

IF MONEY TALKS, HOW CONVINCING IS IT?
THE EFFECTS OF PAYMENTS ON CONSERVATION BEHAVIOR IN ESPARZA,
COSTA RICA

By

KOREY JO FORCE

A THESIS PRESENTED TO THE GRADUATE SCHOOL
OF THE UNIVERSITY OF FLORIDA IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF ARTS

UNIVERSITY OF FLORIDA

2013

© 2013 Korey Jo Force

To my parents: I would never be where I am without you

ACKNOWLEDGMENTS

First and foremost, I thank the respondents of this study who were eager and willing to speak with me about their experiences. I also especially thank the Ministry of Agriculture and Livestock agents in Costa Rica that took me under their wing as well as the helpful collaboration from Center for Tropical Agriculture Research and Higher Education. Finally, I thank my family for supporting me in every decision I make and every challenge I choose to pursue.

TABLE OF CONTENTS

	<u>page</u>
ACKNOWLEDGMENTS.....	4
LIST OF TABLES.....	9
LIST OF FIGURES.....	11
LIST OF ABBREVIATIONS.....	13
ABSTRACT.....	14
CHAPTER	
1 INTRODUCTION.....	16
2 CONSERVATION BHEAVIOR, PES, AND RISEMP: HISTORICAL AND LITERATURE FOUNDATION.....	22
Behavioral Theory: Motivating Environmentally Responsible Behavior of Individuals.....	22
Knowledge and Behavior.....	23
Intrinsic vs. External Motivations.....	24
Psychology of Decision-Making.....	26
Key Components of Environmentally Responsible Behavior.....	27
Payments for Environmental Services (PES): A Broad Theory.....	28
Positive Potentials of PES.....	29
Negative Potentials of PES.....	30
A Special Kind of PES: Silvopastoral Systems.....	31
Traditional Treatment of Pastureland.....	32
Direct Benefits of Silvopastoral Practices.....	33
Barriers to Adoption.....	34
The Regional Integrated Silvopastoral Approaches to Ecosystem Management	
Project (RISEMP).....	36
Funding and Partners.....	37
Purpose.....	37
Program Details.....	38
Target components.....	38
Design of participant groups.....	39
Measuring: environmental service index (ESI).....	39
Preliminary Results.....	41
Preliminary results from Nicaragua.....	41
Connections with Costa Rica.....	43
Framework for Discussing the Effects of RISEMP.....	44

3	INSIDE THE <i>TICO</i> MIND: THE CONTEXT OF ESPARZA, COSTA RICA	54
	Costa Rica Country Profile.....	54
	Geography and Demographics.....	55
	Political Development.....	56
	Economic Development.....	56
	Social Development	57
	A Unique Case of Conservation History.....	58
	Command-and-Control	59
	A New Era: Pagos por Servicios Ambientales (PSA)	60
	Locating Esparza: A Profile of the Central Pacific Region	62
	Cattle Production.....	63
	Silvopastoral Practices	63
	Obstacles to Cattle Production	64
	Esparza, Costa Rica.....	65
	Partnering Institutions	66
	Center for Tropical Research and Higher Education (CATIE)	66
	Mission.....	66
	Relationship with the Esparza community.....	67
	Ministry of Agriculture and Livestock (MAG).....	67
	Mission.....	67
	MAG of Esparza.....	68
	RISEMP in Costa Rica.....	69
	Participants.....	69
	Farm Size, Cattle Count, and Location.....	70
	Gender	71
	Influencing Factors	71
	Land tenure.....	71
	Cattle market.....	72
	Participants' uncertainties	72
	Looking Forward	73
4	DATA COLLECTION, PREPARATION, AND PROCESSING	85
	Forms of Data Collection	86
	Semi-structured interviews	86
	Selection of participants.....	86
	Circumstances of interviews	87
	Questionnaire.....	88
	Key Informants Interviews	89
	Official RISEMP Data	90
	Data Preparation, Processing, and Interpretation	90
	Coding.....	91
	Motivations.....	91
	Practices	92
	Components.....	94
	Processes	95

Consequences	97
Construction of Environmental Consciousness Index	98
Looking Ahead.....	99
5 SHORT TERM EFFECTS OF THE RISEMP ON CONSERVATION BEHAVIOR.	113
Net Changes in the Provision of Environmental Services	114
Net Land-Use Changes	114
Changes in Rates of Adoption.....	116
Behavioral Factors and Implications.....	117
Changes by Project Groups.....	119
Changes in Mean Point Accumulation by Project Group.....	119
Changes in Rates of Adoption by Project Group	121
Behavioral Factors and Implications.....	122
Difference between groups A and B2	123
Effects of subjective norms and intrinsic motivations	123
Effects of positive external incentives	126
Effects of habitualization and environmentality	128
Tying Everything Together.....	130
6 EFFECTS ON LONG TERM BEHAVIOR CHANGE	145
Data Notes.....	146
Continued Practices.....	148
Continued Practices by Project Group	149
Continued Practices by Payment Group.....	150
Behavioral Factors and Implications.....	151
Effects of subjective norms and intrinsic motivations	151
Effects of positive external incentives	153
Effects of habitualization and environmentality	155
New Implementation of Practices	155
New Implementation by Project Group.....	156
New Implementation by Payment Group.....	157
Behavioral Factors and Implications.....	158
Effects of subjective norms and intrinsic motivations	158
Effects of positive external incentives	159
Effects of habitualization and environmentality	160
Differences in Environmental Consciousness.....	161
Breaking-Down Environmental Consciousness.....	162
Differences in Environmental Consciousness by Project Group.....	163
Differences in Environmental Consciousness by Payment Group.....	164
Behavioral Factors and Implications.....	164
Effects of subjective norms and non-project exposure.....	165
Effects of positive external incentives	166
Effects of habitualization and environmentality	167
Tying Everything Together.....	167

7	CONCLUSION: THE EFFECTS OF THE RISEMP ON CONSERVATION BEHAVIOR	190
APPENDIX		
A	QUESTIONNAIRE FOR GROUPS B AND C.....	198
B	QUESTIONNAIRE FOR GROUP A.....	203
	REFERENCES.....	206
	BIOGRAPHICAL SKETCH.....	209

LIST OF TABLES

<u>Table</u>	<u>page</u>
2-1 Behavior change theories and key components	46
2-2 Silvopastoral systems and benefits	47
2-3 Initial investment costs for selected silvopastoral practices (USD/Ha): Costa Rica, Colombia and Nicaragua	48
2-4 Observable relationships between project aspects and behavior-change components	49
2-5 Environmental services index used by RISEMP	50
3-1 GDP growth rate and GDP per capita: Costa Rica and Latin America and the Caribbean	74
3-2 Evolution of protected areas in Costa Rica 1955-1999.....	75
3-3 Farm size of total RISEMP participants and random sample	76
3-4 Distribution of participants by community	77
3-5 World price of beef (US cents/pound).....	79
4-1 Division of payment classes	101
4-4 Environmental components cited by respondents coded into general categories	104
4-5 Environmental processes cited by respondents coded into general processes	105
4-6 Environmental consequences cited by respondents coded into general consequence	107
5-1 Changes in ESI point accumulation.....	133
5-2 RISEMP effects of subjective norms and intrinsic motivations	134
5-3 Respondents who reported silvopastoral practices before the RISEMP.....	135
5-4 RISEMP effects of positive external incentives.....	136
5-5 Motivations for participation by project group	137
5-6 RISEMP effects by length of involvement.....	138

5-7	Effects of the RISEMP design on participant behavior	139
6-1	Distribution of respondents by project group	170
6-2	Effects of subjective norms and intrinsic motivations on the continuation of silvopastoral practices	171
6-3	Effects of positive external incentives on the continuation of silvopastoral practices	172
6-4	Motivations for participation by project group	173
6-5	Effects of subjective norms and intrinsic motivations on the new implementation of silvopastoral practices	174
6-6	Effects of positive external incentives on the new implementation of silvopastoral practices	175
6-7	Effects of length of involvement on the new implementation of silvopastoral practices	176
6-8	Effects of subjective norms and intrinsic motivations on environmental consciousness	177
6-9	Effects of positive external incentives on environmental consciousness	178
6-10	Effects of length of involvement on environmental consciousness	179
6-11	Respondents who reported silvopastoral practices before the RISEMP.....	180

LIST OF FIGURES

<u>Figure</u>	<u>page</u>
2-1 Projected share of deforested land converted to pasture and cropland, 2000-2010	50
2-2 Typical time profile scenerio of benefits of silvopastoral systems on 20 hectare farm in Nicaragua	52
2-3 Adoption behavior of PES 2yrs vs. PES 4yrs Nicaragua pilot site.....	53
3-1 Political map of Costa Rica.....	80
3-2 Trends in HDI 1980-2010	81
3-3 Total contract and budget allocation for each PSA activity (1997-2008)	82
3-4 Esparza, Costa Rica.....	83
3-5 The five districts of the Esparza canton.....	84
4-1 Number of respondents who reported few, average, or high numbers of silvopastoral practices	108
4-2 Number of respondents who reported low, average, or high awareness of environmental components	109
4-3 Number of respondents classified as low, average, or high awareness of environmental processes.....	110
4-4 Number of respondents who reported low, average, or high awareness of environmental consequences.....	111
5-1 Net changes in living fences, forest cover, improved pasture, and fodder banks.....	140
5-3 Comparison of international beef prices and percent adoption rate of silvopastoral practices	142
5-4 Average points accumulated by group and payment intervals	143
5-5 Average rate of change in ESI point accumulation per hectare by group every 2 years.....	144
6-1 Drawing by a respondent of his landholding and the land-uses in each hectare	181

6-2	Continuation of silvopastoral practice by project group since RISEMP by percent	182
6-3	Continuation of silvopastoral practices by payment group since RISEMP by percent	183
6-4	Respondents' belief that silvopastoral practices were beneficial in life, the well-being of their cattle, the future of the community, and the environment....	184
6-5	New implementation of silvopastoral practices by project group since RISEMP by percent	185
6-6	New implementation of silvopastoral practices by payment group since RISEMP by percent	186
6-7	Ability of respondents to report aspects of environmental consciousness	187
6-8	Environmental consciousness by percent project group.....	188
6-9	Environmental consciousness by percent payment group.....	189

LIST OF ABBREVIATIONS

CATIE	Center for Tropical Agriculture Research and Higher Education
ESI	Environmental service index
EC	Environmental consciousness
MAG	Ministry of Agriculture and Livestock
PES	Payments for environmental services
RISEMP	Regional Integrated Silvopastoral Approaches to Ecosystem Management Project
TA	Technical assistance

Abstract of Thesis Presented to the Graduate School
of the University of Florida in Partial Fulfillment of the
Requirements for the Degree of Master of Arts

IF MONEY TALKS, HOW CONVINCING IS IT?
THE EFFECTS OF PAYMENTS ON CONSERVATION BEHAVIOR IN ESPARZA,
COSTA RICA

By

Korey Jo Force

May 2013

Chair: Marianne Schmink
Major: Latin American Studies

In studies of Payments for Environmental Services (PES), or monetary compensation for conservation, little attention has been focused on the individual-level effects of payments on conservation behavior. This study presents an analysis of the effects of a pilot PES program, the Regional Integrated Silvopastoral Approach to Ecosystems Management Program (RISEMP), on participants' motivations to adopt silvopastoral practices in the Esparza watershed, Costa Rica. Data were collected in the summer of 2012 through semi-structured interviews with randomly selected participants of the project. The two primary research questions explored by this study are:

1. To what extent did the RISEMP affect participants' motivation to engage in conservation behavior during the project and what factors contributed to these motivations, or lack thereof?
2. To what extent did the RISEMP affect participants' motivation to engage in long-term conservation behavior and levels of environmental consciousness and what are the factors that contributed to this?

This study found no significant difference between incentivized and non-incentivized project participants in both the quantity of practices adopted and levels of environmental consciousness. The conclusions of this study suggest that payments

were unnecessary to motivate landowners to adopt silvopastoral practices due to the following conditions:

1. There was a previous, positive, and observable exposure to silvopastoral practices
2. There existed a national rhetoric of environmental conservation, payments for environmental services, and agroforestry
3. There were relatively high standards of living, economically, socially, and environmentally
4. There existed relatively high levels of degradation such that the first practices adopted less labor than more intensive practices.

Instead, this study suggests that the most motivating incentive was the provision of the physical investments and technical assistance necessary to implement a successful silvopastoral system.

CHAPTER 1 INTRODUCTION

If money talks, how convincing is it? This is one of the major questions surrounding economists' theory of payments for environmental services (PES) which offers monetary compensation for environmental conservation through a market for "environmental services." Research to date has evaluated the quantitative results of pilot projects and incipient programs, focusing mainly on the total environmental services provided or restored, and the additional income to providers. Relatively little attention has been focused on the individual level effects of payments on conservation behavior. This study presents an analysis of the effects of a pilot PES program, the Regional Integrated Silvopastoral Approach to Ecosystems Management Project (RISEMP), on participants' motivations to engage in conservation behavior in the Esparza watershed, Costa Rica. The two primary research questions explored by this study are:

1. To what extent did the RISEMP affect participants' motivation to engage in conservation behavior during the project, what factors contribute to these motivations, or lack thereof, and what are the implications of these findings for future PES programs?
2. To what extent did the RISEMP affect participants' motivation to engage in long-term conservation behavior and levels of environmental consciousness, what are the factors that contribute to this, and what are the implications of these findings for future PES programs?

