minimally compensating households most affected by conservation (Lindberg et al. 1996). Firstly, the seasonal fluctuation of tourists can negatively impact households that primarily rely on tourism income (Wunder 2000; Hernandez et al. 2005; Almeyda 2010a). Because instability can encourage insurance such as agriculture and livestock production that economic development initiatives aim to reduce (Hernandez et al. 2005), tourism is promoted as supplementary income in addition to other sustainable livelihoods (Mbaiwa & Stronza 2010; Salafsky 2001; Wunder 2000).

Secondly, proponents of ecotourism have suggested that tourism participation gradually minimizes economic differences between households (Wunder 2000), yet some studies report an unequal distribution of benefits (Mbaiwa 2004; He et al. 2008; Yuan 2008).

In Belize, a study found that direct economic benefits were distributed among only a minority of households who were negatively affected by ecotourism and conservation (ie. through loss of resource access and/ or property destruction by protected wildlife). In Nepal and Mexico, large capital requirements created a barrier to participation in ecotourism (Gurung & Seeland 2011) only to increase the differences in wealth between households (Hernandez et al. 2005; Walpole& Goodwin 2000). In addition, research has shown that a destination's specialization may better explain differences between communities rather than the form of that participation—locally owned businesses or wage employees (Wunder 2000). Inflation of land/ labor/ food can also impact the distribution of wealth between households and communities (Walpole & Goodwin 2001; He et al. 2008; Almeyda 2010b). Households with goods or services to sell gain, while households who buy lose.

Researchers encourage community-based ecotourism development as a way to foster political empowerment, defined by Scheyvens (1999) as the inclusion of all relevant stakeholder interests in decision-making processes. In an extensive ecotourism literature review by Kruger (2005), he identified local community involvement as an important explanatory variable of sustainable ecotourism in multivariate regression analyses. In Uganda and China, researchers found that community-based conservation initiatives are more successful than state-led initiatives in fostering positive conservation attitudes (Lepp & Holland 2006; Yuan 2008). Local people in Uganda perceived community-based conservation initiatives as inclusive and trustworthy (Lepp & Holland 2006), fostering feelings of political empowerment. However, community-based ecotourism projects are not

without criticisms. Belsky (1999) argues they are coercive protected area management strategies that do not acknowledge social constructs and effectively include all relevant stakeholders, which is consequently political disempowerment.

METHODS

Site Description

The Tapajós National Forest (referred to as FLONA do Tapajós or TNF) is located in the Brazilian state of Pará along the eastern bank of the Tapajós River. The forest is accessible by bus from the port city of Santarém, the largest city on the Amazon River between Belém and Manaus, and also by boat from the touristic beach side town of Alter do Chão. The national forest was established in 1974 by the Brazilian government and encompasses approximately 600,000 hectares. Although human population had been recorded in this area as early as the 1800's, it was not until 1994 that legislation gave current residents the legal right to live within the national forest limits. After 6 years of delay, these rights were further specified in the National System of Units of Conservation (SNUC), which identifies two forms of protected areas: full protection (38%) and sustainable use (62%). As of December 2010, protected areas (or "conservation units") in the Brazilian Amazon accounted for 2,197,485 km^2 (43.9%) of the region.

National Forests (Flonas), like the Tapajós National Forest discussed here, were created for multiple sustainable uses of timber and non-timber products as well as scientific research in predominantly native forests. Of the four populated areas inside the Flona, this study includes 19 riverine communities and one forest community, Chibé, which split from

the riverine community Tauari in 2000. Two other communities, Revolta and Santa Cruz, are located just outside of the TNF, but are still affected by TNF zoning restrictions. Other permitted inhabitant zones not included in this study are private farms located along BR 163 on the eastern border of the forest and the Aveiro municipality in the southwestern part of the forest (Cordeiro, 2004).

As integrated conservation and development programs (ICDPs) proliferated in tropical countries, the forest management project known as ProManejo was realized as part of the PPG7 Pilot Program for the Protection of Tropical Forests. PPG7 was mainly financed by the World Bank, United Kingdom (DFID), the German Organization for technical cooperation (GTZ), the Brazilian government, and the German development bank (KfW). The principal objective of ProManejo was to provide financial and technical support for sustainable forest management initiatives that both improve rural livelihoods and reduce land uses that require deforestation. The Amazon-wide activities started in July 1999 and finalized in June 2006. ProManejo consisted of four main components: 1) strategic studies, 2) promising initiatives, 3) monitoring and control of development, and 4) management of the Tapajós National Forest (TNF). The TNF component was intended to create a management model that would later be applied to other parts of the Amazon (IBAMA 2004). Projects ranged from fire use control to incorporating agroforestry systems to creating markets for medicinal oils, as well as ecotourism development that we will be discussing in this chapter. A previous study by Bauch (2010) in the Tapajós National Forest found that ProManejo's environmental goals of reducing agriculture land and cattle ranching were not furthered by

community-based enterprises (including ecotourism). Participation in these enterprises did however increase household income, but not wellbeing proxies like count of assets (Bauch, 2010).

Travel guidebooks tend to mention the TNF as an attraction near Santarém, but vary in descriptive and logistical details. The most recent edition of Lonely Planet provides details for self-reliant tourists as well as contacts for tourism agencies that visit the TNF. The guidebook describes entrance permissions needed, applicable visitor taxes, and bus schedules (St. Regis et al., 2011). International tourists with no Portuguese language skills would have a very difficult time arranging this trip themselves. Therefore, a majority of tourists visit the forest arrive by boat through pre-arranged tours by agencies in Alter do Chão or Santarém. Tour packages commonly include hikes in the forest (5.8- 14.5km), snorkeling in the streams, swimming in the river, wildlife viewing, and homestay and/or camping in the woods.

Tourism in the TNF began well before the ProManejo interventions (1999-2006). Tour guides (mostly from Santarém) would bring visitors to the rainforest, riverine beaches, and town centers of TNF. In exchange for showing tourists a household's land, guides would pay the household that they visited. Concerns about the distribution and use of that money eventually led most guides to shift to providing compensation to the community in the form of school supplies. Thus, households were already allowing outside tour guides to bring tourists to their lands in exchange for compensation to the community, long before they developed artisan stores, homestay capabilities, and visitor taxes.

With encouragement from ProManejo, each community formed as association sometime between 1999 and 2003. Elected representatives communicate with government, tourism operators, and NGOs on a regular basis. They are also responsible for handling ecotourism logistics, such as assigning mandatory local guides on a rotating basis and purchasing items for the community using fees collected from tourists (as of 2012, R$7/ USD$3.50 per visitor). ProManejo provided guide training and initiated tourism meetings. Since ProManejo inception, local guides have become mandatory for all forest treks and they continue to maintain quality trails. Guides only speak Portuguese and vary in interpretative knowledge, and therefore guides hired outside the forest do most of the natural history interpretation.

Due to the concentrated tourism to Maguari and Jamaraqua as well as the negligible tourism in Acaratinga, these three communities were selected for follow-up visits in 2012. Maguari was the first community to build an ecotourism trail in 2001 and continue to receive regular tourist visits. Residents now sell products made from locally extracted latex in the community artisan workshop and handicraft store in Alter do Chão. The community president of Jamaraqua built an open-air cabana built specifically for tourists in 2008. Both communities also have new convenience stores, owned by community representatives. Acaratinga is Jamaraqua's neighbor but is separated by a poorly maintained dirt road and not a frequent host to visitors. These communities are in the northern part of the forest, accessible by bus and boat. Transportation from Santarém to some of the Flona communities is bi-weekly at best and not meant for touristic travel. All non-residents must have approval

to enter the TNF by bus, which requires a visit to the Brazilian government offices in Santarém. However, tour guides that come by boat from Alter do Chão or Santarém are not subject to the same government checkpoint and can potentially evade the authorization process, resulting a paucity of information about visitation.

Since ProManejo, community ecotourism development has progressed at different rates, some making additional steps to accommodate tourists and others not. Butler (1980) explains the idea of a Tourist Area Cycle of Evolution in 6 developmental steps: exploratory, involvement, development, consolidation, stagnation and rejuvenation or decline. Using indicators of Butler's (1980) Tourism Area Cycle, TNF tourism in 1997 was in the exploratory stage, characterized by small numbers of tourists (60% of households reported zero or one tourist visit to their community in the last year), no tourist-specific facilities, and few socioeconomic benefits from tourism (low tourism income). In 2006, most communities were still in the exploratory phases, however Jamaraquá and Maguarí began to receive regular weekly tourism. Fast track 15 years later to 2012 and the same communities have entered the involvement state, characterized by tourists-specific facilities, tourism advertisement, and emergent tourism season. In the years proceeding ProManejo, handicraft stores and guesthouses were built to accommodate tourists. Tourist travel coordinated by government and tourism agencies that are also advertising the TNF. Of the three communities visited in 2012, 2 communities (Jamaraquá and Maguarí) were in the Involvement stage and 1 community (Acaratinga) was still in the exploration stage.

Household Characteristics

As with the stage of development, attitudes towards conservation and ecotourism development have also evolved. Doxey (1975) suggests residents of tourism destinations go through 4 stages of irritation: euphoria, apathy, annoyance, and antagonism. We witnessed stages of 'euphoria', characterized by the first phase of development with little prior tourism planning, and 'apathy', characterized by more formal resident-tourist interactions. During the 9-year study, the TNF was in a state of euphoria and witnessed by overwhelming resident support for continued tourism. A tourist season was being developed, leading to outside advertisement from tourism agencies, travel media, and government. By 2012, some of the residents in Maguari and Jamaraqua entered into a stage of apathy, treating tourists more like clients than neighbors, while residents in Acaratinga had not yet transitioned to more formal interactions.

Residents are primarily subsistence farmers, cultivating cassava, corn, beans, and rice. They also rely on the many species of fish from the Tapajós River. Of those surveyed, head of households were 50 years old, with 3-4 years of education, and living 83% of their life in the same community.

Table 17 Descriptive Statistics for Households

	n (1997)	1997 Mean (Std Dev)	n (2006)	2006 Mean (Std Dev)
Head of Household Age (If no male, female)	216	45.7 (15.7)	215	50.4 (14.6)
Head of Household Years of Education	206	3.0 (2.0)	202	3.8 (2.2)
Family Size	216	5.7 (2.3)	216	5.6 (2.6)
% Life in Community	216	77 (33)	201	83 (28)
Minutes Walking to River	214	13.6 (23.3)	216	14.6 (27.1)
Liquid Assets Index	201	-.30 (1.1)	200	0.01 (1.1)
Physical Assets Index	189	-0.92 (1.2)	194	-0.05 (1.2)
HH Assets Index	209	-0.16 (0.94)	214	0.22 (0.97)
# of Agriculture Plots	207	6.4 (6.1)	215	3.8 (3.2)
% owning cattle	216	24 (43)	216	26 (44)
% Best House Quality	216	23 (42)	216	46 (50)

Data Collection

This paper is primarily based on a household panel survey conducted with identical households in 1997 and then again in 2006. Supplemental insight was gained during semi-structured interviews with key informants and personal observations in 2012. The first wave of the panel survey was part of a U.S. Forest Service study of ecotourism and other sustainable development alternatives for the Tapajós National Forest. A random stratified sample of 320 households in 20 communities was surveyed in 1997 (Pattanayak & Sills 2001). In 2006, 355 households were interviewed, using a similar survey instrument (Weber, Sills, Bauch, & Pattanayak 2011; Bauch 2010). In both panel surveys, interviews were conducted by a group of hired and trained Brazilians at the interviewee's homestead. Interviewers sought to interview both one male and one female head of household. For purposes of comparison, this thesis uses responses from the 216 households that were

interviewed in 1997 and again in 2006. The loss in households surveyed stemmed from relocation, availability, death, and unclear relationship ties.

In February 2012, semi-structured interviews were conducted in the Tapajós River region, including Santarém, Alter do Chão, and the National Forest with people from the tourism industry (5), government (1), non-governmental organizations (1), and communities (3). Interview respondents were selected based on knowledge of tourism and availability during the small fieldwork window. These interviews followed an interview guide with questions about the socio-economic and environmental impacts of ecotourism.

HYPOTHESES

It is our aim to examine the relationship between tourism participation and wealth during the ProManejo funding period (1999-2006). In the literature, studies suggest that significant capital can be a barrier to participation in tourism, (Gurung & Seeland 2011; Belsky 1999), also that participation improves quality of life (Liu et al. 2012; Nyaupane et al. 2006) and provides significant economic benefits (Wunder 2000; Lindberg et al. 1996), however may benefit only a select few (Belsky 1999; Gurung & Seeland 2011). Using the Tapajós National Forest as a case study we test the following hypotheses:

H1) Wealthier households were more likely to participate in tourism.

H2) Tourism participation resulted in greater perceived wellbeing.

H3) Tourism participation resulted in greater and increased wealth.

"Household Participation" is defined as a household with at least one member involved in ecotourism meetings and/ or employment as a guide during the ProManejo funding period from 1999 to 2006, roughly 23% of the 216-household survey sample.

H1: Participation

Using the TNF as a case study, we explored the relationship between household participation during ProManejo and wealth in 1997 (using the first principal component of liquid assets, physical assets and household assets, house quality, total number of cattle, and number of agriculture plots—See Table 35 for descriptions). Simple t-tests and chi-square tests were employed to find significant discrepancies in wealth between participant and nonparticipant households. In chi-square tests, Cramer's V was used to report the strength of that association. Cramer's V values are on a scale of -1 to 1, 0 indicating a weak association and 1 or -1 indicating a strong association (positive or negative respectively).

Ownership of assets is a commonly used indicator of wealth (Vyas 2006). We employ the first principal component of household asset ownership as created by Bauch (2010), which maximizes the variance of the linear combination of assets across both years. Since the underlying data are reports of assets owned by and functioning in households in 1997 and 2006, we are able to compare these wealth indices between years. A low score indicates low socio-economic status and a high score indicates high socio-economic status (Vyas 2006).

The second wealth index considered is house quality: best quality versus poor quality, created by Bauch (2010). House materials were ranked based on their costs and were confirmed desirable or undesirable by community members. Building materials were ranked

in order of desirability/ cost for floors (cement, wood, or dirt), walls (cement, wood, thatch, mud, or combinations of each), and roofs (tile, wood, tin, or thatch). Respondents during the 2006 interviews remarked that the most desirable combination of building materials is cement floors, cement walls, and tile roofs. Best house quality was defined as using 2 or more of the 3 best building materials.

H2: Perceived Impacts

To test the association between household participation in tourism to greater perceptions of familiar and community wellbeing, we employ chi-square tests using Cramer's V to define the associations strength and direction. To better understand the relationship between resident perceptions and tourism participation, we have estimated a bivariate logit regression model using explanatory variables from the literature as well as suggestions from interview respondents and personal observations.

While the literature commonly reports improvements in quality of life due to ecotourism development (Liu et al. 2012; Almeyda 2010b), one of the complaints is that benefits are not equally distributed to residents (Belsky 1999; Gurung & Seeland 2011), creating a local elite. The economic development literature has referenced investment ability, tourism employment, and location of rural residents as key determinants of unequal distribution of economic benefits within communities (He et al. 2008; Hernandez et al. 2005; Yuan 2008; Nyaupane et al. 2006). In fieldwork, the Brazilian government suggested that low visitation patterns to the national forest were to blame for minimal benefits derived from tourism. And finally household participation as an explanatory variable to perceived benefits.

Government endorsement was held constant within the logit model, controlling for the communities advertised in the brochure printed by IBAMA in 2007.

> **(Perceived impact on wellbeing) = f** [investment ability (receives pension), participation (past participation—includes employment and development involvement), distance to the river, tourism frequency (low, medium, high levels), and controls (government endorsement of ecotourism community)]. See Table 19.

H3: Actual Impacts

To better understand the impacts of household participation on wellbeing, we tested the differences between overall wealth accumulation and changes in wealth pre-ICDP to post-ICDP. Just like the first hypothesis, we use wealth indices (liquid assets, physical assets and household assets, house quality, total number of cattle, number of agriculture plots, and landownership) to proxy wellbeing. Simple t-tests and chi-square tests were employed to find significant discrepancies in wealth between participant and nonparticipant. In chi-square tests, Cramer's V was used to report the strength of that association.

RESULTS

Participation

We find no relationship between wealth (in 1997) and household participation in the ecotourism project funded by ProManejo (1999-2006), conflicting with previous tourism literature. Therefore we reject the hypothesis, household wealth is not a determinant of future participation. This finding and suggests that there is no capital barrier to participation.

Perceived Impacts

While the majority of residents in the Tapajós National Forest felt that their quality of life and the community as a whole had improved between surveys (1997 and 2006), households who participated in tourism during this time did not feel significantly different from non-participant households (See Table 37). Nevertheless, of the 159 (74%) households that reported tourist visits to their community in the past year, participant households perceived a significantly higher quality of life and greater community improvements than non-participating households since the development of tourism. Results suggest that participating households feel like not only their family, but also their community, has benefited from tourism development.

Table 18 Perceived Changes to Family and Community (n=159)

Perceived Change Since Tourism Development in Community		**Family** (Chi-sq = 19.5, p-val= <0.0001, Cramer's V= 0.35)		**Community** (Chi-sq = 9.28, p-val= 0.0023, Cramer's V = 0.24)	
Participation in Ecotourism During ProManejo		**Better**	**Same/Worse**	**Better**	**Same/Worse**
	Yes	24	23	33	14
	No	19	93	49	63
	Total	43 (27%)	116 (73%)	82 (52%)	77 (48%)

Looking closely at the previous table, we can see that about 50% of participant households perceived familiar benefits from tourism, while 70% of participant households saw benefits in their communities. Almost 17% of non-participant households saw benefits to

their family from tourism, yet about 44% perceived benefits to the community. The discrepancies between perceptions of benefits among non-participant households, suggests that the 'trickle-down' benefit theory within a tourism destination has either not yet reached the majority of households by the close of the ICDP or certain households are receiving the majority of benefits.

Household

While the literature has recently expanded to include involvement in tourism development as an important indicator of genuine tourism participation, many previous studies consider employment only. In the case of the TNF, perception of household benefits is more strongly explained by development involvement rather than employment as a forest guide (Cramer's V = 0.33, 0.31 respectively). However, not unexpectedly our measure of "tourism participation", employment and/or involvement in development, had the strongest positive relationship (Cramer's V= 0.35) and was therefore included in the regression analyses.

The bivariate logit model estimated for greater perceptions of household benefits was significant, however only participation and weekly tourism frequency were significant within the model (See Table 19). Results suggest that the perception of household benefits were most significantly related to resident reports of more frequent tourist visits to the community and secondly by households involved in the ecotourism project funded by ProManejo. Findings indicate that ProManejo had a positive and significant impact on participating households, but proximity, investment ability, and government endorsement were not likely

contributors to increased perception of tourism benefits. In other words, it was not the households with greater physical or financial capital that were more likely to perceive benefits, conflicting with previous tourism literature.

Table 19 Logit Model Estimate for Perceived Household Benefits From Tourism

		Perceived Household Benefits (n=159, pseudo R^2 = 0.19)			
Parameter	**Name**	**Est.**	**Std. Err.**	**Chi-Sq**	**p-val**
Intercept		-2.45	0.52	22.0	<0.0001
Household received pension in 1997	Retire97	0.15	0.51	0.08	0.78
Past Participation (1999-2006)	Pastpart	1.74	0.42	16.8	<0.0001
Minutes to River	Minriv97	-0.01	0.01	0.21	0.65
Tourism Frequency (1997-2006) (Ref =0)	Sometimes	0.67	0.51	1.73	0.19
	Weekly	2.03	0.64	10.1	0.001
Government Endorsement & Advertisement (control)	Eco	0.13	0.48	0.08	0.78

Community

During fieldwork in the TNF, residents in the most developed communities of Maguari and Jamaraqua attributed their better access to income-generating employment as an impact of tourism. One resident reported that she had moved to Maguari specifically because of the employment opportunities. In the community with fewer tourists, residents argued that tourism is insignificant and does not impact their household or their community.

While the previous chi-square test showed a moderately strong association between participation and greater perceptions of community benefits, we estimated another bivariate

logit model for greater perceptions of community benefits, as a function of financial capital, participation, proximity to the river, and resident reports of tourism frequency all while controlling for government endorsement of particular communities (See Table 20). Results suggest that perceptions of community benefits due to tourism is primarily due to more frequent tourist visits to the community and secondly participation in ecotourism during ProManejo. Government endorsement of ecotourism communities was not significant at a 90% confidence level, suggesting that frequent tourism visitation is most strongly related to perception of benefits rather than ecotourism community designation and advertisement.

Table 20 Logit Model Estimate for Perceived Community Benefits From Tourism

		Perceived Community Benefits (n=159, pseudo R^2 = 0.27)			
Parameter	**Name**	**Est.**	**Std. Err.**	**Chi-Sq**	**p-val**
Intercept		-1.34	0.40	11.35	0.0008
Household received pension in 1997	Retire97	0.42	0.48	0.77	0.38
Past Participation (1999-2006)	Pastpart	1.19	0.42	8.13	0.0043
Minutes to River	Minriv97	-0.006	0.01	0.29	0.59
Tourism Frequency (1997-2006) (Ref =0)	Sometimes	0.54	0.40	1.80	0.18
	Weekly	3.72	1.08	11.7	0.0006
Government Endorsement & Advertisement (control)	Eco	0.64	0.41	2.51	0.11

As part of the ProManejo forest management strategy, each community enacted visitor taxes with the purpose of increasing community welfare. A government official reported that revenues from these visitation taxes are used for the betterment of entire

communities. However, when I asked about this Maguari, the community representative reported that revenues had been used on the community center, signage, and trails. This suggests some confusion about the revenues, because that infrastructure was actually funded by ProManejo itself.

Actual Impacts

Four indices were used to proxy household wealth: house quality, land ownership (type and quantity), and livestock ownership (type and quantity). Asset indices (physical, liquid, and household assets) were not significantly different between participant and non-participant households, however by breaking down the indices we find two of the wealth measures significantly different in explaining participation.

While Brazilian national forests are public domain and cannot be 'owned', we contend that households have a socially recognized 'ownership' of plots that can be seen as productive asset wealth. Results suggest that ownership of rubber plots, traditionally used to extract latex, is more likely among households that participated in tourism (with strength statistic Cramer's V = 0.13). However the size of those plots and the change in ownership were not significant in explaining participation.

Fifty-three percent (114) of households extracted latex in 2006 and of that, 28% (32) households participated in ecotourism during ProManejo. Rubber plot ownership is likely explained by complimentary activities such as ecotourism participation and lesser dependence on land intensive agriculture. Extracting latex, a common use of rubber trees, is not strenuous and depending on the size of the plot can be a morning chore. Therefore age of

household head, size of family, participation in ecotourism, and changes in agriculture land ownership were tested as explanatory variables to plots ownership. The logit model was significant (pseudo $R^2 = 0.13$), suggesting that ownership of rubber plots can be most explained by household participation in tourism, followed by smaller households, less agriculture land in 2006 compared to 1997, and older heads of household.

Table 21 Logit Model Estimate for Rubber Plot Ownership in 2006
(n= 206, pseudo $R^2 = 0.13$)

Parameter	Variable	Estimate	Std. Err.	Chi-Sq	P-val
Intercept		-1.16	0.70	2.67	0.102
Past Participation in Last 9 Years	Pastpart	0.82	0.36	5.12	0.024
# People in Household (2006)	Family06	-0.14	0.06	5.29	0.021
Head of Household Age (2006)	Agehh06	0.04	0.01	10.6	0.001
Change in agriculture land	n_agchg	-0.05	0.03	3.64	0.056

Secondly, participant households owned fewer cattle compared to non-participant households (at a 85% confidence level), yet increased their cattle ownership by a greater margin during ProManejo that non-participant households. In 1997, approximately 22% of households who owned cattle were also participating in tourism, yet by 2006 that percentage grew to 26%. This increase is demonstrated by the 30% of households, who participated in tourism, that have increased their herd size. In contrast, only 19% of households who did not participate increased their herd size during ProManejo.