The RISEMP was a pilot-PES project funded by the World Bank and Global Environment Facility (GEF), implemented through partnerships with the Center for Tropical Agricultural Research and Higher Education (CATIE) and the Ministry of Agriculture and Livestock (MAG) in Costa Rica. The project was designed to test the effects of different positive external incentives on participants' adoption of silvopastoral

practices, or the inclusion of trees in pasture land-use systems. Thus, different project groups were created from voluntary small to medium sized landowners in the Esparza watershed, who received either payments alone, or payments combined with technical assistance, and participated for either 2 or 4 years. A control group was also created in which participants were not offered incentives, but agreed to allow the project to monitor their land use.

Thus, the RISEMP was meant to inspire behavior-change among landowners, and its design made it ideal for the analysis of the motivations, or lack thereof, for these changes. The exact motivations for behavior change remain contested among behavior-psychologists: some argue that positive external incentives are necessary to create a sense of habit, while others argue that motivation must come from an internal value base. Behavior-change literature identifies key components that are essential and/or promising to changing an individual's behavior and promoting environmentally responsible behavior, in the case of this study defined as the adoption of silvopastoral practices. According to this literature, once individuals are empowered with information and knowledge about the behavior, they are more likely to engage in environmentally responsible behavior when: his/her values align with a biospheric belief system that credits the importance of a balance with nature; the behavior is habitualized or engaged in frequently; the behavior is one from which an individual receives intrinsic satisfaction; and/or the behavior is one that the individual perceives as positive, accepted by members of his/her close social circle, and possible and/or achievable. The RISEMP therefore offers a unique opportunity to explore the effects of external incentives on

participants' motivations to engage in conservation behavior, as well as explore the importance of these key components of behavior change.

Chapter 2 begins this study by establishing the literature foundation upon which the analysis of the short term and long term effects of the RISEMP are discussed in later chapters. To do this, it begins with a review of behavior-change theories, and their components, paying close attention to those that were significant in the project design of the RISEMP; it is these theories, and components, that will be used throughout this study to examine the effects of the RISEMP. This review begins with the discussion of the importance of knowledge and information as a necessary but not sufficient condition for behavior-change. It then addresses the disagreement between behavioral psychologists concerning the source from which behavior change is motivated and maintained over long periods of time, and identifies significant components from psychological theories of decision making, to create a key set of characteristics of environmentally responsible behavior that are addressed throughout the duration of this study. The chapter then introduces the concept of payments for environmental services (PES), addressing the positive and negative potentials of PES, providing a vocabulary and basis upon which to discuss the effects of the RISEMP on project participants. From this discussion, the chapter transitions into a discussion of silvopastoral practices, the direct and indirect benefits of such practices, and the barriers to their adoption. The chapter concludes with an introduction to the RISEMP, addressing the purpose, identifying the funding and partner organizations, specifying the program details, and discussing the preliminary results from another project site in Nicaragua.

Chapter 3 paints a picture of the *Tico*¹ mind, or the unique context in which landowners of the Esparza watershed made behavioral decisions. The chapter begins this painting with a discussion of Costa Rica's status as one of the most developed countries in Latin America, politically, economically, socially, and environmentally. Then, the chapter addresses the unique conservation history of the country that has created a population familiarized and well versed in not only the rhetoric of conservation, but also that of payments for environmental services, something that behavioral theorists suggest can increase an individual's propensity to adopt an environmentally responsible behavior. From this discussion, the chapter transitions to focus on the Esparza, Costa Rica, pilot site, highlighting geographic and demographic information, paying specific attention to the region's previous exposure to payments for environmental services. The chapter concludes with a brief discussion of the demographics of the RISEMP participants and factors that may have influenced the controlled implementation of the project.

Chapter 4 focuses on the process through which data were collected, prepared, and operationalized for this study. The two largest sources of data utilized by this study were semi-structured random interviews with RISEMP participants in the summer of 2012, and official RISEMP data provided to the author by CATIE. The chapter begins with an explanation of the selection of participants, the circumstances of each interview, and the questions asked of each respondent. The chapter then transitions into a discussion of the preparation, processing, and interpretation of the data that were used to analyze behavior. Close attention is paid to the operationalization and construction of

¹ *Tico* is a slang term used to mean "Costa Rican."

the environmental consciousness index, a measure of respondents' number of silvopastoral practices and their ability to name environmental components, processes, and consequences, which is used in Chapter 6 to gauge long-term effects on project participants.

The next two chapters are used to analyze the data collected by this study. Chapter 5 addresses the first research question: to what extent did the RISEMP affect participants' motivation to engage in conservation behavior during the project, what factors contribute to these motivations, or lack thereof, and what are the implications of these findings for future PES programs? To answer this question, this chapter begins by discussing the net changes in the provision of environmental services by project participants, an indication of behavior change. This discussion pays specific attention to the net land-use changes of participants and the overall rates of adoption. The chapter then transitions to an examination of the effects of the incentives offered by the RISEMP by comparing the changes among project groups in both the total provision of environmental services, and the rate of adoption of silvopastoral practices. The differences, or lack thereof, of these comparisons are then discussed within the behavioral framework introduced in Chapter 2.

Chapter 6 extends upon this study's data analysis by addressing the second research question: to what extent did the RISEMP affect participants' motivation to engage in long-term conservation behavior and levels of environmental consciousness, what are the factors that contribute to this, and what are the implications of these findings for future PES programs? The long term effects of the RISEMP are discussed in three dimensions: the continuance of silvopastoral practices after the end of the

RISEMP; the new implementation of silvopastoral practices after the end of the RISEMP; and respondents' relative levels of environmental consciousness. While Chapter 5 analyzes the short-term of the RISEMP incentives through the official data given to this study, the long term behavioral effects are discussed in terms of the possible relationships between the behavioral theories, discussed in Chapter 2, and current practices, trends, and beliefs, as cited by former-participants, and what these findings might say about the RISEMP.

Chapter 7 serves to summarize the findings of this study, placing them specifically in the behavioral framework used throughout the study. The chapter discusses the implications of these findings on several levels. The implications for local landowners in Esparza are addressed, paying specific attention to what the findings of this study might mean for future land use and livelihoods of farmers in the future. The findings are also discussed in the context of PES as a whole, and what they might suggest for the future design of similar systems and/or projects.

CHAPTER 2 CONSERVATION BEHAVIOR, PES, AND RISEMP: HISTORICAL AND LITERATURE FOUNDATION

This chapter begins to lay the foundation upon which the analysis of the short and long term effects of the Regional Integrated Silvopastoral Approaches to Ecosystem Management Project (RISEMP) are discussed in Chapters 5 and 6. To do this, it begins with a review of behavior-change theories, and their components, paying close attention to those that were significant in the project design of the RISEMP; it is these theories and components that will be used throughout this study to examine the effects of the RISEMP. This chapter then introduces the concept of payments for environmental services (PES), a system of environmental valuation and compensation upon which the RISEMP was based in 2002. From this explanation, the chapter transitions into a discussion of silvopastoral practices (the inclusion of trees in pastureland), the direct and indirect benefits of such practices, and the barriers to their adoption. The chapter concludes with an introduction to the RISEMP, addressing the purpose, identifying the funding and partner organizations, specifying the program details, and discussing the preliminary results from another project site in Nicaragua.

Behavioral Theory: Motivating Environmentally Responsible Behavior of Individuals

The world is talking about the importance of the environment more than ever before, but unsustainable environmental exploitation, degradation, and depletion continue at a seemingly un-bounded rate. The question that behavior psychologists confront is: how do we bridge the gap between environmental concern and action so that individuals engage in environmentally responsible behavior? While knowledge and access to information have proven to play an enabling role (Schultz, 2002) scholars

reject the claim that a causal relationship exists between access to information and environmentally responsible behavior. Some scholars credit a value base within individuals that values ecological components and processes such that the individual fears damage to said components (Stern, 2000), while others claim that the creation of incentivized behavioral habits are the necessary first-steps to long-term behavior change (Geller, 2002). The following discussion will explore these theories and the factors identified within them by behavioral psychologists as necessary for behavior change to create a framework for the analysis of PES and RISEMP.

Knowledge and Behavior

Early behavioral psychologists who placed extreme faith in the Rational Decision Making rhetoric of economists, or basic cost-benefit analysis by individuals as the determinant of behavior, believed that a simple increase in knowledge was all that was necessary for individuals to understand the importance of the environment, realize what they were doing wrong, and make a behavior change accordingly (Kilbert et al., 2012). Schultz (2002) discussed this theory in the Knowledge-Deficit Model which argues that increasing an individual's knowledge about an issue and the appropriate behavioral response, leads to an increase of the appropriate behavior. Although intuitive and credible at face-value, the causal relationship between knowledge and behavior has thus far remained insignificant in behavioral studies. It is important to note however, that although an increase in knowledge hasn't significantly predicted behavior, in studies involving recycling behavior, the lack of knowledge served as a barrier for individuals to engage in the behavior (Schultz, 2002).

One reason for this is the way in which individuals listen to, interpret, and store the information that they are exposed to. Behavioral psychology shows that humans

tend to seek information that supports existing beliefs, desires, or emotions: a search that often leads to the avoidance, dismissal, and/or forgetting of information that requires them to change their minds, and in many cases, their behavior (Center for Research on Environmental Decisions (CRED), 2009). This “confirmation bias” shows that people have strong preferences for retaining their own mental models, which often leads them to misinterpret data presented to them (CRED, 2009). Thus, in the process of encouraging and changing behavior, knowledge is necessary to enable behavior but is rarely acts as a motivator.

Intrinsic vs. External Motivations

Scholars theorize in one of two general directions about how long-term behavior change at the individual level should be motivated: intrinsically or externally. Stern (2000) argues in the Value Belief Norm (VBN) theory that long-term behavior change should be intrinsically motivated, or come from a shift in values strong enough to motivate a permanent change in behavior. The VBN Theory purports that actions are at the end of a chain which begins with a value base, which leads to a belief system, which leads to personal norms, which finally lead to a behavior. Stern argues that environmentally responsible behavior occurs when an individual has a value base that is rooted in the well-being of the biosphere and an ecological belief-system in which achieving a balance with nature and striving for sustainability is necessary (2000). This then leads to the creation of a personal norm, or a standard that an individual feels obligated to follow, concerning appropriate and or necessary treatment of the environment, and in this obligation the individual engages in environmentally responsible behavior.

Other scholars argue, however, that long-term behavior change should be motivated by external factors until the said behavior becomes internalized either through habit or through a value system change. Geller (2002) argues that interventions should focus on observable behaviors, or “act people into thinking differently” (p. 528). Under this rationale, Geller argues that external factors are the key to improving performance and that interventions should focus on incentives, or positive consequences, to motivate desired behaviors (2002). Once behaviors are repeated frequently enough, individuals will either incorporate the behavior into their habitual routines or incorporate it into their value system, something Agrawal refers to in the conservation field as “environmentality” (2005).

While in theory this approach can be ideal for both recipients and providers, especially in the case of payments for environmental services, findings on the effectiveness of incentives are mixed. In general, studies on material incentives and positive external motivation show that these approaches only motivate behavior while the incentives remain in place, and removing them is followed by a termination in behavior (DeYoung, 1993). Katz and Kahn (1978) maintain that extrinsic motivation (positive or coercive in nature), only results in small levels of compliance due to the undesirable side-effect in which too much attention is focused on the intervention, or incentive, and not enough attention is focused on other motives or the behavior itself (DeYoung, 1993). This means that in many cases, people are only willing to change the target behavior when an obvious and easy incentive is present, and limit their behavior to that which is targeted. These possible unintended side-effects can lead to questions

of durability and the willingness of individuals to explore related and untargeted pro-environmental behavior changes (DeYoung, 1993).

Psychology of Decision-Making

While these theoretical differences create the base for understanding behavior change, other literature deals more specifically with the motivating psychology of behavior change. DeYoung (2000) discusses the importance of intrinsic satisfactions, or self-serving returns, in explaining an individual's behavior. DeYoung (2000) describes three important and significant sources of personal satisfaction among respondents of a study about recycling: 1.) striving for behavioral competence, or feeling like one is capable and successful at a given behavior; 2.) frugal, thoughtful consumption, in that individuals wish to feel that they aren't wasting resources; and 3.) participation in maintaining a community, or remaining part of and accepted by a social unit.

Ajzen relatedly argues in the Theory of Planned Behavior (1991), that the strength of an individual's intention to engage in a behavior is determined by three factors: 1.) the attitude toward the behavior; 2.) the subjective norm; and 3.) perceived control. Firstly, Azjen (1991) asserts that an individual must have a positive attitude about the behavior and the outcome of the action, and therefore feel that something that he/she values will be threatened if he/she refuses to act. Azjen (1991) also shows that the subjective norm, or the actions that an individual perceives as important or valued by those that the individual cares about, plays a large role in individuals' decisions to engage or not engage in a behavior. Finally, much like DeYoung's (2000) intrinsic satisfaction, individuals must have a sense of perceived control, or the belief that his/her

actions will have a direct effect on an outcome and that he/she has the ability to successfully engage in the action.

Key Components of Environmentally Responsible Behavior

From this behavioral literature, we can identify key components that are essential to changing an individual's behavior and promoting environmentally responsible behavior. Once individuals are empowered with information and knowledge, they are more likely to engage in environmentally responsible behavior when: his/her values align with a biospheric belief system that credits the importance of a balance with nature; the behavior is habitualized or engaged in frequently; the behavior is one from which an individual receives intrinsic satisfaction; the behavior is one that the individual perceives as positive, accepted by members of his/her close social circle, and possible and/or achievable. Table 2-1 shows a list of these behavior change components that are explored in this study's analysis of the short and long term effects of the RISEMP on participants' motivations to engage in conservation behavior. It is from within this framework that we can shift into a discussion of payments for environmental services and their placement within changing behavior.

It is important to note that the majority of behavior theories are based in a Western context: one referred to as post-materialist (Inglehart, 1981). According to Inglehart (1981), post-materialist societies are ones in which basic material needs are met and secure, and individuals are therefore able to address concerns beyond those of survival; basic material needs are defined as the physiological¹ and safety² needs

¹ Maslow identified the following physiological human needs: food; water; shelter; warmth (Inglehart, 1981).

² Maslow identified the following safety human needs: security; stability; and freedom from fear (Inglehart, 1981).

identified at the bottom of Maslow's hierarchy of needs. Concern and actions based on global concepts of environmental conservation and sustainability are considered second to the basic material needs cited by Maslow. This means that if individuals' physiological and safety needs are not met, behavioral theorists expect behavior that strives, first and foremost, to secure these needs. The implications of this limitation will be buffered by the focus of this study in Costa Rica, one of the most developed countries in Latin America, and by the status of participants as landowners. This study's application of behavioral psychology applies only to individuals who have their basic material needs met, and does not address decision making processes that involve individuals who struggle for survival. This will be discussed further in Chapter 3.

Payments for Environmental Services: A Broad Theory

Conservation efforts in Costa Rica, and all over the world, have often fallen within a command-and-control approach in which landowners and inhabitants are required to follow conservation rules, guidelines, or practices outlined by a higher political power (Evans, 1999). Payments for Environmental Services (PES) which began to gain popularity in the latter part of the 1980's, however, offered financial incentives to conserve Environmental Services (ES) or what the Millennium Ecosystem Assessment (2005) cites as "benefits provided by ecosystems" (39). These ES can include: provisioning services, such as food, water, and/or timber; regulating services, such as regulation of climate, flood, and or water quality; cultural services, such as recreation, aesthetic enjoyment, and/or spiritual enjoyment; and supporting services, such as soil formation, pollination, and/or nutrient cycling (Millennium Ecosystem Assessment, 2005).

In contrast to command-and-control policies, PES are defined as a “*voluntary* transaction where a *well-defined* ES (or a land-use likely to secure that service) is being “bought” by a (minimum one) ES *buyer* from a (minimum one) ES *provider* if and only if the ES provider secures ES provision (*conditionality*)” (Wunder, 2005, 3). These innovative programs often seek to integrate the conservation of environmental services with the market primarily through either area-based schemes, which regulate land or resource use within specified land areas, or product-based schemes, which add a “green premium” to products that are certified to be environmentally friendly (Wunder, 2005). Currently, four main environmental service strategies stand out within the relevant literature on PES: carbon sequestration and storage; biodiversity protection; watershed protection; and landscape beauty (Wunder, 2005; Pagiola, Arcenas, & Platais, 2005).

Positive Potentials of PES

Advocates of PES are found among market-economists and behavioral psychologists that agree with the Rational Choice Theory that defines individuals as benefit maximizers and cost minimizers, and Geller’s (2002) external approach to behavior change which encourages the use of positive incentives to motivate behavior change. Market-economists claim these programs to be more effective because individuals will be able to maximize their incomes. Furthermore, PES bases payments to service providers on payments from service users, creating a structural feedback mechanism in which service users have strong incentives to help regulate and enforce the provision and conservation of the ES for which they are paying (Pagiola, Arcenas, & Platais, 2005). Behavioral psychologists, like Geller (2002), believe that incentives such

as payments are a key tool in “acting people into thinking”; or incentivizing behavior until it is habitual or an individual’s values change.

Since the early 1990's, there has been a shift in PES programs from a conservation focus to a more people-oriented approach that strives to integrate PES with development goals. While integrated conservation projects and sustainable forest management programs have targeted development goals, striving to increase income while simultaneously conserving the environment, they have fallen short of achieving major shifts in tropical land use (Wunder, 2005). The failures of these command-and-control programs help justify the rationale and promise of establishing norms for PES. Pagiola (2007) suggests that PES offers a potential link with development. Pagiola presents two realities of PES that he uses to suggest a potential link: 1.) PES offer payments for environmental services, a source of income; and 2.) some of the most degraded areas also have the highest poverty rates. The link between development and PES, however, remains unclear and will be discussed later in this study (Pagiola, 2007).

Negative Potentials of PES

As promising as some believe it to be, the market-oriented approach suggested by PES has strong critics. Conservationists argue that PES can lead to problems referred to as leakage and/or additionality (Wunder, 2005). Leakage refers to the unanticipated diversion of the degradation of environmental services and natural resources to other areas, in essence leading to no net gain in the environmental services, while additionality refers to the market inefficiency of paying for services that would have been provided regardless of payments. Conservationists further doubt both the sustainability and stability of transforming conservation of environmental services

into a commodity. Once positive incentives, in the form of payments, are stopped or another land-use practice becomes more profitable, what will motivate people to continue providing an environmental service? Geller (2002) argues that the continual practice of a behavior is what is necessary to ensure long-term behavioral change at the individual level, while Stern (2000) argues that if the values of an individual are not targeted and changed initially, then the effects of incentives are superficial and fleeting. Individuals will only engage in the practices to obtain payments, and, according to Stern (2000), without an initial focus on values so that a behavior is intrinsically motivated, long-term behavior change is impossible with sporadic PES programs.

A Special Kind of PES: Silvopastoral Systems

To explore these questions of the effects of PES on behavior change, this study focuses on silvopastoral practices, a unique form of environmental services. Silvopastoral practices most generally refer to the inclusion of trees in pastured areas, an environmentally responsible alternative to the traditional belief that pastureland must be completely cleared of trees. Table 2-2 describes four prominent types of silvopastoral systems identified by Pagiola et al. and provides a description of each (2004). Silvopastoral practices are unique in that they provide benefits beyond those considered public goods, such as carbon sequestration, and therefore have the potential to simultaneously provide direct benefits to landowners. Despite this potential, silvopastoral practices are not widely utilized in Latin America. Not only is a culture of “pasture clearing” connected to raising cattle, but high investment costs, time lags before increased profitability, and modest returns on practices have also presented barriers to the adoption of these practices. Nevertheless, the individual returns received

from silvopastoral practices are essential to address in the analysis of RISEMP and in the speculation about its potential as a tool for long term behavior change in Costa Rica.

Traditional Treatment of Pastureland

Traditional treatment of pastureland for cattle production entails the expansion of pasture at the expense of standing forest; forest is cleared to allow for maximized cattle grazing (White, 2001). This disappearance of forest due to pasture expansion and degradation has been an increasingly habitual and rising phenomenon for the past 60 years (Kaimowitz, 1996). Several key factors have motivated this land-use behavior, the most important of which for this study are government interventions and policies, and characteristics of livestock production that make it attractive to farmers (White, 2001). Government interventions and policies have played a large role in establishing land tenure systems that require landowners to demonstrate the use of their land to maintain property rights and to access subsidies for livestock credit; likewise, policies that hold timber values low make forest management a less profitable land use, further making deforestation and pasture conversion an attractive behavior for land-owners (Kaimowitz, 1996; White, 2001).

The characteristics of cattle production help to explain its popularity and continued expansion as markets for cattle-products rise in favorability. Kaimowitz (1996) cites these characteristics as: low labor, input, and management requirements; value in cultural prestige; ease of transport; and the attractive attributes of a biologically flexible and easily liquidated financial asset (Kaimowitz, 1996; White, 2001). Figure 2-1 shows a 2006 FAO projection of the share of deforested land converted to pasture between 2000 and 2010. Limitations in specifications, collection, and compilation of data required to calculate land-use change make the FAO's 2006 *Livestock Policy Brief*

projection the most up-to-date information available. This projection shows the expected favorability of converting forest to pasture, over that of crops, from 2000 to 2010 in select Latin American countries (FAO, 2006). Trends in land conversion, the continually rising demand for beef products, and the favorable characteristics of cattle production make it unlikely that actual trends varied greatly from the FAO projections (2006).

This traditional establishment and treatment of pastureland has negative environmental implications. Pasture conversion itself has led and often continues to lead to the waste of large amounts of wood and non-timber forest products (Kaimowitz, 1996). Soil degradation, biodiversity loss, and the loss of sources of carbon sequestration and storage are also environmental consequences of clearing forest for pastureland (Kaimowitz, 1996; White, 2001; Pagiola et al 2004). Not only is this traditional land-use environmentally destructive, it also creates a pasture that is unable to sustain sufficient nutritional value for cattle for more than a couple of years without intensive management (Kaimowitz, 1996).

Direct Benefits of Silvopastoral Practices

While many environmental services are in the form of public goods that are hard to see and regulate, such as carbon sequestration and biodiversity services, silvopastoral practices have the potential to provide direct and tangible returns to individuals practicing them, in addition to the public goods.³ Table 2-2 describes the potential direct benefits for landholders that result from each silvopastoral system. For

³ Silvopastoral systems provide public goods such as carbon sequestration, biodiversity conservation, and watershed/water source management (Kaimowitz, 1996; White, 2001; Pagiola et al, 2004).

the individual, the main direct benefits come in the form of the additional production from the trees (foliage, fruit, firewood, etc.), increased pasture productivity, animal shade, the diversification of products, and overall contributions to the farming system as sources of fodder or income at times when other sources are unavailable (Pagiola et al., 2004). For some individuals, silvopastoral practices can return the additional benefits of water protection and protection against landslides on sloped surfaces (Pagiola et al., 2004).

The existence of these direct benefits has implications in the analysis of the conservation behavior of landowners that will be discussed in Chapter 5 and 6. Practices that offer direct benefits make it impossible to control solely for the value systems or positive external incentives that are involved in the RISEMP project design. If practicing a certain behavior is proven to bring a valued benefit to an individual, this, in itself, can serve as an incentive for a short and/or long term behavior change in which it is difficult to determine the effects of other variables.

Barriers to Adoption

Despite the potential for direct on-site benefits of silvopastoral practices, the barriers to their adoption help to explain why higher numbers of livestock owners are not moving away from traditional management of pastureland with no or low tree density and unimproved pasture. Both White (2001) and Pagiola et al. (2004) maintain that one of the primary barriers to adoption of silvopastoral practices is economic: the high initial costs associated with establishing a silvopastoral system. Other barriers such as time lags in the rates of financial return, modest profitability, and increased labor demands, further exacerbate this initial economic barrier.

The initial costs of silvopastoral practices are high because they most commonly require the purchase of physical investments (in the form of seeds and/or trees), their transportation, and the labor required to establish and maintain them in pastures. Table 2-3 shows the initial investment costs for five selected silvopastoral practices in each of the watersheds chosen for the RISEMP (Pagiola et al., 2004). The costs of increasing cattle numbers to take advantage of increased fodder availability present additional investment barriers to those faced during the initial stages of implementing a silvopastoral system.

These high initial investments become even higher opportunity costs due to the time lags that it takes for silvopastoral systems to become productive. In a cost-benefit scenario explored by Pagiola et al. (2007), the authors speculated the return rates on switching 3 hectares of unimproved pasture to improved, and establishing a 0.75 hectare fodder bank on a 20 hectare farm in Nicaragua (See Figure 2-2). Once the silvopastoral system had been established, it was estimated that the net farm income would increase by 50% (Pagiola et al., 2007). In the first few years of the installation of the silvopastoral system, however, farm income was projected to be significantly lower due to the high initial investments and the time required for the trees to grow sufficiently to provide benefits. Pagiola et al. (2007) projected that it wasn't until the fifth year of the silvopastoral system that net farm income would rise above pre-system income. This means that landowners must be willing to commit time, labor, and money that they might have spent on another income earning activity.

Low rates of return are generally typical because of the labor and financial investment required and the limited number and type of silvopastoral practices that

landowners are able to adopt. White et al. (2001) found that for landowners in Esparza, Costa Rica, rates of return on adoption of improved pasture were between 9% and 12%. It is important to remember, however, that White et al.'s (2001) estimations were derived from an incentivized project, most likely increasing rates of adoption. This has two implications: rates of return most likely reached profitable levels sooner because lower individual investment on the part of the farmer was possible; and farmers were most likely able to adopt more practices, therefore increasing the returns on their land. Rates of return depend on many factors including location, the specific land-use type, and the type of silvopastoral practice adopted; if landowners are only able to adopt one minor practice, returns can be very low. Projections for the RISEMP estimated rates of return between 4% and 14%, depending on the country, type of farm, and practices adopted (Pagiola et al., 2007). Estimates of returns are independent of biodiversity conservation and carbon sequestration benefits; in other words, they assume that non-site benefits are not factored in to the landowner's decision-making process (Pagiola et al., 2007).

The Regional Integrated Silvopastoral Approaches to Ecosystem Management Project (RISEMP)

The previous sections of this chapter create context from which the RISEMP will be introduced, discussed, and framed within this study. The RISEMP was a quasi-PES⁴ pilot project that took place in the Esparza watershed from 2002 to 2007. The project was designed to incentivize a conservation-oriented behavior change among small to medium sized landowners in the Esparza watershed through the adoption of

⁴ This study refers to the RISEMP as a "quasi-PES" project because it does not fit the definition of PES established by Wunder (2005) in which a service provider is paid by a service consumer. The RISEMP was a project funded by the World Bank and GEF, therefore the consumers of environmental services were not responsible for compensating the landowners providing them.

silvopastoral practices. It is essential to discuss the details of the program, the preliminary results from other project sites, and the framework that this study derives from this information.