IMPLICATIONS AND CONCLUSIONS

As a sustainable use protected area of Brazil, the forest management plan permits traditional populations to reside within the forest. Tapajós National Forest was used as a pilot study of community-based forest management strategies, otherwise known throughout the Amazon as ProManejo. Ecotourism projects were one of many market-based policy tools employed to decrease deforestation and encourage sustainable livelihoods. However, there were many projects funded by ProManejo aimed at improving wellbeing— programs such as health programs, community forest management, and marketing traditional oils to name a few. A previous study by Bauch (2010) found that community-based microenterprises funded by ProManejo increased household income, but did not affect measures of household wealth and wellbeing.

Participation

As Kruger (2005) and Scheyvens (1999) suggest, local community involvement in tourism development is vital for a sustainable ecotourism destination. As part of the forest management plan, community-elected representatives are responsible for communicating resident concerns to larger governing bodies. Ecotourism planning meetings were held between 1999-2006, politically empowering local residents. While we know these meetings occurred, it is hard to know the degree to which the residents participated. Given their inexperience with the tourism industry and market, we believe residents were minimally active in the development plans, resulting in a lack of broad-based participation. During my fieldwork, only one respondent perceived an unequal distribution of tourism revenues within

communities, granted I spoke predominantly to those highly involved in tourism. The NGO representative that negatively viewed ecotourism development within the TNF criticized its approach as unsustainable. He said visitation was centered in Jamaraquá and Maguarí, with strong familiar ownership of tourism rather than community ownership, resulting in only a select few households to receive benefits. The NGO works with communities inside the TNF (but not in tourism) and offers unique, small scale cultural and ecotourism opportunities to communities northwest of the TNF. Selection of communities outside of the TNF was deliberate and in response to the NGO's goals for sustainable ecotourism development. Large case study analyses, like Kruger's (2005) research on sustainable ecotourism destinations and Brooks' et al. (2006) study of successful ICDPs, local participation in tourism development is essential.

Analyses suggest differing forms of capital (physical, liquid, and financial) are not barriers to participation in tourism for the TNF. However as newer forms of participation become significantly more lucrative, specific capital, such as boats for transportation or spare bedrooms for guests, are required. As of 2012, the most lucrative form of local participation is providing homestays to tourists, which includes 3 homemade meals and a bed, at a cost of R$40 (USD $20) per day (as of February 2012). Homestays are a fairly new concept in the TNF, starting after ProManejo funding ended. They are normally pre-arranged by ICMBio or through tourism agencies, severely limiting independent visitation. Community representatives, who have more conveniences for hosting visitors, usually provide homestays and ultimately capture most of the profits, contributing to unequal income distribution.

Spillover benefits, such as gifts from guests or purchases in their convenience stores, may also increase the wealth divide. Community-owned, rather than privately owned, accommodations may decrease the wealth divide by involving many families. Maguari and Jamaraqua took a similar approach when building artisan shops that benefit the working collective.

Impacts

Residents I spoke with in the TNF expressed indifferent or negative feelings towards ProManejo. One resident said ProManejo did nothing to help his community or family, but attributed an improvement in quality of life to other more recent projects. In 2004, two years before the end of ProManejo funding, Projeto Tecbor (financed by Bank of Brasil) built a new store in Jamaraquá to sell handicrafts made of seeds collected in the forest and latex extracted from rubber trees. This project was developed by the University of Brasilia and employs 5 families in the community. The government has also implemented other projects since the end of ProManejo, including Casa Vida. Under this program for the past five years, the government has built new homes for residents of the TNF using desirable and durable building materials, such as cement floors/walls and tile roofs. However, one resident expressed disgust with the government because his community had not received these new homes like surrounding communities. Interestingly, I found the representative of this community no better off than his neighbors, unlike the very obvious differences between community representatives and residents of Jamaraquá and Maguarí, where Projeto Tecbor (Jamaraquá only) and Casa Vida had been implemented.

Greater perceived household wellbeing does not correlate with any of the more traditional indicators of socio-economic status, such as ownership of durable goods, agriculture land, or house quality, measured in a household survey at the close of the ecotourism project, with the exception of fewer cattle ownership and ownership of rubber plots. This may be because the survey did not measure relevant dimensions of wellbeing or because improvements in wellbeing did not yet manifest in concrete indicators like assets owned. Perhaps future studies should include indicators such as improved self-esteem, frequency of high quality meats consumed, or access to greater economic opportunities, such as business entrepreneurship.

We explored the lack of relationship between participation and wealth indices based on personal observations and key informant interviews in two of the communities most often visited by tourists, five years after the survey. We find that the impacts of tourism likely depend on the type of participation, e.g. as a tourist guide or as a host providing lodging and meals. As tourism to the forest increased, the need for overnight accommodation increased. Thus, a system of "homestays" was developed during the five years after the official end of the ecotourism project. In Jamaraquá and Maguarí, two households (one in each community) have since built lodging specifically for tourists. Households I spoke with began hosting tourists in 2007 and 2008. One resident from Jamaraquá said that in the last year, his family hosted visitors for one night but he did not want to continue hosting tourists because another family in the community has better facilities for tourists – specifically, a new 2-story, open-air cabana. In both communities, the hosts were community representatives who lived along

the main road and close to the river. Informants in nearby communities not involved in tourism confirmed that a clear hierarchy in socioeconomic status had emerged in the communities that receive tourists. However, residents of communities more often visited by tourists reported that benefits such as employment in community-owned artisan shops had improved their wellbeing and contributed to the overall good of the community.

Other opportunities in the tourism sector, such as guiding services (R$40, USD$ 20 as of February 2012), are more widely spread out across households, while homestay providers tend to be community representatives. Guides are called on a rotating basis while households with tourist specific accommodations monopolize homestays. While differences in wealth seem to be affiliated with type of participation, it is positive to note that guides and hosts are both locals. Previous studies suggest that outsiders and/or foreigners benefit most from ecotourism—owning businesses or capturing the skilled jobs, rather than local residents (He et al. 2008; Yuan 2008; Van Schaardenburgh 2002; Walpole & Goodwin 2000; Lindberg et al. 1996; Mbaiwa 2005).

While ownership of a rubber plot can arguably be a consequence of changing land use priorities and not a welfare indicator. Land ownership is important to consider because ownership affords a variety of types of tourism participation (direct and indirect), including showing rubber production processes to tourists and/or producing rubber that is eventually used to make handicrafts sold to tourists. Rubber trees are highly abundant in this region and take years to reach a stage for harvesting latex. Therefore it is unlikely that residents created rubber tree plantations to encourage tourism. Latex extraction is a large part of life in the

Amazon. Within the TNF, motivated residents sell latex to the cooperative COOMFLONA. Communities within the TNF have created handicraft businesses to sell latex products within the forest as well as in the regional market. Items include: purses, shoes, and notebooks. Participation by way of selling products could mean an increased interest in rubber production. Perhaps the conclusion that participant households own more rubber plots is a function of an entrepreneurial spirit, hoping to produce the supply for a growing tourist demand. Interestingly, significantly more families are cutting rubber in 2006 than were in 1997, however indifferent between participant and non-participant households in 2006.

In sum, consistent with much of the literature on ICDPs, we find little evidence that tourism benefited participating households by the close of the official project and end of financing, leaving them economically disempowered. However, overall wealth did improve among households surveyed, evidenced by increases in asset indices. Five years later, we find that tourism continued to evolve, and that particular households in the communities receiving the most tourists were able to build on the physical and human capital created under ProManejo and benefit from tourism - but these benefits do not appear to be widely distributed in the communities, and they are difficult to attribute to ecotourism, separate from the many other interventions by government and NGOs in the region. Future studies should consider social capital, such as kinship to community representatives, as an independent variable that may influence distribution of benefits and would be of great interest to tourism planners and researchers alike.

ENVIRONMENTAL IMPACTS OF TOURISM

One of the main tenants of ecotourism is to contribute to conservation and minimize environmental impacts. Due to infrastructure development and subsequent wildlife disturbance, ecotourism is not without environmental consequences (Koens 2009). However, participation in ecotourism can also lead to more pro-conservation attitudes and greater environmental awareness by local populations (Koens 2009; Wyman & Stein 2010a; Stem et al. 2003; Bascomb 2008; Almeyda 2010a; Liu et al. 2012).

FOREST RELATIONSHIP

Do these pro-conservation attitudes influence behavior? Ajzen and Fishbein's (1980) theory of reasoned action was used by Lepp (2007) to explain the relationship between attitude and behavior. According to the theory, behavioral intent creates a positive association. Lepp (2007) describes the case of Uganda's Magombe Swamp, where a community-based conservation group fostered positive attitudes towards conservation, leading to a reduction of land clearing and ultimately resident protection of the swamp.

One of the goals of ecotourism is to encourage more sustainable use of local natural resources, including reducing land uses that require deforestation and increasing sustainable use of the forest such as collection of non-timber forest products. Literature suggests that local involvement in ecotourism can reduce deforestation and promote more sustainable forest uses (Almeyda 2010a, 2010b; Kruger 2005; Wunder 2000). However, in areas where tourism income shares are low, ecotourism may have little effect on activities like cattle

ranching and cash crop production (Wunder 2000). Kruger (2005) reviewed 251 ecotourism case studies and found that if participating households did not economically benefit substantially from tourism, they did not switch to more traditional and sustainable uses of resources.

Households engaged in tourism have been shown to have greater environmental awareness. In China, Liu et al. (2012) found that households participating in ecotourism perceived more negative environmental impacts from tourism compared to non-participating households. In Costa Rica, Almeyda (2010a) found employees of the Lapa Rios eco-lodge to have significantly higher knowledge concerning biodiversity, conservation, and ecotourism. While both neighbors and employees thought tourism positively impacted fauna and flora, employees thought the impacts where significantly greater than their neighbors.

Wyman & Stein (2010b) characterized local involvement in conservation strategies in Belize into three categories: ecotourism employment, conservation pledge (voluntary pledge to decrease deforestation), or both employment and pledge. They found that both participating in tourism *and* signing the pledge is positively related to decreased deforestation. Tourism-only and pledge-only involvement increased the probability of deforestation, which they attribute to perceived inequality in the distribution of benefits. Of the 15 significant variables tested in a binomial logit regression model on deforestation, 11 variables had stronger influences on the probability of deforestation than tourism-only and 9 variables were stronger than tourism and pledge together. Factors like large cattle herds, numerous agriculture plots, low cattle income and lesser-educated households have strong

explanatory power for deforestation. Thus, while Wyman & Stein (2010b) did find a relationship between local participation and the goals of ecotourism, many other factors have stronger explanatory power.

Ecotourism has been portrayed as an incentive for conservation but researchers have found that tourism alone is unlikely to reverse traditional land uses that it aims to curb (Wunder 2000; Wyman & Stein 2010b). Thus, it has been recommended that ecotourism be promoted in conjunction with other community enterprises (Salafsky 2001; Wunder 2000).

Hypothesis

My objective is to test the hypothesis: Households participating in tourism are more likely to engage in activities that conserve the forest. Crop production, sale, and purchase are indicators of activities requiring deforestation, and non-timber forest product collection, use, and purchase are indicators of pro-conservation land uses. T-tests and Chi-square tests are used to test relationships between these indicators and participation in the last 9 years and in 2006.

Crop Production

In 2006, of the four staple crops grown in the region (manioc flour, maize, beans, rice), 81% of households planted at least one crop, 41.7% of households sold at least one crop, 96.3% of households bought at least one crop, and 80.6% of households consumed at least one crop produced in 2006. As seen in Table 26 the variety of crops planted, sold, and consumed has significantly decreased while the number of staple crops purchased increased between 1997 and 2006. This may indicate a shift towards a more cash-based economy

during the 9-year survey interval. In fact, the back half of the public buses between Santarém and the TNF are reserved for transporting goods. During my fieldwork, I noticed many residents transporting rice, corn, and bananas on public buses, suggesting continued integration into the regional cash economy.