Funding and Partners

The Regional Integrated Silvopastoral Approaches to Ecosystem Management Project (RISEMP) was a pilot payments for environmental services program prepared with the support of the Livestock, Environment and Development Initiative (LEDI) and the Food and Agriculture Organization (FAO). Funding was provided by the Global Environment Facility, and the initiative was managed by the World Bank from 2002 to January 2008 with the coordination of the Center for Tropical Agriculture Research and Education (CATIE) (Global Environment Facility (GEF) Evaluation Office, 2009).

Purpose

The RISEMP targeted microwatersheds in three different countries: Colombia (Quindío); Costa Rica (Esparza); and Nicaragua (Matiguás-Río Blanco). The project was designed to demonstrate and measure two outcomes:

1. The effects of the introduction of PES on farmers, based on their adoption of integrated silvopastoral farming systems in degraded pasture lands
2. The resulting improvements in ecosystems functioning, global environmental benefits, and local socio-economic gains resulting from the provision of these services

(GEF Evaluation Office, 2009).

According to the GEF Evaluation Office, the RISEMP Operational Manual cited four main hypothesis surrounding payments for environmental services and conservation behavior:

1. The adoption of silvopastoral practices can be attributed to PES

2. The adoption of silvopastoral practices can be attributed to Technical Assistance
 3. The adoption of silvopastoral practices can be attributed to both PES and Technical Assistance
 4. Different payment schemes (2 years and 4 years) would affect the speed and intensity of adoption behavior
- (GEF Evaluation Office, 2009, 9).

The RISEMP program projected that to take advantage of the limited time-frame of PES, participants of two years would invest more heavily in their farms than those who participated for 4 years while payments lasted. When payment ceased after two years, it was expected that 2-year participants would invest less in their farms. (GEF Evaluation Office, 2009)

Program Details

Target components

According to the GEF Evaluation Office (2009), the pilot project included four target components. The first was to strengthen local institutions and organizations to better equip them to assist farmers in implementing and maintaining silvopastoral systems on their lands. This capacity building was especially focused on the managing Non-Governmental Organizations (NGOs): the Center for Research in Sustainable Agriculture Production Systems (CIPAV) in Colombia, CATIE in Costa Rica, and Nitlapán in Nicaragua. Secondly, the project strove to develop and establish an improved monitoring system to measure the potentials of "...intensified silvopastoral systems in providing global environmental services and local socio-economic benefits" (GEF Evaluation Office, 2009, 5-6). The third target component of the project was to develop and implement an effective and efficient payment mechanism that provided incentives for establishing and maintaining improved silvopastoral systems on farms.

Fourthly, the project strove to develop a strategy for replication that included an exploration of "...sustainable financing mechanisms to ensure long-term sustainability of the project" (GEF Evaluation Office, 2009, 6).

Design of participant groups

Landowners within each country were offered voluntary contracts in one of several 'treatment' groups for a duration of either two or four years. The first group received only payments for environmental services based on the proportional increase in environmental services relative to the baseline measures conducted in 2002 (Pagiola et al., 2004). The second group received this PES as well as technical assistance. Technical assistance included a satellite image of each participant's property, education in the form of presentations and workshops about silvopastoral practices, and advice and consultation about best practices. The third treatment group was used as a control population, and received neither payments, with the exception of an initial baseline payment, nor technical assistance.

Measuring: environmental service index (ESI)

In efforts to compensate providers for environmental benefits that are hard to define and measure, payments for environmental services programs have tended to pay for land uses that are most hospitable to environmental services, such as biodiversity conservation (Pagiola et al., 2004). Furthermore, programs have typically failed to differentiate payments based on the quantity and/or quality of environmental services provided. Pagiola et al. (2004) emphasize the importance of understanding the quantity and/or quality of environmental services as existing on a spectrum that ranges from "...relatively inhospitable systems such as monocultures with heavy agrochemical use to relatively hospitable systems such as organic coffee grown under a diverse shade of

native species” (14). Costa Rica's national Payments for Environmental Services Program (PSA) for example, pays landowners to conserve standing forest and pays all participants the same amount (Pagiola et al., 2004). This system, although easily calculable, presents a potential market failure in which there is either an under-payment for desirable land use changes or an over-payment for the less desirable (Pagiola et al., 2004). The RISEMP attempted to mediate these potential pitfalls by developing a point system in which specific land uses were assigned differing point levels and using it to determine payment (Pagiola et al., 2004).

Two separate indices were developed to measure specific environmental services of each land use: biodiversity conservation and carbon sequestration.⁵ These two indices were then combined to create an Environmental Service Index (ESI) which was used to calculate payments (Pagiola et al., 2004). Table 2-5 shows the biodiversity conservation and carbon sequestration indices. The biodiversity conservation index exists on a scale from 0.0 to 1.0; 0 represents the most biodiversity-poor land-use (in this case annual crops) and 1.0 represents the most biodiversity-rich land-use (in this case primary forest) (Pagiola et al., 2004). The points assigned to each land use were determined by a panel of experts who considered the potential of each land use to maintain the original biodiversity of the area; Pagiola et al. explain that several factors were taken into consideration including “...the number of species (of plants, birds, small

⁵ According to Pagiola et al. (2004), a water index was not included for two reasons: 1.) there was a lack of data necessary to construct it; and 2.) improved water flows are considered national benefits and therefore cannot receive funding from the GEF.

mammals, and insects), their spatial arrangement, stratification, plot size, and fruit production” (2004, 14).⁶

Preliminary Results

Preliminary results from Nicaragua

While there were three project sites in the RISEMP, only the Matiguás, Nicaragua site received follow-up evaluation. Evaluation showed several positive changes attributable to the presence of the RISEMP, suggesting that the project was successful in achieving conservation and development goals (GEF Evaluation Office, 2009; Pagiola, Arcenas, & Rios, 2007). According to Gomez (2009), the PES schemes of the RISEMP encouraged the increased use of silvopastoral practices in more than 24% of the total area as well as a substantial increase in tree density, fodder banks, and living fences. Additionally, the total area of degraded pastureland fell by 80% during the RISEMP (TRANSLINKS, 2009). Pagiola, Rios, and Arcenas (2007) argue that the project was also successful in human development in that poorer households were able to participate in the program, sometimes to a greater extent than households of higher income. Furthermore, although some RISEMP participants reverted back to pre-RISEMP practices after the PES scheme ended, most were pleased with the benefits of increased productivity received from the silvopastoral practices and planned to continue the practices in the future (Gomez, 2009).

The comparison between project groups was less clear, as selection bias and unintended behavioral effects plagued much of the project's control. The GEF Evaluation Office (2009) however, cited several valid differences between the PES

⁶ The ESI measures the environmental benefits of all land uses, not just those provided by silvopastoral practices (Pagiola et al., 2004).

group of 2 and 4 years. Figure 2-3 shows the adoption behavior of silvopastoral practices of the 2-year PES group and the 4-year PES group by the average incremental points per farmer per year relative to the previous year. The trend of adoption appears to support the RISEMP hypothesis in that the rate of adoption behavior was initially higher in the 2 year PES group and substantially declined over the last two years when the payments stopped⁷ (GEF Evaluation Office, 2009).

The GEF Evaluation Office (2009) cites the end of payment incentives and the failure of landowners to be convinced of the long-term direct economic advantages of silvopastoral practices as the roots of these trends. The end of the economic incentives to engage in silvopastoral practices for two years, in the form of payments, explains both the higher rate of adoption of the 2 year PES group, as they wanted to accumulate as many ESI points as possible before their payments ended, and the severe decline after payments ceased, indicating that their only incentives to engage in the silvopastoral practices were financial. The GEF Evaluation Office (2009) expands upon this point as it explains that many 2-year PES group participants were not yet convinced of the direct financial benefits of silvopastoral practices, and thus decreased the amount of money and labor they invested in the practices; this would lead to the overall decline in incremental ESI points (GEF Evaluation Office, 2009).

The GEF Evaluation Office was unable to conclude any valid differences between the other project groups (control, PES only, and PES plus technical assistance) due to problems with the experimental design of the project that resulted in

⁷ Among the 2 year PES group, the incremental Environmental Service Index score became negative in the last two years of the project; this indicates a severe decline in the ecological value of the farm (GEF Evaluation Office, 2009).

unintended behavioral responses and difficulty in distinguishing un-biased differences between experimental groups (2009). Much of the control group for example, didn't meet the selection criteria of the project, weren't familiar with other conservation projects like other participants in the PES groups were, and had lost interest in the project but were asked to join anyway. The Nicaragua project site also experienced problems of contagion in that farmers that weren't receiving any technical assistance directly from the project, were gaining exposure through other means by attending project meetings anyway, talking with participants who were receiving technical assistance, and accessing other resources from institutions in the area. There were a string of potential unintended behavioral pressures created through the project that included: subjective pressure to comply with the project due to a close relationship between participants and institutions; contractual pressure that restricted burning and deforestation; behavioral incentives for control group participation; and harbored resentment on the part of participants towards group selections. In Nicaragua, participants of the control group were offered perks to participate and many of the participants showed signs of resentment of not being part of a PES group and therefore worked to show the project that they could improve without support. These complications resulted in the low validity of comparing the means of each project group (GEF Evaluation Office, 2009).

Connections with Costa Rica

The GEF Evaluation Office observed in its evaluation report (2009) of the Nicaragua pilot site that the PES + TA (PES and Technical Assistance) groups in Costa Rica and Colombia showed higher values of incremental change compared to Nicaragua. It is suggested that this may indicate that the combination of PES and

Technical Assistance was more effective than sole payments (GEF Evaluation Office, 2009). It is these types of relationships, those between project incentives and measurable behavior, which this study strives to uncover in the Esparza, Costa Rica pilot site.

Framework for Discussing the Effects of RISEMP

The design of the RISEMP presents the potential to examine the effects of project incentives on the motivations to engage in the conservation behavior discussed above. The literature discussed in this chapter can be used to create a framework through which to accomplish this analysis. Table 2-4 shows this framework: the observable relationships between characteristics of the project design and behavior-change components.

The Control group of the RISEMP enables the analysis of Azjen's (1991) concept of subjective norms and DeYoung's (1993) intrinsic motivations. Because the participants in this project group were not offered incentives to adopt silvopastoral practices, actions on the part of participants can be considered independent of external motivations. An increased adoption of silvopastoral practices would suggest that participants were motivated internally, most likely through either subjective norms or intrinsic motivations. A failure to adopt silvopastoral practices by the Control Group would suggest either the absence or weakness of intrinsic motivations and/or subjective norms.

The PES and PES plus technical assistance groups present the opportunity to observe the effects of positive external incentives through payments, and knowledge and information through technical assistance. Any changes by the PES only group would be attributed to the payments as an external motivation. Changes in the PES

and technical assistance group allows for the analysis of the role of knowledge and information, in the form of technical assistance. Since both groups were offered payments, significant differences in the rates of adoption by participants in each group can be attributed to the absence or presence of technical assistance.

The length of involvement presents a similar control: time. Because 2-year participants and 4-year participants were offered the same incentives, significant differences in the rate of adoption between the two groups can be attributed to the length of time that participants received external incentives. This allows for the discussion of the role of Geller's (2002) habitualization and Agrawal's (2005) environmentality, which assume that the longer a person engages in a behavior, the more likely he/she is to continue engaging in said behavior.

This chapter helped to create the framework this study uses to address the two main research questions:

1. To what extent did the RISEMP affect participants' motivation to engage in conservation behavior during the project, what factors contribute to these motivations, or lack thereof, and what are the implications of these findings for future PES programs?
2. To what extent did the RISEMP affect participants' motivation to engage in long-term conservation behavior and levels of environmental consciousness, what are the factors that contribute to this, and what are the implications of these findings for future PES programs?

Chapter 3 continues to strengthen this base by discussing the Cost Rican context, with specific regard to the rhetoric of conservation, and the specifics of the Esparza project site. Chapter 4 then addresses the researcher's methods of data collection and preparation. Finally, Chapters 5 and 6 addresses the two research questions outlined by this study and data analysis from the RISEMP official data, and data collected by the author.

Table 2-1. Behavior change theories and key components.

Behavioral Theory	Behavior-Change Component
Knowledge-Deficit Theory (Schultz, 2002)	Knowledge and Information
Value Belief Norm (VBN) Theory (Stern, 2000)	Values and Belief System
Behavioral Analysis Approach & Environmentality (Geller, 2002; Agrawal, 2005)	External Incentives
Motive of Intrinsic Satisfaction (DeYoung, 1993)	Intrinsic Motivations
Theory of Planned Behavior (Ajzen, 1991)	Subjective Norms

Table 2-2. Silvopastoral systems and benefits.

Silvopastoral System	Description	Potential Direct Benefit to Landholder
Trees & Shrubs	Trees and shrubs are planted in pastures.	Provides shade and diet supplements while protecting the soil from packing and erosion.
Cut & Carry Fodder	Replace grazing in open pasturelands with stables in which livestock are fed with the foliage of different trees and shrubs specifically planted in areas formerly used for other agricultural practices.	Provides diet supplements while sequestering carbon and holding nutrients in the soil.
Living Fences & Wind Screens	The use of fast-growing trees and shrubs for fencing and wind breaks.	Provides an inexpensive alternative for fencing and supplements livestock diets. It can also provide firewood.
Forest Plantation Livestock Grazing	Livestock are allowed to graze in forest plantations.	Used to control invasion of native and exotic grasses, thus reducing the management costs of the plantation.

Pagiola, S., Agostini, P., Gobbi, J., de Haan, C., Ibrahim, M., Murgueitio, E., Ramírez, E., et.al. (2004). Paying for biodiversity conservation services in agricultural landscapes. *Environment Department Papers: Environment Economics Series*, 96. Retrieved from <ftp://ftp.fao.org/docrep/nonfao/lead/x6154e/x6154e00.pdf>

Table 2-3. Initial investment costs for selected silvopastoral practices (USD/ha): Costa Rica, Colombia and Nicaragua.

	Esparza, Costa Rica	Quindío, Colombia	Matiguás-Río Blanco, Nicaragua
Improved Pasture	250	375	265
Planting 100 trees in improved pasture	50	55	265
Planting 100 leuceana trees	n/a	1000	n/a
Live fencing	610	700	390
TOTAL (if practices are combined)	910	2130	920

Pagiola, S., Agostini, P., Gobbi, J., de Haan, C., Ibrahim, M., Murgueitio, E., Ramírez, E., et.al. (2004). Paying for biodiversity conservation services in agricultural landscapes. *Environment Department Papers: Environment Economics Series*, 96. Retrieved from <ftp://ftp.fao.org/docrep/nonfao/lead/x6154e/x6154e00.pdf>

Table 2-4. Observable relationships between project aspects and behavior-change components.

Aspect of Project Design	Behavior-Change Component
Control group	Subjective norms
	Intrinsic motivations
PES only group	Positive external incentive
PES and TA group	Knowledge and Information
2 and 4 year participation groups	Habitualization & Environmentalty
	Intrinsic values and norms

Table 2-5. Environmental services index used by RISEMP.

(Points per hectare, unless otherwise specified)

<i>Land use</i>	<i>Biodiversity index</i>	<i>Carbon sequestration index</i>	<i>Environmental service index</i>
Annual crops (annual, grains, and tubers)	0.0	0.0	0.0
Degraded pasture	0.0	0.0	0.0
Natural pasture without trees	0.1	0.1	0.2
Improved pasture without trees	0.4	0.1	0.5
Semi-permanent crops (plantain, sun coffee)	0.3	0.2	0.5
Natural pasture with low tree density (< 30/ha)	0.3	0.3	0.6
Natural pasture with recently-planted trees (> 200/ha)	0.3	0.3	0.6
Improved pasture with recently-planted trees (> 200/ha)	0.3	0.4	0.7
Monoculture fruit crops	0.3	0.4	0.7
Fodder bank	0.3	0.5	0.8
Improved pasture with low tree density (< 30/ha)	0.3	0.6	0.9
Fodder bank with woody species	0.4	0.5	0.9
Natural pasture with high tree density (> 30/ha)	0.5	0.5	1.0
Diversified fruit crops	0.6	0.5	1.1
Diversified fodder bank	0.6	0.6	1.2
Monoculture timber plantation	0.4	0.8	1.2
Shade-grown coffee	0.6	0.7	1.3
Improved pasture with high tree density (> 30/ha)	0.6	0.7	1.3
Bamboo (<i>guadua</i>) forest	0.5	0.8	1.3
Diversified timber plantation	0.7	0.7	1.4
Scrub habitats (<i>tacotales</i>)	0.6	0.8	1.4
Riparian forest	0.8	0.7	1.5
Intensive silvopastoral system (>5,000 trees/ha)	0.6	1.0	1.6
Disturbed secondary forest (> 10 m ² basal area)	0.8	0.9	1.7
Secondary forest (> 10 m ² basal area)	0.9	1.0	1.9
Primary forest	1.0	1.0	2.0
New live fence or established live fence with frequent pruning (per km)	0.3	0.3	0.6
Multi-story live fence or wind break (per km)	0.6	0.5	1.1

Note: The environmental service index is the sum of the biodiversity and carbon sequestration indices.

Pagiola, S., Agostini, P., Gobbi, J., de Haan, C., Ibrahim, M., Murgueitio, E., Ramírez, E., et al. (2004). Paying for biodiversity conservation services in agricultural landscapes. *Environment Department Papers: Environment Economics Series*, 96. Retrieved from <ftp://ftp.fao.org/docrep/nonfao/lead/x6154e/x6154e00.pdf>

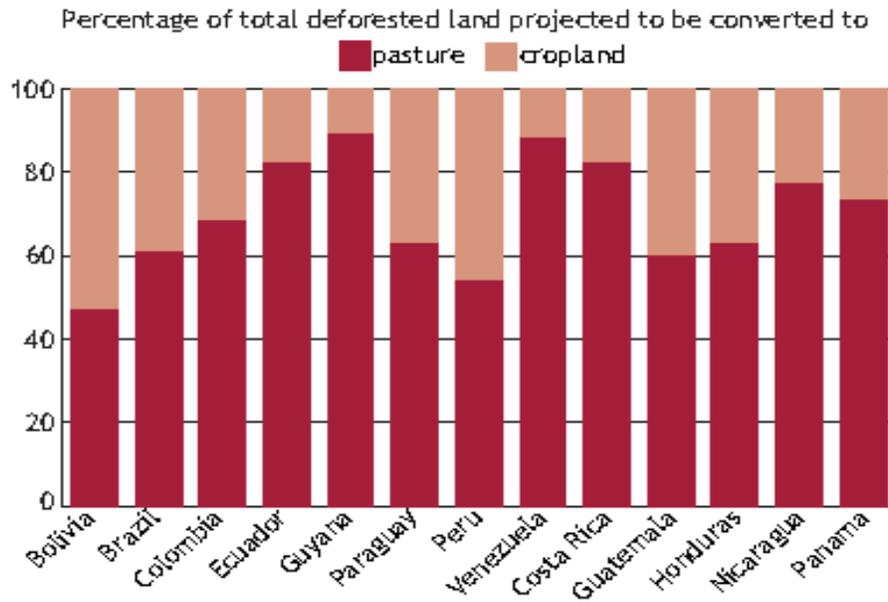


Figure 2-1. Projected share of deforested land converted to pasture and cropland, 2000-2010.

Food and Agriculture Organization (FAO). (2005). Livestock Policy Brief 03. Retrieved from <http://www.fao.org>.

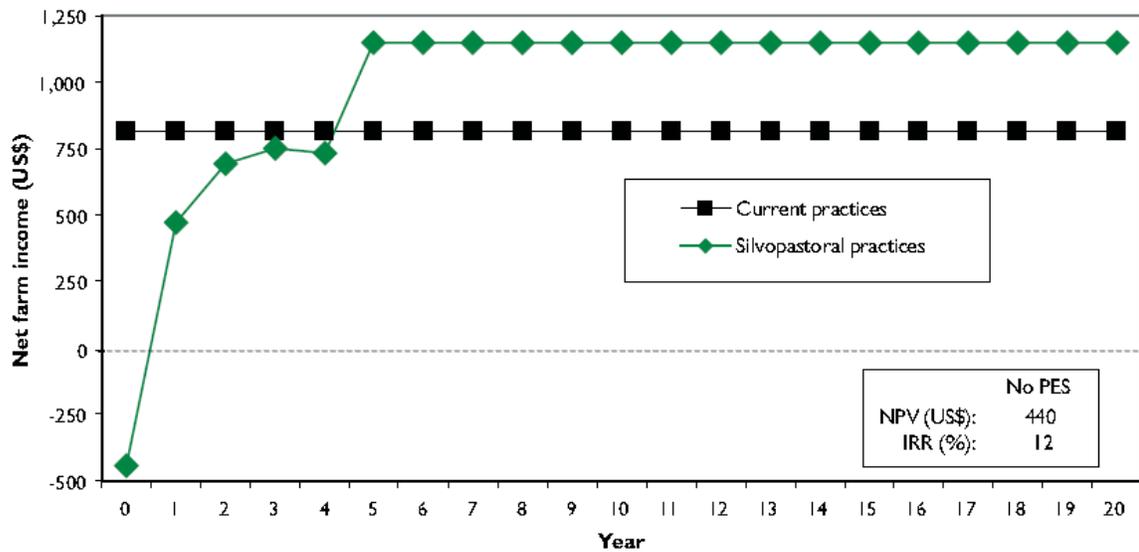


Figure 2-2. Typical time profile scenerio of benefits of silvopastoral systems on 20 hectare farm in Nicaragua.

Pagiola, S., Rios, A., & Arcenas, A. (2007). Can the poor participate in Payments for Environmental Services?: Lessons from the Silvopastoral Project in Nicaragua. *The World Bank*. Retrieved from <http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/ENVIRONMENT/EXTTEE/0, ,contentMDK:21648051~isCURL:Y~menuPK:1187844~pagePK:210058~piPK:210062~theSitePK:408050,00.html>

Nicaragua

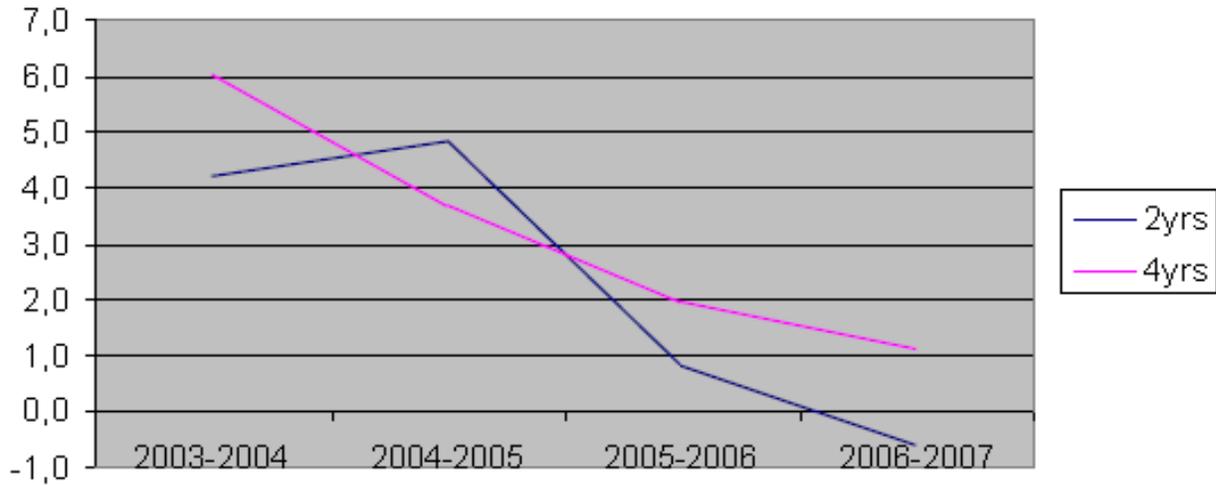


Figure 2-3. Adoption behavior of PES 2yrs vs. PES 4yrs Nicaragua pilot site.¹

Global Environment Facility (GEF) Evaluation Office. (August 2009). *Assessing the potential for experimental evaluation of intervention effects: The case of the Regional Integrated Approaches to Ecosystem Management Project (RISEMP)*. Impact Evaluation Information Document No. 15. Retrieved from http://www.thegef.org/gef/sites/thegef.org/files/documents/Impact_Eval_Infodoc15.pdf

¹ Average incremental points per farmer per year in relation to previous year (GEF Evaluation Office, 2009, 27).

CHAPTER 3 THE *TICO* CONTEXT: ESPARZA, COSTA RICA

Chapter 2 focused on concepts of behavior change, payments for environmental services (PES), and the RISEMP, while this chapter strives to outline the unique context in which the *Tico*¹ landowners of Esparza, Costa Rica, make decisions. It discusses the unique frame through which participants of the RISEMP entered and participated in the project. It will begin with a discussion of Costa Rica's position as one of the most developed countries in Latin America, politically, economically, socially, and environmentally, a position that places it appropriately within the behavioral literature that has focused primarily on post-material Western societies. It will then address the unique conservation history of the country, which has created a population familiarized and well versed in not only the rhetoric of conservation as a whole, but also that of payments for environmental services, something that behavioral theories suggest can increase an individual's propensity to adopt an environmentally responsible behavior. The chapter will then transition into a discussion of the Esparza, Costa Rica, project site, highlighting geographic and demographically relevant information, and specifically addressing the region's previous exposure to silvopastoral practices. Finally, this chapter will discuss the available demographics on the RISEMP participants, and factors that may have influenced the implementation of the project.

Costa Rica Country Profile

Costa Rica is hailed as one of the most developed countries in Latin America, politically, economically, socially, and environmentally. This level of development

¹ *Tico* is a slang term used to mean "Costa Rican."

makes it an appropriate country of study for the behavioral theories developed in post-materialist societies discussed in Chapter 2 and their application to behavior change in Esparza, Costa Rica. According to Inglehart (1981), post-materialist societies are ones in which basic physiological and safety material needs are met and secure, and individuals are therefore able to address concerns beyond those of survival, such as environmental conservation and sustainability. Particularly in the case of the RISEMP, only people with land, cattle, and land tenure were accepted as participants; this population tends to have greater financial security and exist above the poverty line, without a day-to-day worry about survival. Thus the level of development of Costa Rica, although not necessarily a post-materialist society to the same extent as the United States or countries of Europe, presents the potential for the application of the behavioral theories discussed in Chapter 2.

Geography and Demographics

Costa Rica is a Central American country with an area of 51,100 square kilometers that shares a northern border with Nicaragua and a southern with Panama (See Figure 3-1) (CIA Worldfactbook, 2013). The country's climate zones are tropical and subtropical with two main seasons: dry and rainy. The coastal plains are separated by a north to south mountain chain that includes over 100 volcanic cones, several of which are active (CIA Worldfactbook, 2013). Over 50% of Costa Rica is under forest cover and the nation's tropical rainforests are home to an estimated 5% of the world's biodiversity (UNDP, 2011).