The number of staple crops planted in 2006 by past participant households is significantly higher than the number planted by non-participants (p-val= 0.06). The number of crop purchases and crop sales were not significantly different between participant and non-participant households. The quantity of staple crops produced for consumption (measured in kg per capita) was also significantly higher for participant households (p-val = 0.089), while the quantity bought was significantly lower for participant households (p-val = 0.003). Quantity sold was not significantly different. Average quantity produced (for sale and consumption) was higher in participant households, although not significantly different between household groups (p-val = 0.27), meriting further investigation of impacts of participation on crop production. It seems counter intuitive that households that have participated in ecotourism, theoretically receiving more economic benefits, are producing more for consumption; however it may suggest that they are not economically benefiting enough from tourism.

These findings suggest that participation in tourism had an effect on diversity of staple crop production, but not necessarily how the land is used (production for consumption v. sale). Number of plots owned in 2006 (p-val = 0.83) was not significantly different between participant and non-participant households, which would be consistent with similar

crop production. Fertile soils could potentially explain greater production (for consumption) in participant households, since only 3% (7) of the households reported the use of fertilizers in 2006. Six of those households were not involved in ecotourism.

Table 22 Agriculture Production (Kg/ Capita) by Past Participation
(*** significant at 1%; ** significant at 5%; * significant at 10%)

2006 Variables	***Non-Participant HH***			***Participant HH***						
Definition	**Obs.**	**Mean**	**Std. Dev.**	**Obs.**	**Mean**	**Std. Dev.**	**Test Stat**	**p-val**	**Sign**	**Test[1]**
Crops Planted	166	224.9	315.4	50	280.0	289.8	-1.1	0.27		t
Crops Produced for Consumption	166	144.8	194.7	50	198.8	200.5	-1.71	0.089	*	t
Crops Produced for Sale	166	80.05	206.8	50	81.20	159.6	-0.04	0.97		t^
Crops Purchased	166	118.7	191.4	50	65.00	66.80	3.05	0.003	***	t^

After closer examination of variety and quantity of staple crop production, the relationship between participation and agriculture was not conclusive. There is no evidence in support of the hypothesis that forest uses associated with deforestation (i.e., total crop production) are employed less by households who previously participated in tourism.

Forest Products

The use of non-timber forest products is an indicator of a household's traditional dependence on forests. In 2006, on average households collected 4 non-timber forest products, used 5, and sold less than one. Overall, the number of NTFPs used was greater in 2006 than 1997, but the number collected was not significantly different (p-val = 0.04, 0.57

[1] Statistical Tests—T-test (t); T-test with unequal variance (p-val <0.01) use Satterthwaite t-value (t^)

respectively). And the sale of NTFPs decreased between 1997 and 2006 (p-val = 0.007). See Table 34 for a full list of behavioral responses tested.

Counts of NTFPs (0-11) collected and used in 2006 were not significantly different in participant and non-participant households. However leite-do-amapá, breu jutaiçica, and honey (common Amazonian non-timber forest products) were more often collected in participant than non-participant households (p-val = 0.03, 0.08, 0.04 respectively). If we expand to an 85% confidence level, the diversity of NTFPs sold in 2006 was significantly higher in participant households than non-participant (See Table 23), meriting further attention.

Table 23 Non-Timber Forest Product Dependence by Past Participation (n=216)
(*** significant at 1%; ** significant at 5%; * significant at 10%; (*) significant at 15%)

2006 Variables	***Non-Participant HH***			***Participant HH***						
Definition	**Obs.**	**Mean**	**Std. Dev.**	**Obs.**	**Mean**	**Std. Dev.**	**Test Stat**	**p-val**	**Sign**	**Test[1]**
# NTFPs Collected	166	3.82	2.19	50	4.28	2.41	-1.27	0.2		t
# NTFPs Used	166	5.11	2.55	50	5.08	2.89	0.07	0.95		t
# NTFPs Sold	166	0.29	0.66	50	0.52	0.97	-1.57	0.12	(*)	t^

The use and collection of andiroba seeds (traditionally used to make medicinal oils) significantly increased between 1997 and 2006, but the sale of andiroba products remained constant. Surprisingly, households who participated in ecotourism in the last 9 years used andiroba products significantly less than non-participant households (p-val = 0.03). This

[1] Statistical Tests—T-test (t); T-test with unequal variance (p-val <0.01) use Satterthwaite t-value (t^)

implies a shift away from traditional medicines like andiroba and perhaps a shift towards modern medicine. During my walk through the forest of Maguarí, my guide did point out several medicinal trees, but admitted that his family did not use them frequently. In contrast, my host in Acaratinga had recently collected a large quantity of andiroba seeds with the intentions of making oil.

In 2006, almost 51% of households made or sold forest products like canoes, paddles, brooms, etc. However, only 9.4% of households admitted to extracting timber and 21% admitted to collecting palm leaves (used for building materials and handicrafts) more than once per year. Neither timber nor palm leaf harvest frequencies were significantly different between households. Households who made or sold items using forest products discussed throughout this section were more likely to have previously participated in tourism (p-val = 0.02).

After exploring the relationship between pro-conservation land uses and previous participation in tourism, I reject the hypothesis that participation in tourism increased participation in conservation-compatible forest uses.

Table 24 Tourism Life Cycle Stages by Butler (1980)

Exploration

- *Few tourists/ irregular visitation*
- *Explorers make own travel arrangements*
- *No tourist facilities*

Involvement

- *Tourist facilities*
- *Some tourism advertisement*
- *Tourist season exists*
- *Some organization for tourist transit*

Development

- *Well defined tourism area*
- *Local involvement and control of tourism declines*
- *Modern facilities replace the old*
- *Peak season can double population*
- *Labor imported*

Consolidation

- *Rate of increase in number of visitors decreasing*
- *Major part of economy relies on tourism*
- *Major chains exist*
- *Tourist industry restricts locals*

Stagnation

- *Peak number of tourists reached*
- *The area will be well-established tourism location, but no longer popular*
- *Location begins to attract conventions and large groups, not individuals*

Decline

- *Nearby newer attractions become more popular*
- *Tourist facilities start to disappear with disappearing vacationers*
- *Property turnover is high*

Rejuvenation

- *Becomes a unique location*
- *Specific interest group targets a new market*

IMPLICATIONS AND CONCLUSIONS

As Integrated Conservation and Development Projects (ICDPs) continue to proliferate within and surrounding protected areas, it is critical to assess their effectiveness in conserving natural resources and improving local livelihoods. The internationally-funded ProManejo initiative piloted key ICDP strategies, including community involvement in ecotourism, in the Tapajós National Forest. This thesis assesses local participation in ecotourism as one of many market-based policy tools employed to reduce deforestation and improve wellbeing.

THEORY

Government Identification of Ecotourism Communities

In theory, the existence of community-based tourism depends on the devolution of decision-making power to communities in an equitable relationship with large tourism industry (Mitchell & Reid 2001; Wunder 2000). ProManejo introduced the community-based approach to tourism development in the Tapajós National Forest. The intention was for government agencies, elected community leaders, and local residents to work together to develop sustainable forest management strategies, including tourism. However, the local residents have very minimal knowledge of the tourism industry, suggesting that community meetings were to a large extent run by outsiders with more intimate knowledge of the industry. Consistent with the CBT approach, community meetings provided a forum for residents to express concerns and participate in the decision making process. However, there

is no mechanism that allows the community to work with the "outside" or commercial tourism industry. As Mitchell & Reid (2001) demonstrated in Peru, as outside tourism grows, local control and regulation of tourism development decreases. In the case of the Tapajós, the commercial tourism industry has grown alongside CBT. Tourism operators have long brought tourists to visit the TNF, and ProManejo did not take away their business by promoting CBT. If anything, Promanejo and the outside tourism industry have had a symbiotic relationship, with both contributing to increased tourism in the region, albeit mostly in the communities preferred by the tourism agencies. These preferences are based on travel costs to communities, surrounding attractions, and available tourist accommodations, which essentially results in tourism agency endorsement of only 2 out of 20 communities in the forest.

As described by Seaton (1997), political hostility has grown among some residents who see ProManejo as a government's failed attempt to adequately address their community's needs. Seaton (1997) suggests that such resentment is often seen in socialist societies and/or government controlled tourism. The lack of authentic participation, as defined by Tosun (1999), suggests that the TNF has suffered from outside control of tourism development. Factors outside of the communities' control, such as transportation and advertisement, usurp power from the locals.

Household Participation

After categorizing case studies based on their stage of development, as defined by Butler (1980), we realize that the drivers of participation in tourism remain fairly constant

across different stages of development. Communities in the earliest stage are notably more fearful of development, due in part to their unfamiliarity with the tourism sector (Bascomb 2008; Gurung & Seeland 2011). As the destination develops, gender roles evolve and specialize (Swain 1989; Stronza 2005; Almeyda 2010a, 2010b; Belsky 1999), but greater capital is a strong and consistent determinant of participation regardless of development stage (Gurung & Seeland 2011; Hernandez et al. 2005; Liu et al. 2012; Belsky 1999). In the TNF, communities exhibit characteristics of Butler's (1980) exploratory phase—few tourists/ irregular visitation, no tourist facilities— potentially moving towards the involvement phase—advertisement, tourist specific facilities—in select communities as destinations evolve. Determinants of participation in the exploratory phase (1997-2006) and exploratory/involvement stage (2006) are overlapping but also evolving as suggested by the literature.

Environmental Impacts of Participation

As with the socioeconomic impacts discussed earlier in this thesis, the lack of impacts due to tourism is likely because of the early stage of development. Yet integration into the marketplace was significantly different among participants vs. non-participants. While overall crop production was not affected by previous tourism involvement, non-participants did purchase more crops, suggesting greater integration in the cash economy. In contrast, households who previously participated in tourism showed greater involvement in the sale of NTFPs. These results suggest there may be an interaction between participation and market integration, warranting further research.

MANAGEMENT OF TNF

Government Identification of Ecotourism Communities

So what does all this mean for the national forest? From the outside, it appears that community-based tourism is actually driven by government promotion and tourism agencies' preferences, rather than highly interested or involved residents. While local participation is important, government endorsement and advertisement (brochures and website content), infrastructure (road access and public transportation options), and tourism agency packages have the greatest influence over tourism flows.

While government offices located in Santarém do provide assistance in planning independent trips to the national forest, they are not intuitive places for tourists to seek out information. Unfortunately, this region does not have a tourist information center dedicated to independent travelers. Tourism agencies offer pre-packaged tours, which show a version of the communities that they think will be most attractive to tourists. The government could help redress the minimal local control of tourism and improve community participation by investing in infrastructure such as independent information centers and transportation.

Household Participation

Several key explanatory variables (from 1997) are repeatedly significant in past and current participation models. They include number of males, age of head of household, forest dependence, community attachment, and residence in government endorsed ecotourism community. After holding socio-demographic and residence characteristics constant, participating households also collect a greater diversity of NTFPs.

Past (1997-2006) and current (2006) participation were found significantly more likely among households dependent on sustainable forest uses, suggesting a compatible symbiotic relationship between resident and conservation goals. This is important for tourism planners to understand because households more dependent upon the diversity of non-timber forest products could incorporate the collection, production, and sale of NTFPs into tourism development plans. As it turns out, in two of the three communities I visited, successful artisan shops sold many handicrafts made from NTFPs.

The relationship between number of males and participation was stronger for formal past participation (1997-2006) than for the more inclusive participation measure (2006), suggesting gender plays a role in the form of participation, not necessarily the actual participation itself. Traditional household roles are common in the TNF, consistent with the dominance of male guides and female artisans.