Costa Rica is home to 4.5 million people, approximately 94% of which are reported as white or mestizo, 3% as black, 1% as Amerindian, 1% as Chinese, and 1% as other (CIA Worldfactbook, 2013). While a large majority of the country is reported as

Roman Catholic, 76%, Costa Rica has a relatively large population classified as Evangelical, 13% (CIA Worldfactbook, 2013). Costa Rica maintains a 64% urbanization rate, a low number relative to the 80% rate of Latin America as a region, and a literacy rate of 94.9% (CIA Worldfactbook, 2013; UN Human Settlement Program, 2012).

Political Development

Costa Rica's political history and development can be referred to as the one of the most peaceful and stable in Latin America. Costa Rica gained its independence from Spain in 1821 in a non-violent movement, and with the exception of a 44-day civil war in 1948, has never experienced any armed conflicts (CIA Worldfactbook, 2013). In 1949, Costa Rica instituted the constitution that exists today, one that abolished the national army and declared Costa Rica a democratic republic (CIA Worldfactbook,2013). Despite several complaints about unjust defamation charges brought against journalists and challenging bureaucratic processes, the Freedom House ranks Costa Rica as a free nation (Freedom House, 2012).

Economic Development

Although Costa Rica was one of the poorest parts of the Spanish empire, it has enjoyed relatively stable economic success for the past 30 years. While the backbone of the economy is composed of traditional agricultural exports², a diversification of the economy that includes industrialized and specialized agricultural products, high-value added goods, and tourism has helped to strengthen exports (CIA Worldfactbook, 2013). The green energy and ecotourism industries have become some of the most widely developed in the world and are responsible for dramatically boosting foreign direct

² Costa Rica's primary traditional agricultural exports are bananas, coffee, sugar, and beef (CIA Worldfactbook, 2013).

investment (CIA Worldfactbook, 2013). Costa Rica is ranked 13th in the world for installed capacity to produce hydroelectric energy (CIA Worldfactbook, 2013). Table 3-1 shows the relatively stable growth in both in real GDP and GDP per capita compared to Latin America as a whole. Since 1990, Costa Rica has maintained GDP real growth rates and GDP's per capita of either equivalent or above regional averages (UNDP, 2011; World Bank, 2013).

The GDP is composed 6.3% from agriculture, 21.7% from industry, and 72% from services (CIA Worldfactbook, 2013). By occupation, 14% of the labor force is employed in agriculture, 22% in industry, and 64% in services; the high concentration of the workforce in the service industry and its large contribution to the GDP show that Costa Rica has an efficient and value-adding workforce relative to other countries in Latin America and the Caribbean. Furthermore unlike its neighboring countries, remittances only compose approximately 2% of the total GDP (CIA Worldfactbook, 2013). It is for these reasons that the World Bank (2013) classifies Costa Rica as an upper middle class nation.

Social Development

Development indicators show that Costa Rica maintains higher levels of development than both the average for Latin America and the Caribbean (0.731) and the average for the world (0.676). The country has a Human Development Index (HDI)³ of 0.744 which ranks it 69 out of 187 countries with sufficient data (United Nations Development Program (UNDP), 2011). Figure 3-2 shows the high HDI scores of Costa

³ The United Nations Development Program's (UNDP) Human Development Index (HDI) attempts to reflect a well-rounded measure of national well-being. The HDI is a composite measure of health, education, and income indicators (UNDP, 2011).

Rica in relation to the average for Latin America, and the world, since 1980 (UNDP, 2011).

Costa Rica has a Gross Domestic Product (GDP) per capita of 11,900, ranking it 100th in the world (CIA Worldfactbook, 2011). Although the population living below the poverty line has remained relatively constant for nearly 20 years, at a rate of 20-25% (CIA Worldfactbook, 2013), less than 1% of the population lives in extreme poverty⁴ (UNDP, 2011). Furthermore, the World Bank estimates that 91% of the rural population has access to an improved water source⁵ (World Bank, 2011). Infant mortality rate is reported at 9.2 per 1000 births, the 4th lowest rate in Latin America, and maternal mortality rate at 44 per 100,000 births (CIA Worldfactbook, 2013; UNDP, 2011).

Although development indicators remain high relative to other nations in the region, inequality exists as a problem in Costa Rica. The country has a Gini Coefficient,⁶ a measure of inequality in the distribution of family income, of 55.3, ranking it the 22nd most unequal nation in the world, according to the UNDP (2011). Furthermore, an adjustment of the UNDP's HDI value for inequality reduces Costa Rica's score to 0.591 (2011).

A Unique Case of Conservation History

To understand the framework from which landholders in the Esparza watershed entered, participated, and completed the RISEMP, it is essential to briefly address the history of conservation in Costa Rica. The relationship between conservation and the average landholder in Costa Rica differs significantly from that of other nations because

⁴ The UNDP defines extreme poverty as living on less than 1.25 USD (purchasing power parity) per day (2013).

⁵ It is estimated that 100% of the urban population has access to an improved water source.

⁶ The UNDP's Gini Coefficient is an index that measures the "degree of inequality in the distribution of family income" (2011). A score of 0 would mean the existence of perfect equality and a score of 100 the existence of perfect inequality (UNDP, 2011).

of the extensive history of conservation and the establishment of a national PES program in the 1990's. This exposure to the rhetoric of conservation, and more specifically PES, plays a role in the ways in which landholders think, talk, and act toward the environment.

Command-and-Control

Costa Rica has been long hailed as a country deeply interested and motivated by conservation, tracing its first conservation initiatives to the 1800's and earning the nickname of the "Green Republic" (Evans, 1999). Evans (1999) emphasizes three elements that differentiate and enable the case of Costa Rica's successful conservation history: the country's unique biogeography that rendered it isolated from the rest of the Spanish empire; a history of scientific inquiry that can be traced to the mid-1800's; and an agricultural society built upon smaller land-holdings relative to other Latin American land distribution systems. Despite these differentiations, Costa Rica entered a period of severe environmental degradation in the late 1800's in the pursuit of export agriculture, timber, and cattle raising. This immense environmental degradation and resulting economic crisis, claims Evans, shocked the country into the pursuit of conservation beginning in the late 1960's.

The solution pursued was an era of command-and-control national park creation, reflected in Table 3-2, which began in the late 1960's and ended in the 1990's. Today, just over 25% of Costa Rica lies within protected areas, a relatively large proportion of national territory. In addition to creating national parks, the Costa Rican government began issuing subsidies to landowners who maintained standing forests (Rojas & Aylward, 2003).

The transition from command-and-control conservation came as Costa Rica approached the 1990's and faced several challenges to its conservation initiatives. The land appropriations undertaken by the government to create the national park system had left the budget of the Ministry of Environment drained of capital and had created animosity within local communities (Porrás, 2010). This animosity was creating an “island effect” around newer national parks in which landowners were deforesting any land that surrounded national parks to prevent government appropriation. At the same time, the concept of sustainability was gaining increasing international popularity and attention after the Rio Conference in 1990 and the Framework Convention on Climate Change in 1992. This initiative demanded a more people-oriented approach in the government’s conservation agendas. Finally, most scholars tend to cite the pressure faced by the Costa Rican government by the International Monetary Fund (IMF) to cut government subsidy programs that offered credits to those who engaged in conservation practices, a program that resembles the national payments for environmental services program, Pagos por Servicios Ambientales (PSA), in place today (Rojas & Aylward, 2003; Pagiola, Rios, & Arcenas, 2007; Porrás, 2010).

A New Era: Pagos por Servicios Ambientales (PSA)

These pressures led to the restructuring of the conservation agenda within Costa Rica between 1995 and 1996. The most important new policies came in the form of: the Forestry Law 7575, which mandated the “rational use” of all natural resources as well as prohibited land-cover change in forested areas; and the 1995 Environment Law 7554 and 1998 Biodiversity Law, which together mandated that there should be a “balanced and ecologically driven environment for all” and a “rational use” of biodiversity resources, respectively (Sánchez-Azofeifa, Pfaff, Boomhower, & Robalino, 2007).

Together, these laws were responsible for establishing the foundation upon which the nation's current Pagos por Servicios Ambientales (payments for environmental services) (PSA) program was built.

Most importantly, these laws established the National Fund for Forest Finance (FONAFIFO) and legally recognized four environmental services worthy of economic compensation. FONAFIFO stands as a semi-autonomous body responsible for the regulation and facilitation of contracts with landowners for the environmental services that their lands provide (Rojas & Aylward, 2003; Pagiola, Rios, & Arcenas, 2007; Sánchez-Azofeifa, Pfaff, & Boomhower, 2007; Porras, 2010). FONAFIFO thus became the body responsible for recognizing the services defined by the Forestry Law 7575 which include, as cited by FONAFIFO (2012):

...the mitigation of greenhouse gases; protection of water for urban, rural, or hydroelectric use; protection of biodiversity and other forms of life through both conservation and its use as a sustainable resource, scientific or pharmaceutical research, and bio-genetic research; and natural scenic beauty for the purposes of tourism and science.

Today, the PSA program is in its third phase and is funded primarily through government tax revenue, private and public non-governmental funding, and contracts with select service consumers (FONAFIFO, 2012). The program offers payments for three different land practices: conservation; reforestation; and, most recently, agroforestry (Rojas & Aylward, 2003; Pagiola, Rios, & Arcenas, 2007). Figure 3-3 shows the total budget and contract allocation for each land-use that qualifies for Costa Rica's PSA program. Although agroforestry doesn't represent the most common type of

PSA contract or compose large proportions of the programs allocation of funds, it is important to note the existence of a payments system for agroforestry practices that pre-dates the RISEMP.⁷

This previous exposure to the rhetoric of agroforestry, payments for environmental services, and conservation, is important to understand because it creates awareness about the practices and programs, something that behavioral theory suggests could increase the likelihood of behavioral adoption. The rhetoric of agroforestry and conservation is also important because it creates an atmosphere in which people's values are more likely to form around the idea of resourcefulness, sustainability, and the environmental services provided by the environment, another suggested motivation for conservation behavior as discussed by Stern (2000). The illegality of forest cover change is also important because of its potential effects on behavior choices. It is possible that this policy could deter landowners from reforesting areas of their land, in the fear that, once restored, they would never be allowed to clear it. It is also possible that a fear of sanctions from this policy is the motivation to maintain forest cover that exists, as opposed to a biospheric value system that values forest for its conservation benefits.

Locating Esparza: A Profile of the Central Pacific Region

Esparza is a canton of approximately 26,000 people, located in Costa Rica's Central Pacific region in the province of Puntarenas (See Figure 3.4). The Central Pacific Region has been a main agricultural hub of the nation since its settlement, and continues to maintain an economy and culture that revolves around this way of life. The

⁷ Silvopastoral practices are considered agroforestry practices (Nair, 1993).

use of silvopastoral practices and projects incentivizing them pre-date the existence of the RISEMP and were estimated to be used by about 10% of landowners in the region in 2007 (Ministerio de Agricultura y Ganadería (MAG), 2007).

Cattle Production

Settlers arrived in the region more than 500 years ago and began developing the region for agriculture, both crop and livestock production (White et al., 2001). According to the Ministry of Agriculture and Livestock (MAG), livestock production is one of the primary economic activities of the Central Pacific region, with 33.75% of the region's land dedicated to cattle production: 87.8% beef; 3.5% milk; and 8.7% both milk and beef (2007). The cattle industry, production of milk and beef, brings in approximately 19.5 million USD to the Central Pacific Region per year and provides jobs to more than 4,500 people (MAG, 2007). The average landholding of cattle producers in the Central Pacific region is 50 hectares, compared to a country average of 35 (MAG, 2007).

Silvopastoral Practices

Although the region is still degraded due to the use of traditional pastures⁸, especially on mountain slopes (White et al., 2001), MAG (2007) credits the adoption of silvopastoral practices for an increase in total production but a decrease in area under pasture between 2000 and 2007. Between 2000 and 2007, the percentage of area under pasture decreased from 35.19% to 33.75% while the total cattle count increased by 8,556; this means that the number of cattle supported per hectare increased by 3% (MAG, 2007). MAG cites the use of improved pastures as the primary cause of this inverse relationship (2007). It is important to note that in countries with lower costs of

⁸ Traditional pastures are those cleared of trees. For a more in depth discussion of traditional pastures, refer to chapter 2.

land, expansion of pastures rather than intensification has most generally been preferred. In the case of the Central Pacific Region of Costa Rica the price per hectare, 2500 USD, makes silvopastoral practices more attractive as a means to intensify a cattle production enterprise (White et al., 2001).

Obstacles to Cattle Production

The primary obstacles faced by cattle producers in the region are degradation of pasturelands, limited technical assistance, and the 6 month dry season experienced by much of the region (MAG, 2007). Degraded land leads to decreased carrying capacity of pastures, and in turn less healthy livestock; this is then exacerbated by limited technical assistance that would help landowners mediate and/or reverse land degradation, and a long dry season. Land degradation in the region is further exacerbated by the sloping terrain of many landholdings and the 6 month dry season that strain the land's vegetation, and therefore the livestock (MAG, 2007). Once trees are removed from sloped terrain, the nutrient-rich top soil is easily washed or blown away and virtually irreplaceable (P.K. Nair, personal communication, January 16, 2013). This means that landowners in the area experience low rates of productivity due to the relatively low carrying capacity of their land. Finally, MAG (2007) reports a limited availability of technical assistance for the area; it estimates that it only benefits about 10% of producers in the Central Pacific Region.⁹ Although silvopastoral practices are present in the region, MAG estimated that in 2007, only 10% of landowners engaged in them.

⁹ MAG (2007) notes that although they do not offer extensive credit opportunities, other governmental bodies do and that credit is therefore accessible by most producers.

Esparza, Costa Rica

The Esparza Canton is composed of five districts: District of San Jeronimo; District of Espiritu Santo; District of San Juan Grande; District of San Rafael; and District of Macacona (See Figure 3-5). Esparza is considered a Tropical Dry Forest climate, with average precipitation of between 63 and 94.5 inches (1600 and 2400 millimeters) per year and a median temperature of 84.2 degrees Fahrenheit (29 degrees Celsius) (MAG, 2007). The canton experiences two main seasons: a rainy season from May through November and a dry season from November through April.¹⁰ According to a study done by White et al. (2001), the average farm size of livestock owners in the Esparza canton is 29 hectares.

As a large and easily accessible canton¹¹, Esparza was home to a silvopastoral project funded by Tropileche from 1996 to 1997 (White et al., 2001). According to White et al. (2001), the landholders involved improved an average of 15% of their pastures. These improvements ranged from 45% of pastures on smaller farms to 5% of pastures on larger farms, a finding White et al. (2001) attributed to the need for small-scale farmers to adopt more intensive land-use practices. Farmers with small holdings tend to have lower incomes than larger famers and, in these cases, any increase in returns for smaller farmers is a higher proportion of total farm income. The authors also noted that Costa Rica had higher adoption rates than other countries because it had more mature markets with greater points of accessibility (White et al., 2001). This mature market meant higher land prices, which removed the option of expanding pastureland to

¹⁰ This study was conducted during the rainy season.

¹¹ Esparza is located along one of the major cross-national highways.

increase production, so producers intensified instead. This finding has the potential to account for differences between countries in the RISEMP as well.

Partnering Institutions

Although funded by the GEF and World Bank, the partnering institutions within Costa Rica played a pivotal role in the RISEMP's implementation. The Center for Tropical Research and Higher Education (CATIE) served as the main coordinating body within Costa Rica and was responsible for building capacity of local institutions, one of the project goals of the RISEMP. CATIE worked closely with the Ministry of Agriculture and Livestock (MAG) of Esparza during the RISEMP and prepared MAG to continue offering assistance to livestock owners after the project's termination in 2007. The role of each institution within the country and the relationship of each with the communities affected by the RISEMP thus helps to explain the context of Esparza.

Center for Tropical Research and Higher Education (CATIE)

Between 2002 and 2007, CATIE acted as the entry institution into Costa Rica for the RISEMP, while MAG acted as the entry institution into Esparza. Thus, CATIE was the partner through which the RISEMP resources were channeled and focused in Costa Rica.

Mission

CATIE of Costa Rica is one of six locations in Central America, and one of seven in all of Latin America.¹² CATIE began in Costa Rica in 1946 as a regional research and education center in agriculture and natural resources (CATIE, 2013). CATIE's mission is to "...improve human well-being and reduce rural poverty through education,

¹² CATIE's member countries include: Costa Rica; Guatemala; El Salvador; Honduras; Nicaragua; Panama; and Bolivia.

research and technical assistance, and to promote the sustainable management of agriculture and natural resources” (CATIE, 2013). The teaching and research center strives for a Latin America and Caribbean which achieves “...higher levels of human development by competitively and sustainably producing agricultural goods and ecosystem services” (CATIE, 2013).

Relationship with the Esparza community

CATIE exists as a highly respected institution, both academically and socially, throughout Costa Rica because of its focus on improving rural agricultural livelihoods, and relative success in doing so. MAG of Esparza was the partner institution that facilitated entry in to the Esparza community, and it was the relationship between MAG agents and landowners in the area that aided the project’s implementation.

Ministry of Agriculture and Livestock (MAG)

The relationship between MAG and the livestock producers of the region affected the circumstances under which the RISEMP and this study took place. MAG played an integral part in facilitating the RISEMP and the evaluation done by this study. Thus, MAG has significant influence in the community. MAG officers of Esparza both had and continue to have a good relationship with producers in the area and serve as resources for technical assistance and information.

Mission

Although MAG wasn't created until 1960, Costa Rica has maintained a government body responsible for establishing relationships and transferring knowledge and agricultural inputs with agricultural producers since 1910 (MAG, 2012). Today, MAG's mission is to promote the competitiveness and development of the country's agricultural activities and rural landscape while maintaining and protecting the integrity

of the natural environment and its productive resources (MAG, 2012). This pursuit is intended to allow producers to achieve a higher quality of life by facilitating greater integration into the national and international markets (MAG, 2012). MAG's official vision is one in which it is recognized "...by our users and beneficiaries as leaders in the facilitation of high-quality services that promote the development of conditions for constant growth, sustainability, and equity for the agricultural producer and the well-being of the national population, such that Costa Rica is considered a productive agricultural country" (MAG, 2012).

MAG's main influences have been in the form of the provision of education, technical assistance, and financial support for small and medium farmers. MAG has also been responsible for the generation of many of the institutions of the country's agricultural sector (MAG, 2012). In fact, the acting Minister of Agriculture participates in CATIE's Superior Council. Its most recent initiative, for example, helped to create the national Program for the Protection of Sustainable Agricultural Production, in 2004 (MAG, 2012).

MAG of Esparza

Each of Costa Rica's eight political regions maintains a series of MAG offices responsible for serving those residing in each canton of the region. The Esparza Canton MAG office is one of thirteen offices in the Central Pacific Region and is responsible for serving the five districts within it (see Figure 3-5).¹³ The office has two officers in charge of extension work: one who works with agronomy and crop production, and the other with large livestock, primarily cattle. Both officers maintain

¹³ The Esparza Canton MAG Office is responsible for serving the following districts: District of San Jeronimo; District of Espiritu Santo; District of San Juan Grande; District of San Rafael; and District of Macacona.

good relationships with the communities in Esparza and are frequently sought for technical assistance and information. These officers were responsible for both helping CATIE to recruit participants for RISEMP and to implement the project and aiding the researcher in collecting the data used in this study.

RISEMP in Costa Rica

The RISEMP worked with CATIE and MAG of Esparza to recruit voluntary participants for the project. Participants in the Esparza watershed were accepted according to the RISEMP's requirements of farm size, land tenure, primary income activity, and willingness to collaborate with the project. To target improving livelihoods, the RISEMP focused primarily on small to medium sized landowners whose primary income was derived from cattle production.

Participants

Participants were chosen on a set of eight criteria cited by the GEF Evaluation Office (2009, 15) as:

1. Small and medium farmers
2. Secure land tenure
3. Livestock as principal income activity
4. Willingness to sign a contract with the project
5. Willingness to collaborate with the project monitoring activities regarding the following information: socio-economic, carbon, water, biodiversity data
6. Willingness to participate in training and receive technical assistance
7. Willingness to develop a farm development plan in order to generate environmental services and improve productivity
8. Willingness to continue to manage silvopastoral systems after project closure

Farm Size, Cattle Count, and Location

The average farm size for participants in the RISEMP was 33.3 hectares; however, 79.6% of the participants owned less than 50 hectares and 47.6% owned less than 20 hectares. The maximum landholding was 261.9 hectares, thus inflating the mean, while the minimum was 2.7 hectares. The random sample of participants interviewed in this study was reflective of these averages. The mean farm size was 31.18 hectares, with 80.5% of respondents owning less than 50 hectares and 46.3% owning less than 20 hectares. Table 3.3 shows the farm size comparisons between all of the RISEMP participants and those randomly selected for this study.¹⁴

The mean number of cattle owned by surveyed respondents was 28; however, 76.3% respondents owned 38 or fewer cattle and 55.3% owned 15 or fewer cattle. It is important to note that this study does not have the cattle count of all the participants in the RISEMP, only those interviewed by the author. The maximum number of cattle reported was 110, thus inflating the mean, and 4 respondents reported not owning any cattle. Several respondents that reported not owning any cattle at the time of the survey had sold their land, while others were in a period between having just sold their cattle, and purchasing more. These counts refer to respondents' cattle counts at the time of their interview in the summer of 2012. Respondents were asked, however, if they had more, less, or the same number of cattle at the beginning of the RISEMP. Of 37

¹⁴ These farm sizes are those reported in 2002. Although this means that this isn't a completely accurate reflection of current conditions, responses from landholders suggest that there has been little variation.

respondents, 73.0% reported that they had either the same number or more cattle in 2002.¹⁵

Table 3-4 shows the geographic distribution of total RISEMP participants compared to the random sample of this study. The communities with the most RISEMP participants were Angostura, Baron, Cerillos, Mesetas, and Miramar with 10.2%, 7.3%, 9.5%, 7.3%, and 6.6% of participants, respectively. The random sample used for this study produced a similar but varied distribution. The communities with the most participants as part of the random sample were Baron, Juanilama, Sabana Bonita, and Miramar with 11.9%, 9.5%, 9.5%, and 7.1% of respondents, respectively. Both the smaller sample size of this study and time constraints account for the differences in geographic distributions.

Gender

Although gender will not be addressed in this study because it is out of the scope of the research questions, it is important to note. Only three of the participants interviewed were female because the majority of landholdings are in men's names and men were most commonly the primary implementers of the silvopastoral practices. Thus, even in cases that a female participant was interviewed, her husband served as the main informant because he had been the main implementer in the project.

Influencing Factors

Land tenure

The land tenure requirement of the RISEMP restricted participation and, therefore, generalizability. Although Costa Rica has one of the more developed land

¹⁵ 48.6% of respondents reported that they had the same number of cattle; 24.3% of respondents reported that they had more cattle.

tenure systems of Latin America, many farmers continue to use land without holding titles. This means that only landowners who could produce a legal land title were accepted into the project. The extent to which generalizations can be made about the behavior of landowners without land titles in Esparza is thus limited.

Cattle market

While the RISEMP attempted to control for many variables, it was unable to buffer fluctuations in the cattle market. More specifically, the international price of beef dropped during the introduction of the RISEMP. Between 2002 and 2003, world beef prices fell from 101.05 US cents per pound to 85.35 US cents per pound (Indexmundi, 2012). Table 5 shows the world prices of beef in US cents per pound between 2000 and 2012. It is therefore likely that the decision of landowners to participate in the RISEMP was affected by the belief that the cattle industry was becoming less profitable, leading farmers to seek additional income from RISEMP as security.

Participants' uncertainties

Many of the landowners in Esparza, both participants and non-participants of RISEMP, reported feelings of skepticism and insecurity about the promises made by the program when it first came to the area in 2002. Many landholders didn't believe that the program would actually follow through and pay them at the end of each year in return for the work done to increase the provision of environmental services. Those not joining the RISEMP cited this as a significant deterrent. By the time they realized that landholders were actually receiving payments, it was too late to join the program. Those who were participants of RISEMP said that it was this insecurity that kept them from pursuing many changes the first year of the program.

Looking Forward

This chapter builds upon the literature foundation established in Chapter 2 to paint a picture of the unique national, regional, and local context in which landowners in the Esparza watershed made behavioral decisions during the RISEMP. Costa Rica is a Latin American country with relatively high standards of living, economically, socially, and environmentally. Furthermore, there exists a national rhetoric of environmental conservation, payments for environmental services, and agroforestry. At the local level of Esparza, a region highly dependent on cattle production, there was a previous, positive, and observable exposure to silvopastoral practices as well as support from and trust of MAG. With this context established, Chapter 4 transitions into an explanation of the data collection, preparation, and processing that leads to the analysis of the short and long-term effects of the RISEMP on conservation behavior in Chapters 5 and 6.

Table 3-1. GDP growth rate and GDP per capita: Costa Rica and Latin America and the Caribbean.

Year	GDP Growth Rate: Costa Rica	GDP Growth Rate: Latin America and the Caribbean	GDP per capita PPP (USD): Costa Rica	GDP per capita PPP (USD): Latin America and the Caribbean
1990	4.0%	n/a	6,223	7,110
2000	3.0%	4.0%	8,113	8,303
2005	5.9%	5.0%	9,002	8,871
2006	7.9%	6.0%	9,642	9,256
2007	6.8%	6.0%	10,247	9,677
2008	2.7%	4.0%	10,374	9,972
2009	-1.0%	-2.0%	10,085	9,701
2010	4.7%	6.0%	11,600	10,180
2011	4.2%	5.0%	11,900	10,520

United Nations Development Program (UNDP). (2013). "Country Profile: Costa Rica." Retrieved from <http://data.un.org/CountryProfile.aspx?crName=COSTA%20RICA>.

World Bank. (2013). "Costa Rica at a Glance." Retrieved from http://devdata.worldbank.org/AAG/cri_aag.pdf

Table 3-2. Evolution of protected areas in Costa Rica 1955-1999.

Year	% National Territory Protected
1955	0.05
1990	16.80
1997	23.80
1999	24.80
2010	25.1

Central Intelligence Agency (CIA) WorldFactbook. (2013). "Costa Rica." Retrieved from <https://www.cia.gov/library/publications/the-world-factbook/geos/cs.html>

Rojas, M. & Aylward, B. (2003). What are we learning from experiences with markets for environmental services in Costa Rica: A review and critique of the literature. *Environmental Economics Programme*. Retrieved from [http://www.ecosystemeconomics.com/Resources_files/Rojas%20%26%20Aylward%20\(2003\)%20CR%20Markets%20for%20Env%20Services.pdf](http://www.ecosystemeconomics.com/Resources_files/Rojas%20%26%20Aylward%20(2003)%20CR%20Markets%20for%20Env%20Services.pdf)

Table 3-3. Farm size of total RISEMP participants and random sample.

	Total RISEMP Participants	Random Sample
Mean Farm Size (ha)	33.3	31.18
Maximum Farm Size (ha)	261.9	261.9
Minimum Farm Size (ha)	2.7	8.23
% Who Own less than 100 ha	79.6	80.5
% Who own less than 20 ha	47.6	46.3

(RISEMP, 2007)

Table 3-4. Distribution of participants by community.