While younger heads of households have significantly higher probability of past participation, recently arrived households have significantly higher probability of current participation. This could suggest that residents are moving to take advantage of tourism opportunities, because the perceived benefits of relocation now eclipse the costs. Older, established residents may come to resent the community changes as Doxey (1975) explains in his resident-tourist irritation framework and Van Schaardenburgh (2002) demonstrates in Costa Rica. Tourism managers should be aware of resident movement, as they are likely to relocate for greater access to markets. During my fieldwork, I spoke to one resident who

moved from one neighboring community to another, recognizing the greater opportunities Jamaraqua presented.

Proximity to the river and community centers also predict participation in 2006 but not in the past (1997-2006). Ironically enough, three of the four community leaders I visited in 2012 lived next to the water. The fourth was a new family and had only been recently elected within the past few months, suggesting continued evolution of the local hierarchy. Due in part to residential zoning, generations of family members live on the same property as their ancestors. Waterfront residences suggest an underlying property wealth that may be related to initial involvement as community representatives.

Environmental Impacts of Participation

Using the definition of ecotourism as a guiding compass, the ICDP as a whole was unable to conserve the forest by preventing deforestation. In fact, the extent of deforestation between 1997 and 2005 grew by an average of 7.95% within a 5km buffer of each community. Changes in forest cover from 1997 to 2005 ranged from -0.42% in Jamaraqua to -18.51% in Prainha II. Due to the small number of communities, we did not analyze deforestation statistically, but anecdotal evidence suggests that communities highly engaged in ecotourism are associated with low deforestation. For example, Jamaraqua (-0.42%) and Maguari (1.27%) are two communities with the most advanced tourism development in the TNF and also exhibited some of the lowest changes in forest cover between 1997 and 2005. Future research on community participation in tourism and rates of deforestation would definitely be of interest in this area for tourism development professionals.

RESEARCH AND FUTURE ANALYSIS

Government Identification of Ecotourism Communities

Future analysis should focus on the degree of authentic participation in the communities endorsed by the government, in order to better understand the effects of government promotion. While the government clearly can exert significant influence through its endorsement and advertisement of particular communities, many other factors such as lack of transportation infrastructure or minimal artisan market access can discourage tourists from visiting a community. Future research should define a clear set of indicators for the level of community participation, in order to better understand outside pressures, such as advertisement and politics. More in-depth, detailed research on the community-government-tourism agency relationships is merited, given the importance of these relationships for the degree of local control over tourism development, degree of economic integration into the community, and tourism volume. Future research could also benefit greatly from better record-keeping on tourism in the Tapajós, including actual visitation data.

Household Participation

Future research on household participation should examine the role of social networks and relationship with community leaders. As evidenced in my fieldwork, households most integrated into tourism were the community leaders of Jamaraqua and Maguari. These same households were the middlemen between government and tourism agencies to community residents, arranging tourist activities via personal cell phones. While

this is a logical set up, it means that households 'in the know', such as relatives or close friends, are more likely to become involved in tourism.

In addition to social networks, future studies should certainly include age, number of males, community attachment, forest dependence, and especially endorsement by government and tourist agencies. Forms of natural, physical, and financial capital merit further research as well, as this thesis drew tentative conclusions about the increased likelihood of participation among wealthier-but land poor- households. Finally, while panel data mitigate concerns about reverse causality, new problems are introduced by employing panel survey data collected many years apart. Many household characteristics can change within 9 years, diminishing the relevance of the earlier characteristics and the explanatory power of the models.

Environmental Impacts of Participation

For future tourism managers, it will be important to monitor the behavioral and attitudinal impacts of community and household involvement in ecotourism. While the government representative I spoke with perceived tourism to have little impact on conservation attitudes and pro-conservation behaviors, one of the tourism agents I interviewed felt that as a result of tourism, people became more interested in forest conservation. During my visit to the TNF, the residents I spoke with were very proud of their forests. Along my hike to the primary forest, my guide pointed out a tree that had recently been destructively harvested for bark, a tree by-product typically used in beauty products. He believed residents of Belterra (the nearest sizeable town outside of the TNF) had come into

his forest and illegally harvested the bark. He was ashamed and saddened to see destruction in the forest, which he blamed on illegal forest use. He placed blame on outsiders entering the forest, not members of his community. As of 2012, it is my opinion that ecotourism has done little to encourage conservation of the entire national forest, but in pockets like Maguari (which receives a majority of the ecotourists), it has fostered greater awareness about forest conservation.

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APPENDICES

Appendix A

Table 25 Population and sample size by community

	Number of Households in Community		Number of Households Surveyed		
Community	**1997**	**2006**	**1997**	**2006**	**1997 & 2006**
Within TNF:					
Itapuama (1)	13	7	11	5	4
Paraíso (2)	12	10	9	6	6
Itapaíuna (3)	36	33	21	22	13
Prainha II (4)	53	23	20	15	6
Prainha I (5)		36		11	8
Taquara (6)	29	26	0	12	0
Pini (7)	30	26	17	17	12
Chibé (8)	100	46	41	11	6
Tauarí (9)		49		29	16
Nazaré (10)	38	35	17	18	12
Marai (11)	18	17	13	10	1
Bragança (12)	23	12	3	5	1
Marituba (13)	23	18	11	14	8
Piquiatuba (14)	70	57	36	34	20
Pedreira (15)	49	46	28	31	20
Jaguararí (16)	22	35	20	21	11
Acaratinga (17)	21	24	9	11	7
Jamaraquá (18)	19	15	12	12	10
Maguarí (19)	52	53	24	30	24
São Domingos (20)	36	50	16	17	16
Outside TNF:					
Santa Cruz (21)	17^	17	14	13	9
Revolta (22)	29^	29	9	11	6

^Population data not available for these two communities for 1997, so 2006 population data substituted.

Appendix B

Table 26 Descriptive Statistics & T-tests Between 1997 and 2006 data (n=216)
(*** significant at 1%; ** significant at 5%; * significant at 10%)

Definition	Year	Variable	Obs	Mean	Std. Dev.	Min	Max	Med	T-val	Sign
Socioeconomic Characteristics										
Age of male head of household	1997	page97	196	44.64	15.39	20	99	42.5	-7.59	***
	2006	page06	202	49.79	14.17	17	89	48		
Age of female head of household	1997	mage97	202	41.92	15.85	16	99	41	-6.76	***
	2006	mage06	190	48.35	14.95	18	85	48		
Age of head of household (defer to female if no male)	1997	agehh97	216	45.72	15.73	17	97	44.5	-5.07	***
	2006	agehh06	215	50.40	14.66	17	89	48		
Ave. age of head of household	1997	aagehh97	216	44.31	15.46	17	97	43.5	-6.04	***
	2006	aagehh06	215	49.42	13.78	17	84	47.5		
# of people in household	1997	family97	216	5.73	2.70	1	13	5.5	0.65	
	2006	family06	216	5.60	2.57	1	15	6		
# of children (<5 years old)	1997	nokd97	216	1.12	1.20	0	4	1	6.75	***
	2006	nokd06	214	0.52	0.80	0	3	0		
Ave. yrs of education head of household	1997	eavehh97	206	3.14	1.78	0	10	3	-3.49	***
	2006	eavehh06	188	3.81	1.84	1	12	3.5		
Yrs of education of head of household	1997	eduhh97	206	3.05	1.95	0	10	3	-4	***
	2006	eduhh06	202	3.81	2.23	1	13	4		
Years in Community	1997	comm97 hh	212	35.32	19.15	1	89	34.5	4.34	***
	2006	comm06 hh	202	41.86	18.78	2	89	42.5		
If receives pension	1997	Retire97	216	0.24	0.43	0	1	0		
	2006	Retire06	216	0.38	0.49	0	1	0		
If receives remittances	1997	remit97	216	0.29	0.45	0	1	0		
	2006	remit06	212	0.30	0.46	0	1	0		
Distance to walk to river	1997	minriv97	214	13.56	23.33	1	120	2.5	-0.69	
	2006	minriv06	216	14.55	27.07	1	180	5		
Distance to walk to forest	1997	minfor97	207	61.42	51.23	1	360	45	-0.92	
	2006	minfor06	214	66.10	54.27	1	485	45		

Table 26 Continued

Definition	Year	Variable	Obs	Mean	Std Dev	Min	Max	Med	T-val	Sign
Behavioral Characteristics										
# of crops planted	1997	nocrop97	216	2.05	1.29	0	4	2	4.62	***
	2006	nocrop06	216	1.58	1.06	0	4	2		
# of crops sold	1997	Crop_s97	216	0.90	0.85	0	4	1	5.77	***
	2006	Crop_s06	216	0.52	0.67	0	3	0		
# of crops for consumption	1997	Crop_c97	216	1.93	1.34	0	4	2	3.2	***
	2006	Crop_c06	216	1.58	1.06	0	4	2		
# of crops bought	1997	Crop_b97	216	1.40	1.26	0	4	1	12.4	***
	2006	Crop_b06	216	2.66	1.04	0	4	3		
# of NTFPs collected	1997	ntfp_c97	216	3.81	2.76	0	11	4	0.56	
	2006	ntfp_c06	216	3.93	2.25	0	10	4		
# of NTFPs sold	1997	ntfp_s97	216	0.58	1.15	0	8	0	-2.7	***
	2006	ntfp_s06	216	0.34	0.75	0	4	0		
# of NTFPs used	1997	ntfp_u97	216	4.63	2.86	0	11	5	2.11	**
	2006	ntfp_u06	216	5.10	2.62	0	11	5		
Walking time to collection site	1997	Fpmin97	180	63.47	42.63	2	180	60		
After arrival, time collecting NTFP	1997	Fpcoll97	173	131.7	175.0	2	1440	60		
Total time to walk & collect NTFPs	1997	T_time97	172	259.9	208.1	12	1800	240		
# of trips to collect NTFPs in last year	1997	n_time97	211	6.65	11.18	0	90	3	0.07	
	2006	n_time06	211	6.70	7.75	0	60	5		
If family taps rubber	1997	corta97	216	0.17	0.37	0	1	0	2.89	***
	2006	corta06	210	0.28	0.45	0	1	0		
made /sold forest product	2006	makesell	216	0.19	0.39	0	1	0		
Last yr acai[1] collection freq.	1997	Acai_c97	206	12.6	18.8	0	52	6	3.19	***
	2006	Acai_c06	215	22.2	24.0	0	52	6		
Last yr bacaba[1] collection freq.	1997	Bacaba_c97	202	12.2	18.0	0	52	6	5.19	***
	2006	Bacaba_c06	214	21.7	22.4	0	52	12		
Last yr palha[1] collection freq.	1997	Palha_c97	206	4.4	8.8	0	52	1	-5.2	***
	2006	Palha_c06	213	2.5	7.1	0	52	1		
Last yr collection freq. of timber[1]	1997	Madeir_c97	207	2.4	6.6	0	52	0	-3.8	***
	2006	Madeir_c06	213	0.78	1.9	0	12	0		

[1] Collection frequency coded: weekly (52), monthly (12), few times (6), once (1), never (0)

Table 26 Continued

Definition	Year	Variable	Obs	Mean	Std Dev	Min	Max	Med	T-val	Sig
Wellbeing Characteristics										
If has agriculture plot	1997	agplot97	216	0.96	0.20	0	1	1	2.59	**
	2006	agplot06	216	0.90	0.30	0	1	1		
Number of Agriculture Plots	1997	n_ag97	207	6.40	6.15	1	40	4	-5.51	***
	2006	n_ag06	215	3.79	3.23	0	22	3		
If has agroforestry plot	1997	agrfor97	215	0.77	0.42	0	1	1	-0.61	
	2006	agrfor06	215	0.79	0.41	0	1	1		
If has pasture land	1997	pastur97	216	0.37	0.48	0	1	0	1.53	
	2006	pastur06	215	0.31	0.46	0	1	0		
If has rubber tree plot	1997	rubber97	214	0.50	0.50	0	1	0.50	-0.85	
	2006	rubber06	215	0.53	0.50	0	1	1		
# of ducks and chickens owned	1997	poult97	216	14.05	12.9	0	60	10	1.73	*
	2006	poult06	216	11.73	18.3	0	201	8		
# of pigs owned	1997	pigs97	216	1.11	5.52	0	70	0	2.27	**
	2006	pigs06	214	0.24	1.15	0	13	0		
Total # of cows (incl. indiv/ coll)	1997	cowttl97	216	2.14	7.96	0	75	0	-1.12	
	2006	cowttl06	216	2.64	7.95	0	70	0		
House Quality	1997	houseq97	216	0.23	0.42	0	1	0	-5.9	***
	2006	houseq06	216	0.46	0.50	0	1	0		
Liquid Assets	1997	Liqasset97	201	-0.30	1.10	-1.9	4.4	-0.41	-4.5	***
	2006	Liqasset06	200	0.01	1.09	-2.3	3.3	-0.04		
Physical Assets	1997	physasset97	189	-0.92	1.15	-2.6	3.0	-1.17	-11	***
	2006	physasset06	194	-0.05	1.24	-2.5	3.9	-0.17		
Count of Assets	1997	poss97	216	2.99	1.82	0	9	3	-8.6	***
	2006	poss06	216	4.06	1.79	0	9	4		
Perceived Wellbeing										
Family situation changed since tourism	1997	famsitchg97	102	0.11	0.31	0	1	0		
	2006	famsitchg06	159	0.27	0.45	0	1	0		
Community situation changed since tourism	2006	comsitchg06	159	1.50	0.53	1	3	1		
Satisfaction in Life Rank (likert scale)	2006	satisfac	215	3.92	0.88	1	5	4		
Life situation in last 9 years	2006	lifeimprov	215	0.80	0.40	0	1	1		
Community situation in last 9 years	2006	comimprov	215	0.78	0.42	0	1	1		

Table 26 Continued

Definition	Year	Variable	Obs	Mean	Std. Dev.	Min	Max	Median	T-val	Sign
Perceptions of Tourism										
Want tourism in the future	1997	turfut97	200	0.93	0.26	0	1	1		
	2006	turfut06	212	0.91	0.29	0	1	1		
Tourism frequency in last 9 years	2006	ptfreq06	216	12.6	16.7	0	52	1		
Did tourists visit your community last year?	1997	tcom97	212	0.50	0.50	0	1	0.5		
# of occasions household saw tourists last year	2006	ntobs06	155	24.72	69.1	0	360	2		

Appendix C

Table 27 Predictor Variables (1997) for Household Participation (1997-2006)
(*** significant at 1%; ** significant at 5%; * significant at 10%)

	Non-Participant HH			*Participant HH*						
Definition	**Obs**	**Mean**	**Std. Dev.**	**Obs.**	**Mean**	**Std. Dev.**	**Test Stat**	**p-val/ t-val**	**Sign**	**Test [1]**
Socioeconomic Characteristics in 1997										
# males in family	166	2.57	1.75	50	2.88	1.78	-1.09	0.28		t
# females in family	166	1.90	1.31	50	2.20	1.09	-1.49	0.14		t
Age of male head of household	149	45.45	15.4	47	42.09	15.1	1.31	0.19		t
Age of female head of household	154	42.65	16.5	48	39.56	13.6	1.18	0.24		t
Age of household (divert* to female if no male)	166	46.48	15.8	50	43.22	15.4	1.29	0.2		t
Average age of head of household	166	45.01	15.6	50	42.02	14.9	1.2	0.23		t
# of people in household	166	5.59	2.76	50	6.18	2.46	-1.36	0.18		t
# of children (<5 years old)	166	1.12	1.23	50	1.10	1.13	0.01	0.92		wk
Average years of education of heads of household	159	3.11	1.83	47	3.22	1.63	-0.38	0.7		t
Years of education of head of household	159	3.06	1.99	47	3.04	1.83	0.04	0.97		t
# of years in Amazon	165	45.09	16.8	50	42.76	16.0	0.87	0.39		t
# of years in community	163	36.05	19.7	49	32.88	17.1	1.02	0.31		t
If receives pension	166	0.25	0.43	50	0.52	0.97	0.47	0.49		w
If receives remittances	166	0.31	0.46	50	0.22	0.42	1.43	0.23		w
Distance to walk to forest	157	62.25	51.3	50	58.80	51.4	0.41	0.68		t
Distance to walk to river	164	14.01	23.5	50	12.08	23.1	0.51	0.61		t

[1] T-test (t); T-test with Unequal Variance (p-val <0.01) use Satterthwaite t-value (t^); Wald Chi-Square Test (w); Wilcoxon/Kruskal–Wallis T-test for rank sums (wk).

Table 27 Continued

	Non-Participant HH			*Participant HH*						
Definition	**Obs.**	**Mean**	**Std. Dev.**	**Obs.**	**Mean**	**Std. Dev.**	**Test Stat**	**p-val/ t-val**	**Sign**	**Test [1]**
Behavioral Characteristics in 1997										
# of crops planted	166	2.02	1.33	50	2.14	1.14	0.32	0.57		wk
# of crops sold	166	0.88	0.89	50	0.98	0.71	1.64	0.2		wk
# of crops consumed	166	1.91	1.36	50	1.98	1.30	0.14	0.7		wk
# of crops bought	166	1.40	1.28	50	1.40	1.20	0.03	0.87		wk
Last year collection freq. of acai[2]	159	12.1	18.4	47	14.4	20.1	0.43	0.51		wk
Last year collection freq. of bacaba[1]	156	11.1	17.0	46	16.0	20.7	1.26	0.26		wk
Last year collection freq. of palha[1]	159	4.69	9.12	47	3.47	7.66	1.24	0.27		wk
Last year collection freq. of timber[1]	159	2.16	6.21	48	3.25	7.89	1.47	0.23		wk
# of NTFPs collected	166	3.51	2.74	50	4.82	2.62	-2.99	0.003	***	t
# of NTFPs sold	166	0.58	1.10	50	0.60	1.34	-0.12	0.91		t
# of NTFPs used	166	4.34	2.86	50	5.58	2.66	-2.73	0.007	***	t
If sold non-timber forest products	166	0.31	0.47	50	0.36	0.48	0.38	0.54		w
# of trips to forest to collect products	163	6.15	11.3	48	8.35	10.6	-1.2	0.23		t
If uses products made from andiroba seeds	166	0.30	0.46	50	0.28	0.45	0.08	0.77		w
If sells products made from andiroba seeds	166	0.04	0.20	50	0.02	0.14		0.68		f
If collects andiroba seeds	166	0.15	0.36	50	0.08	0.27		0.24		f
Whether family taps rubber	166	0.18	0.39	50	0.12	0.33	1.02	0.31		w

[1] T-test (t); T-test with Unequal Variance (p-val <0.01) use Satterthwaite t-value (t^); Wald Chi-Square Test (w); Wilcoxon/Kruskal–Wallis T-test for rank sums (wk).
[2] Collection frequency coded: weekly (52), monthly (12), few times (6), once (1), never (0)

Table 27 Continued

	Non-Participant HH			*Participant HH*						
Definition	**Obs.**	**Mean**	**Std Dev**	**Obs.**	**Mean**	**Std Dev**	**Test Stat**	**p-val/ t-val**	**Sign**	**Test [1]**
Wellbeing Characteristics in 1997										
If has agriculture plot	166	0.95	0.23	50	1.00	0.00		0.12		f
# of agriculture plots	157	6.30	5.99	50	6.69	6.68	-0.39	0.70		t
If has agroforestry plot	166	0.75	0.44	49	0.84	0.37	1.71	0.19		w
If has pasture land	166	0.34	0.47	50	0.46	0.50	2.49	0.11		w
If has rubber tree plot	165	0.48	0.50	49	0.57	0.50	1.3	0.25		w
# of ducks and chickens owned	166	13.24	11.9	50	16.72	15.81	-1.44	0.16		t^
# of pigs owned	166	1.02	5.89	50	1.42	4.14	-0.54	0.59		t^
Ttl # of cows owned	166	2.43	8.81	50	1.18	3.90	1.43	0.16		t^
House Quality	166	0.20	0.40	50	0.30	0.46	1.98	0.16		w
Liquid Assets	156	-0.32	1.09	45	-0.21	1.11	-0.59	0.55		t
Physical Assets	148	-0.93	1.17	41	-0.88	1.09	-0.28	0.78		t
Count of Assets	166	2.94	1.79	50	3.14	1.93	0.49	0.48		wk
Attitudinal Characteristics in 1997										
Family situation changed since tourism	73	1.92	0.36	29	1.93	0.37	0.03	0.87		wk
Want tourism in the future	154	0.92	0.27	46	0.96	0.21		0.53		f
Involvement in Tourism in 1997										
Participation in 1997 (2 forms)	166	0.04	0.20	50	0.10	0.30	2.45	0.12		w
Participation in 1997 (3 forms)	166	0.11	0.32	50	0.26	0.44	6.45	0.01	**	w
Saw tourists in community last year	162	0.46	0.50	50	0.62	0.49	3.77	0.05	*	w

[1] T-test (t); T-test with Unequal Variance (p-val <0.01) use Satterthwaite t-value (t^); Wald Chi-Square Test (w); Wilcoxon/Kruskal–Wallis T-test for rank sums (wk).

Appendix D

Table 28 Predictor Variables for Household-level Participation in 2006
(*** significant at 1%; ** significant at 5%; * significant at 10%)

		Non- Participating HH			***Participating HH***						
Definition	**Year**	**Obs**	**Mean**	**Std Dev**	**Obs**	**Mean**	**Std Dev**	**Test Stat**	**p-val**	**Sign**	**Test[1]**
Socioeconomic Characteristics											
# males in family	1997	161	2.57	1.77	55	2.85	1.71	-1.03	0.3		t
	2006	159	2.88	1.51	55	3.05	1.57	-0.71	0.48		t
# females in family	1997	161	1.94	1.32	55	2.05	1.08	-0.59	0.55		t
	2006	159	2.88	1.51	55	3.05	1.57	-0.71	0.48		t
Age of male head of household	1997	143	45.90	15.57	53	41.25	14.5	1.89	0.06	*	t
	2006	149	50.26	14.90	53	48.47	11.9	0.79	0.43		t
Age of female head of household	1997	149	43.11	16.55	53	38.57	13.2	1.8	0.07	*	t
	2006	141	49.72	15.73	49	44.41	11.7	2.16	0.03	**	t
Age of head of household (refer to female if no male)	1997	161	46.98	15.87	55	42.05	14.9	2.02	0.04	**	t
	2006	160	51.21	15.45	55	48.07	11.9	1.37	0.17		t
Average age of head of household	1997	161	45.48	15.64	55	40.90	14.5	1.91	0.06	*	t
	2006	160	50.41	14.42	55	46.55	11.4	1.8	0.07	*	t
# of people in household	1997	161	5.59	2.78	55	6.13	2.42	-1.28	0.2		t
	2006	161	5.47	2.51	55	6.00	2.73	-1.33	0.18		t
# of children (<5 years old)	1997	161	1.08	1.20	55	1.22	1.23	0.579	0.45		wk
	2006	159	0.50	0.79	55	0.60	0.83	0.964	0.33		wk
Ave. yrs of education for heads of household	1997	154	3.09	1.82	52	3.28	1.67	-0.67	0.51		t
	2006	137	3.76	1.91	51	3.95	1.61	-0.62	0.53		t
Years of education head of household	1997	154	3.03	1.98	52	3.12	1.88	-0.26	0.79		t
	2006	148	3.78	2.20	54	3.89	2.33	-0.3	0.77		t
Years in Community	1997	158	37.21	19.60	54	29.78	16.7	2.49	0.01	**	t
	2006	151	43.9	19.0	51	35.9	17.0	2.65	0.01	***	t
Distance to walk to river	1997	159	15.02	25.19	55	9.35	16.3	1.91	0.06	*	t^
	2006	161	17.12	30.54	55	7.02	8.67	3.77	0.0002	***	t^
Distance to walk to forest	1997	152	63.51	52.40	55	55.64	47.8	1.02	0.31		t
	2006	159	69.05	58.57	55	57.58	38.5	1.65	0.1		t^

[1] T-test (t); T-test with Unequal Variance (p-val <0.01) use Satterthwaite t-value (t^); Wald Chi-Square Test (w); Wilcoxon/Kruskal–Wallis T-test for rank sums (wk).

Table 28 Continued

		Non- Participating HH			*Participating HH*						
Definition	**Year**	**Obs**	**Mean**	**Std Dev**	**Obs**	**Mean**	**Std Dev**	**Test Stat**	**p-val**	**Sign**	**Test [1]**
If receives pension	1997	161	0.26	0.44	55	0.16	0.37	2.15	0.14		w
	2006	161	0.43	0.50	55	0.24	0.43	6.82	0.009	***	w
If receives remittances	1997	161	0.32	0.47	55	0.20	0.40	2.73	0.098	*	w
	2006	158	0.32	0.47	54	0.26	0.44	0.62	0.43		w
Behavioral Characteristics											
# of crops planted	1997	161	2.02	1.31	55	2.13	1.23	0.21	0.65		wk
	2006	161	1.52	1.04	55	1.75	1.11	1.27	0.26		wk
# of crops sold	1997	161	0.84	0.86	55	1.07	0.79	4.58	0.03	**	wk
	2006	161	0.53	0.68	55	0.49	0.66	0.14	0.71		wk
# of crops consumed	1997	161	1.91	1.33	55	1.96	1.39	0.06	0.81		wk
	2006	161	1.52	1.04	55	1.75	1.11	1.27	0.26		wk
# of crops bought	1997	161	1.40	1.27	55	1.38	1.24	0.004	0.95		wk
	2006	161	2.66	1.05	55	2.65	1.00	0.0001	0.99		wk
# of NTFPs collected	1997	161	4.27	3.16	55	5.69	3.27	-2.85	0.005	***	t
	2006	161	3.76	2.15	55	4.45	2.44	-2.03	0.04	**	t
# of NTFPs sold	1997	161	0.63	1.18	55	0.75	1.48	-0.54	0.55		t^
	2006	161	0.29	0.66	55	0.49	0.96	-1.43	0.16		t^
# of NTFPs used	1997	161	5.12	3.23	55	6.49	3.35	-2.68	0.008	***	t
	2006	161	4.98	2.53	55	5.47	2.85	-1.25	0.21		t
# of trips to collect products	1997	159	6.03	10.70	52	8.54	12.5	-1.41	0.16		t
	2006	163	6.34	7.92	48	7.91	7.05	1.24	0.22		t
If use products made from andiroba seeds	1997	161	0.31	0.46	55	0.25	0.44	0.62	0.43		w
	2006	161	0.60	0.49	55	0.42	0.50	5.26	0.02	**	w
If sells products made from andiroba seeds	1997	161	0.05	0.22	55	0.00	0.00		0.21		f
	2006	161	0.06	0.23	55	0.09	0.29	0.83	0.36		w
If collects andiroba seeds	1997	161	0.17	0.37	55	0.04	0.19		0.01	**	f
	2006	161	0.26	0.44	55	0.16	0.37	2.15	0.14		w
If made and sold forest product-based items	2006	161	0.16	0.36	55	0.29	0.46	4.9	0.03	**	w
Last year collection freq. of acai[1]	1997	156	11.8	18.4	50	15.3	20.0	3	0.08	*	wk
	2006	161	21.4	23.7	54	24.5	25.0	0.2	0.66		wk

[1] T-test (t); T-test with Unequal Variance (p-val <0.01) use Satterthwaite t-value (t^); Wald Chi-Square Test (w); Wilcoxon/Kruskal–Wallis T-test for rank sums (wk).

Table 28 Continued

		Non- Participating HH			*Participating HH*						
Definition	**Year**	**Obs**	**Mean**	**Std Dev**	**Obs**	**Mean**	**Std Dev**	**Test Stat**	**p-val**	**Sign**	**Test[2]**
Last year collection freq. of bacaba[3]	1997	152	10.7	16.5	50	17.0	21.2	2.59	0.10		wk
	2006	160	21.4	22.5	54	22.3	22.4	0.22	0.64		wk
Last year collection freq. of palha[2]	1997	155	4.27	8.4	51	4.82	10.0	0.12	0.73		wk
	2006	159	2.12	5.99	54	3.67	9.81	1.7	0.19		wk
Last year collection freq. of timber[2]	1997	155	2.26	6.29	52	2.87	7.63	0.004	0.95		wk
	2006	159	0.79	1.93	54	0.76	1.74	0.22	0.64		wk
Whether family taps rubber	1997	161	0.18	0.39	55	0.13	0.34	0.82	0.36		w
	2006	157	0.26	0.44	53	0.32	0.47	0.7	0.4		w
Wellbeing Characteristics											
If has agriculture plot	1997	161	0.94	0.23	55	1.00	0.00		0.12		f
	2006	161	0.88	0.32	55	0.96	0.19		0.11		f
# of agriculture plots	1997	152	6.24	5.92	55	6.84	0.91	-0.62	0.54		t
	2006	161	3.74	3.26	54	3.94	3.19	-0.38	0.7		t
If has agroforestry plot	1997	161	0.75	0.43	54	0.81	0.39	0.91	0.34		w
	2006	161	0.81	0.40	54	0.74	0.44	1.09	0.3		w
If has pasture land	1997	161	0.35	0.48	55	0.42	0.50	0.87	0.35		w
	2006	161	0.31	0.46	54	0.30	0.46	0.04	0.84		w
If has rubber tree plot	1997	161	0.50	0.50	54	0.50	0.50	0	1		w
	2006	161	0.53	0.50	54	0.54	0.50	0.01	0.91		w
# of ducks and chickens owned	1997	161	14.09	12.93	55	13.91	13.1	0.09	0.93		t
	2006	161	12.47	20.41	55	9.55	9.92	1.4	0.16		t^
# of pigs owned	1997	161	1.10	6.00	55	1.15	3.86	-0.07	0.95		t^
	2006	160	0.23	0.86	54	0.26	1.77	-0.11	0.91		t^
# of cows individually owned	1997	161	2.11	7.39	55	1.02	3.66	1.43	0.15		t^
	2006	161	2.76	8.80	55	1.18	2.93	1.97	0.05	*	t^
Total # of cows owned	1997	161	2.48	8.94	55	1.15	3.75	1.54	0.12		t^
	2006	161	3.09	9.00	55	1.34	3.05	2.14	0.03	**	t^
House Quality	1997	161	0.22	0.42	55	0.24	0.43	0.04	0.85		w
	2006	161	0.45	0.50	55	0.49	0.50	0.23	0.63		w
Liquid Assets	1997	153	-0.29	1.14	48	-0.35	0.96	0.33	0.74		
	2006	151	0.05	1.14	49	-0.08	0.95	0.72	0.48		t

[1] Collection frequency coded: weekly (52), monthly (12), few times (6), once (1), never (0)
[2] T-test (t); T-test with Unequal Variance (p-val <0.01) use Satterthwaite t-value (t^); Wald Chi-Square Test (w); Wilcoxon/Kruskal–Wallis T-test for rank sums (wk).
[3] Collection frequency coded: weekly (52), monthly (12), few times (6), once (1), never (0)

Table 28 Continued

		Non- Participating HH			*Participating HH*						
Definition	**Year**	**Obs**	**Mean**	**Std Dev**	**Obs**	**Mean**	**Std Dev**	**Test Stat**	**p-val**	**Sign**	**Test[1]**
Physical Assets	1997	146	-0.88	1.20	43	-1.07	0.96	0.97	0.33		
	2006	145	-0.01	1.30	49	-0.15	1.02	0.65	0.52		t
Count of Assets	1997	161	2.96	1.86	55	3.05	1.74	0.29	0.59		wk
	2006	161	4.06	1.78	55	4.05	1.82	0.10	0.75		wk
Perceptions of Wellbeing											
Life situation in last 9 years	2006	161	1.22	0.49	54	1.22	0.46	0.02	0.89		wk
Community situation in last 9 years	2006	161	1.29	0.53	54	1.17	0.47	3.33	0.07	*	wk
Family situation changed since tourism	1997	72	1.92	0.37	30	1.93	0.37	0.04	0.83		wk
	2006	106	1.84	0.37	53	1.51	0.50	19.4	<0.0001	***	wk
Community situation changed since tourism	2006	106	1.58	0.53	53	1.32	0.47	8.78	0.003	***	wk
Satisfaction in Life Rank	2006	161	3.94	0.82	54	3.85	1.04	0.02	0.9		wk
Perception of Tourism											
# of occasions household saw tourists last year	1997	157	0.47	0.50	55	0.58	0.50	-1.4	0.16		t
	2006	104	16.62	51.1	51	41.25	94.3	-1.7	0.09	*	t^
Want tourism in the future	1997	149	0.93	0.26	51	0.94	0.24		1		f
	2006	157	0.88	0.33	55	0.98	0.13		0.03	**	f
Tourism freq. in last 9 years	2006	161	1.83	1.59	55	2.44	1.18	6.79	0.009	***	wk

[1] T-test (t); T-test with Unequal Variance (p-val <0.01) use Satterthwaite t-value (t^); Wald Chi-Square Test (w); Wilcoxon/Kruskal–Wallis T-test for rank sums (wk).

Appendix E

Table 29 Logit Model Estimate for Past Participation (Model I)

1997 Variables	1	2	3	4	5	6	7
Financial							
HH receives pension	X	X	X				
Main Income Source: Agriculture	X	X	X				
Human							
# Family		+	+	X	X		+
# Male	++			X	X	+	
# Female	X						
HH Edu	X	X	X				
HH Age	(-)	X	X	X	X	(-)	
Perc Male		X					
Natural							
# Ag plots	X	X	X	X			
Physical							
Distance to River	X	X	X	X			
Liquid Assets	X	X	X	X			
Other							
Years in Community	X	X	X	X			
Ecotourism Community	+++	+++	+++	+++	+++	+++	+++
Sample Size (n)	182	182	182	191	216	216	216
Model p-val	0.086	0.137	0.101	0.054	0.003	0.001	0.0008
Pseudo R-sq	0.093	0.085	0.084	0.077	0.072	0.070	0.064

(+++/--- significant at 1%; ++/-- significant at 5%; +/- significant at 10%)
(+): denotes significance to 15%
X: denotes variables included in models, yet not found significant at 15%

Appendix F

Table 30 Logit Model Estimate for Past Participation (Model II)

1997 Variables	1	2	3	4	5	6
Financial						
HH receives pension	X	X				
Main Income Source: Agriculture	X	X				
Human						
# Family		X		X		
# Male	X		X		X	
# Female	X					
HH Edu	X	X				
HH Age	X	X	X		X	
Perc Male		X				
Natural						
# Ag plots	X	X				
Physical						
Distance to River	X	X	X	X		
Liquid assets	X	X	X	X		
Forest Relationship						
# NTFP collected	+	++	++	++	++	+++
Other						
Years in Community	X	X	X	X		
Ecotourism Community	+++	+++	+++	+++	+++	+++
Sample Size (n)	182	182	197	197	216	216
Model p-val	0.045	0.061	0.003	0.003	0.0002	<0.0001
Pseudo R-square	0.111	0.106	0.102	0.097	0.096	0.090

(+++/--- significant at 1%; ++/-- significant at 5%; +/- significant at 10%)
X: denotes variables included in models, yet not found significant at 10%

Appendix G

Table 31 Logit Model Estimate for Current Participation (Model I)

1997 Variables	1	2	3	4	5	6	7	8	9	10
Financial										
HH receives pension	X	X	X	X						
Main Income Source: Agriculture	X	X	X	X						
Human										
# Family	X		(+)	(+)	X	X		+	(+)	
# Male	X	+			X	X	+			+
# Female	X	X								
HH Edu	X	X	X	X						
HH Age	X	X	X	X	X	X			-	--
Perc Male	X		X							
Natural										
# Ag plots	X	X	X	X	X					
Physical										
Distance to River	X	X	X	X	X					
Liquid Assets	X	X	X	X	X					
Other										
Years in Community	--	--	--	--	--	-	---	---		
Ecotourism Community	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++
Sample Size (n)	182	182	182	182	191	213	213	213	216	216
Model p-val	0.086	0.046	0.054	0.038	0.007	0.0005	0.0002	0.0002	0.001	0.0007
Pseudo R-sq	0.106	0.104	0.101	0.100	0.104	0.098	0.089	0.087	0.072	0.076

(+++/--- significant at 1%; ++/-- significant at 5%; +/- significant at 10%)
(+): denotes significance to 15%
X: denotes variables included in models, yet not found significant at 15%

Appendix H

Table 32 Logit Model Estimate for Current Participation (Model II)

1997 Variables	1	2	3	4	5
Financial					
HH receives pension	X	X			
Main Income Source: Agriculture	X	X			
Human					
# Family	X			X	
# Male	X	X	X		
# Female	X	X			
HH Edu	X	X			
HH Age	X	X	X		
Percent Male	X				
Natural					
# Ag plots	X	X			
Physical					
Distance to River	X	X	X	X	
Liquid assets	X	X	X	X	
Physical assets					
Forest Relationship					
# NTFP collected	++	++	++	+++	+++
Other					
Years in Community	--	--	--	---	---
Ecotourism Community	+++	+++	+++	+++	+++
Sample Size (n)	182	182	197	197	213
Model p-val	0.032	0.015	0.0002	<0.0001	<0.0001
Pseudo R-square	0.129	0.128	0.134	0.132	0.114

(+++/--- significant at 1%; ++/-- significant at 5%; +/- significant at 10%)
X: denotes variables included in models, yet not found significant at 15%
(+) / (-): denotes variables included in model are significant to 15%

Appendix I

Table 33 Logit Model Estimate for Current Participation (Model III)

2006 variables	1	2	3	4	5
Financial					
HH receives pension	X	(-)	X		
Human					
# Family	X	X	X	X	
# Male	X	X	X	X	
# Female	X	X	X		
HH Edu	X	X	X		
HH Age	X	(+)	+	+	+
Perc Male	X	X	X		
Natural					
# Ag plots	X	X	X	X	X
Physical					
Distance to River	(-)	-	-	--	--
Liquid Assets	X	(+)	(+)	X	X
Total cattle owned			X		
*Interaction: # ag plots/ liquid assets		--	--	--	--
Forest Relationship					
# of NTFPs collected	X	X	X	+	+
Andiroba Use			---	---	---
Involvement in Market Place					
make/ sell goods			+	+	++
Qty of crops purchased per capita			-	--	--
Other					
Years in community	--	---	---	---	---
Ecotourism Community	+++	+++	++	++	++
Sample Size (n)	172	172	172	185	186
Model p-val	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Pseudo Rsq	0.168	0.201	0.275	0.263	0.262

(+++/--- significant at 1%; ++/-- significant at 5%; +/- significant at 10%)
X: denotes variables included in models, yet not found significant at 10%

Appendix J

Table 34 Behavioral Responses (2006) to Household Participation (1997-2006)
(*** significant at 1%; ** significant at 5%; * significant at 10%; (*) significant at 15%)

	Non-Participant Households			Participant Households						
2006	**Obs**	**Mean**	**Std Dev**	**Obs**	**Mean**	**Std Dev**	**test stat**	**p-val**	**sign**	**test**[1]
# crops planted (0-4)	166	1.50	1.05	50	1.84	1.06	3.63	0.06	*	wk
# crops sold	166	0.51	0.67	50	0.56	0.70	0.18	0.67		wk
# crops consumed	166	1.50	1.05	50	1.84	1.06	3.63	0.06	*	wk
# crops bought	166	2.67	1.05	50	2.64	1.03	0.01	0.91		wk
crops planted (kg/capita)	166	224.9	315.4	50	280.0	289.8	-1.1	0.27		t
crops consumed (kg/capita)	166	144.8	194.7	50	198.8	200.5	-1.71	0.089	*	t
crops sold (kg/ capita)	166	80.05	206.8	50	81.2	159.6	-0.04	0.97		t^
crops bought (kg/ capita)	166	118.7	191.4	50	65.0	66.8	3.05	0.003	***	t^
# ag plots	166	3.76	3.22	49	3.88	3.31	-0.22	0.83		t
# NTFPs collected	166	3.82	2.19	50	4.28	2.41	-1.27	0.20		t
# NTFPs sold	166	0.29	0.66	50	0.52	0.97	-1.57	0.12	(*)	t^
# NTFPs used	166	5.11	2.55	50	5.08	2.89	0.07	0.95		t
andiroba use	166	0.59	0.49	50	0.42	0.50	4.5	0.03	**	w
sell andiroba	166	0.05	0.23	50	0.10	0.30	1.33	0.25		w
andiroba collect	166	0.25	0.43	50	0.20	0.40	0.47	0.49		w
make or sell forest product-based item	166	0.16	0.36	50	0.30	0.46	5.14	0.02	**	w
acai collection freq.[2]	166	2.91	1.76	49	2.65	1.76	1.08	0.3		wk
bacaba collection frequency.	165	2.58	1.50	49	2.51	1.50	0.07	0.8		wk
thatch collection freq.	164	4.09	0.80	49	4.00	0.76	0.61	0.44		wk
timber collection frequency	164	4.58	0.66	49	4.59	0.67	0.06	0.81		wk

[1] T-test (t); T-test with Unequal Variance (p-val <0.01) use Satterthwaite t-value (t^); Wald Chi-Square Test (w); Wilcoxon/Kruskal–Wallis T-test for rank sums (wk).
[2] Collection frequency coded: weekly (52), monthly (12), few times (6), once (1), never (0)

Appendix K

Table 35 Wellbeing Variables & Descriptions

Variable Name	Description
Liqasset06* Liqasset97*	Ownership of liquid assets (using stacked 1997 and 2006 weights): gas stove, radio, TV, sewing machine, canoe, bike, chainsaw, shotgun, fixed fishing net, cast net, and counts of livestock (chicken, ducks, cattle, pigs).
Physasset06* Physasset97*	Ownership of physical asset (using stacked 1997 and 2006 weights)- first principle component: all liquid assets from above, land (total and types), and house quality.
pc_poss06* pc_poss97*	Principle component index of household asset count: gas stove, radio, clock, television, sewing machine, canoe, bicycle, chainsaw, motor boat
Liqasset_chg*	Change in liquid asset ownership
Physasset_chg*	Change in physical asset ownership
pc_poss_chg*	Change in household asset count
houseq06* houseq97*	House Quality: 1. Best Quality (home constructed from 2 or more of the best materials); 0. Poor Quality (home constructed from 2 or more of the poor materials)
houseq_chg	House Quality from 1997 to 2006: 1. Improved; 0. Same/ Worse
agrfor06 agrfor97	Household has an agroforestry plot: 1. Yes; 0. No
pastur06 pastur97	Household has pasture land: 1. Yes; 0. No
rubber06 rubber97	Household has rubber tree plot: 1. Yes; 0. No
pastur_chg	Ownership of pasture plot from 1997 to 2006: 1. New landowner; 0. No change/ No land
rubber_chg	Ownership of rubber plot from 1997 to 2006: 1. New landowner; 0. No change/ No land
n_ag97 n_ag06	Number of agriculture plots owned

Table 35 Continued

n_agchg	Change in number of agriculture plots
ag_chg	Ownership of agriculture plots from 1997 to 2006: 1. Increased landholding; 0. Same/ Less
cowttl06* cowttl97*	Total number of cattle owned by household= cowind06 + (1/2)*cowcol06. Assumption that household with collectively owned cattle only receive half the benefits/costs.
cowttl_chg	Change in total number of cattle owned
cow_chg	Ownership of cattle from 1997 to 2006: 1. Increased herd; 0. Same/ Decreased
lifeimprov	Quality of life in last 9 years: 1. Improved; 0. Same/ Worse
commimprov	Quality of life in community in last 9 years: 1. Improved; 0. Same/ Worse
familysitchg06	Family situation since tourism development: 1. Improved; 0. Same/ Worse
commsitchg06	Community situation since tourism development: 1. Improved; 0. Same/ Worse

* Variable created by Bauch (2010).

Appendix L

Table 36 Welfare Responses (2006) to Household Participation (1997-2006)
(*** significant at 1%; ** significant at 5%; * significant at 10%; significant at 15%)

	Non-Participant Households			Participant Households						
Variable	**Obs**	**Mean**	**Std Dev**	**Obs**	**Mean**	**Std Dev**	**test stat**	**p-val**	**sign.**	**test[1]**
Asset Wealth										
houseq06	166	0.45	0.49	50	0.52	0.5	0.85	0.36		w
Liqasset06	155	0.00	1.12	45	0.05	0.99	-0.27	0.79		t
Physasset06	150	-0.07	1.29	44	0.02	1.04	-0.40	0.69		t
pc_poss06	165	0.18	0.99	49	0.37	0.92	-1.18	0.24		t
Productive Assets										
agrfor06	166	0.8	0.4	49	0.78	0.42	0.09	0.77		w
pastur06	166	0.29	0.45	49	0.37	0.49	1.09	0.30		w
n_rubber06	166	4.72	24.0	49	5.36	15.7	-0.22	0.86		t^
rubber06	166	0.49	0.5	49	0.65	0.48	3.84	0.0499	**	w
n_ag06	166	3.76	3.22	49	3.88	3.31	-0.22	0.83		t
cowttl06	166	2.93	8.88	50	1.68	3.28	1.51	0.13	(*)	t^
cow06	166	0.25	0.44	50	0.30	0.46	0.44	0.51		w

[1] T-test (t); T-test with Unequal Variance (p-val <0.01) use Satterthwaite t-value (t^); Wald Chi-Square Test (w); Wilcoxon/Kruskal–Wallis T-test for rank sums (wk).

Appendix M

Table 37 Changes in Wealth and Wellbeing by Past Participation
(*** significant at 1%; ** significant at 5%; * significant at 10%; significant at 15%)

	Non-Participant Households			Participant Households						
Variable	**Obs**	**Mean**	**Std Dev**	**Obs**	**Mean**	**Std Dev**	**test stat**	**p-val**	**sign.**	**test[1]**
Asset Wealth										
houseq_chg	166	0.33	0.47	50	0.28	0.45	0.46	0.50		mh
liqasset_chg	146	0.32	0.97	41	0.36	1.04	-0.23	0.82		t
physasset_chg	135	0.87	1.09	36	1.07	1.01	-0.98	0.33		t
pc_poss_chg	160	0.37	0.92	48	0.50	0.89	-0.88	0.38		mh
Productive Assets										
pastur_chg	166	0.11	0.31	49	0.14	0.35	0.43	0.51		mh
rubber_chg	165	0.13	0.33	48	0.15	0.36	0.11	0.74		mh
n_agchg	157	-2.42	6.02	49	-2.54	7.49	0.12	0.91		t
ag_chg	157	0.24	0.43	49	0.22	0.42	0.03	0.87		mh
cowttl_chg	166	0.5	6.94	50	0.5	4.99	0	1		t
cow_chg	166	0.19	0.39	50	0.30	0.46	2.92	0.09	*	mh
Perceived Wellbeing										
lifeimprov	166	0.8	0.4	49	0.82	0.39	0.55	0.81		mh
commimprov	166	0.76	0.43	49	0.84	0.37	1.31	0.25		mh
famsitchg06	112	1.83	0.38	47	1.58	0.53	19.39	<0.0001	***	mh
comsitchg06	112	1.58	0.53	47	1.3	0.46	9.22	0.0024	***	mh

[1] T-test (t); T-test with Unequal Variance (p-val <0.01) use Satterthwaite t-value (t^); Wald Chi-Square Test (w); Wilcoxon/Kruskal–Wallis T-test for rank sums (wk).