Community	Total Participants		% of Participants	
	RISEMP	Random Sample	RISEMP	Random Sample
Angostura	14	2	10.2	4.8
Artieda	6	4	4.4	9.5
Baron	10	5	7.3	11.9
Cerillos	13	3	9.5	7.1
Guadalupe	6	2	4.4	4.8
Jesus Maria	2	2	1.5	4.8
Juaniliama	9	4	6.6	9.5
Macacona	3	1	2.2	2.4
Maranon	3	2	2.2	4.8
Mesetas	10	2	7.3	4.8
Miramar	9	3	6.6	7.1
Mojon	2	1	1.5	2.4
Nances	1	1	0.7	2.4
Penas Blancas	6	2	4.4	4.8
Sabana Bonita	8	4	5.8	9.5
Salinas	4	2	2.9	4.8
Salitral	6	0	4.4	0
San Jeronimo	8	1	5.8	2.4
San Juan	5	0	3.6	0
San Juan C	2	0	1.5	0
San Juan Grande	1	0	0.7	0

Table 3-4. Continued

	Total Participants		% of Participants	
	RISEMP	Random Sample	RISEMP	Random Sample
San Miguel	6	1	4.4	2.4
San Rafael	3	0	2.2	0

(RISEMP, 2007)

Table 3-5. World price of beef (US cents/pound).

Year	Price
2000	88.2
2001	87.81
2002	101.05
2003	85.35
2004	107.06
2005	115.25
2006	113.63
2007	119.25
2008	121.33
2009	114.13
2010	133.88
2011	185.63
2012	190.93

Indxmundi.com. (2013). "Beef Daily Price." Retrieved from <http://www.indexmundi.com/commodities/?commodity=beef&months=120>



Figure 3-1. Political map of Costa Rica.

Nationsonline.org. (2013). "Political Map of Costa Rica." Retrieved from http://www.nationsonline.org/oneworld/costa_rica.htm

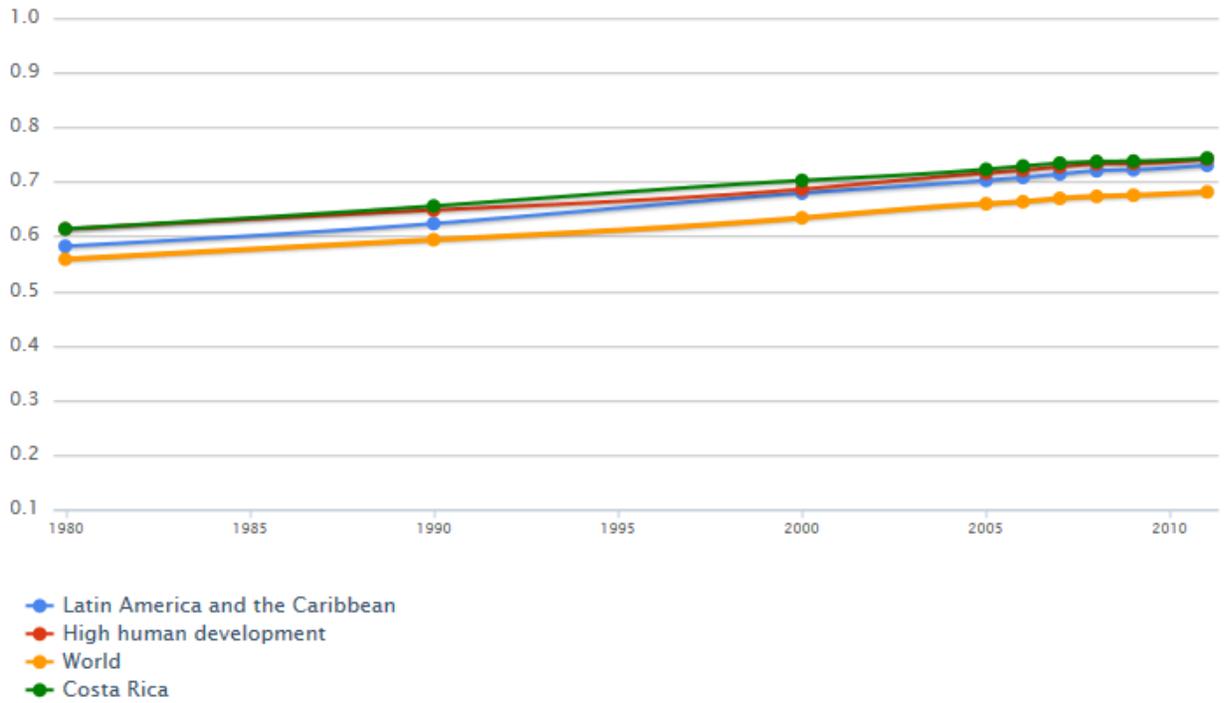


Figure 3-2. Trends in HDI 1980-2010.

United Nations Development Program (UNDP). (2013). "Country Profile: Costa Rica." Retrieved from <http://data.un.org/CountryProfile.aspx?crName=COSTA%20RICA>.

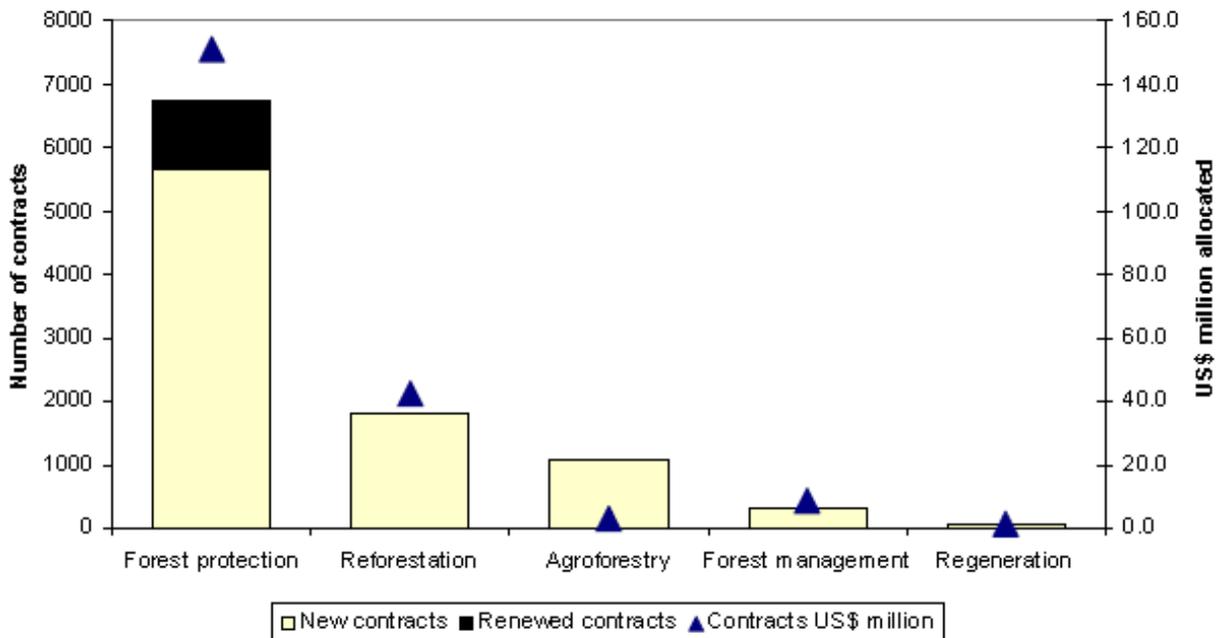


Figure 3-3. Total contract and budget allocation for each PSA activity (1997-2008).

Porras, I. (2010). Fair and green? Social impacts of payments for environmental services in Costa Rica. *International Institute for Environment and Development*.



Figure 3-4. Esparza, Costa Rica.

Nationsonline.org. (2013). "Political Map of Costa Rica." Retrieved from http://www.nationsonline.org/oneworld/costa_rica.htm

CHAPTER 4 DATA COLLECTION, PREPARATION, AND PROCESSING

The previous chapters provided a necessary context and established a framework through which to analyze behavior change in the specific context of landowners in the Esparza watershed during and after the RISEMP. This chapter explains the methodologies of data collection and preparation used by this study. The two largest sources of data utilized in this study were semi-structured random interviews with a total of 41 RISEMP participants and official RISEMP data provided to the author. This chapter begins by explaining the methodologies and forms of data collection from eight-weeks of research in the Esparza watershed, Costa Rica, which included: semi-structured random interviews; interviews with key informants; and observations. This explanation addresses the selection of participants, the circumstances of each interview, and the questions asked of each respondent. The chapter then discusses the preparation and processing of data and the interpretation of results used to create the index of environmental consciousness that is used in Chapter 6.

The GEF (2009) identifies three logical frameworks through which the RISEMP can be studied: effects at the field level; institutional effects; and replicatory effects. Field level analysis refer to the analysis of the processes and changes that occur at the project site, among project participants. The RISEMP could also be studied at the institutional level, analyzing the effects of the project on the implementing institutions. Finally, the replicatory effects of the project refer to diffusion or spread of the lessons taught by the project and their incorporation into research in the future. It is important to note that this study examines the effects of the RISEMP at the field level, as defined by the GEF (2009).

Forms of Data Collection

During an eight-week investigation in the Esparza watershed, Costa Rica, the majority of semi-structured interviews were conducted on the respondents' landholdings, but several were conducted in offices (Esparza Ministry of Agriculture and Livestock Office (MAG) and Esparza Agriculture Cooperative) and residences of other members of the communities. This study incorporates data collected through interviews with key informants who live within the community and helped with the implementation of the RISEMP program between 2002 and 2008 and with other cattle-owners who reside in the Esparza watershed. Observations of economic, social, and political factors relevant in the area were also important to this study.

Semi-structured interviews

The bulk of data utilized by this study were collected through semi-structured interviews of a total of 41 RISEMP participants: 15 each from Groups B (PES + TA 2-4 years) and C (PES 2-4 years) and 11 from Group A (Control). In order to define the methodological foundation of these interviews, this section describes: the method used to select participants from each group; the circumstances under which the majority of interviews were conducted; the questionnaire used to guide the interview; and the coding and indexing process that this study used to analyze the data.

Selection of participants

Selection from Groups B and C (PES + TA and PES)

Groups B and C (PES + TA and PES), each of which are later subdivided into those who received payments for 2 years and those for 4 years, were combined to serve as a participant base of 92 from which to generate a random sample. Participants from Group A (Control), the control group, were chosen separately and will be

discussed in the next section. Participants were divided into ten classes based on total payments received for the duration of their participation in the RISEMP program; intervals of 500 USD separated each payment class. The total and proportional distribution of participants in each payment class can be seen in Table 4-1. The proportionality of total participants in each payment class was used to generate a proportionally representative sample number of participants from each payment class that totaled 30 participants from Groups B and C (PES + TA and PES), 32.6% of total payment recipients. An online random number generator was used to randomly select participants from each payment class. Throughout the study, 12 participants that were initially randomly selected had to be replaced due to death, incarceration, and/or relocation to another area. In these cases, the participants were removed from the list and replaced by a random selection of remaining participants in each payment class.

Selection from Group A (Control)

A random number generator was used to select 15 of the participants from Group A (Control). Four of the participants that were initially selected from Group A (Control) died, leaving 11 randomly identified participants or 40.6% of total Group A (Control) participants. Time constraints prevented the selection of four additional participants to replace those that were deceased.

Circumstances of interviews

The majority of semi-structured interviews were conducted on the personal landholdings of each participant who was involved in the RISEMP program. With the exception of three interviews, a Ministry of Agriculture and Livestock (MAG) agent who had been involved in the recruitment and implementation of the RISEMP program accompanied me and facilitated the introduction to the landowner. During the three

exceptions, a well-known member of the community served as my driver and facilitator to these introductions. After the initial introductions in the majority of conducted interviews, the extension agent removed himself from the interviews. This facilitation and introduction played a large role in establishing a strong feeling of comfort and trust between myself and the participants. In a small number of cases, the extension agent remained within close proximity of the interview and his presence affected the interaction between myself and the participant, by either making the participant nervous about providing an honest response, or serving as a source of conversational distraction for the participant. This is not considered problematic because it occurred in few cases (less than 3) and did not disrupt respondents' ability, or lack thereof, to answer the main questions utilized by this study.

Each participant was asked to spare between 30 and 90 minutes to speak with me about his/her involvement and/or experience with the RISEMP program. Interviews lasted for an average of 45 minutes; it was evident that longer than an hour was fatiguing for participants. Although several participants seemed apprehensive to accept, no participants declined, and the majority seemed happy to have me at or in their homes and to discuss the RISEMP program. In the cases in which I visited the property of the participant, I was invited to sit in either the corral where ranchers were working when I arrived, on the front porch, or in the kitchen. In the cases in which I was unable to visit the property of the participant, we met and conducted the interview at either the MAG office in central Esparza, or the property of another participant.

Questionnaire

All participants were asked questions from one of two questionnaires: one for participants in Groups B and C (PES + TA and PES) who received payments and one

for participants in Group A (Control) who received no payments (See Appendices A and B). Participants were asked and encouraged to elaborate more when they felt inclined, and many took advantage of this invitation. At the end of the questionnaire, participants were asked to share anything that they felt that we hadn't mentioned or discussed satisfactorily.

I took detailed notes during the interviews in place of recording; upon arrival it was evident that the presence of recording technology made participants uneasy. I also asked several participants to draw their landholdings and illustrate what was done during the RISEMP as well as which silvopastoral practices were still present. Only one participant refused to draw his land; the other participants seemed enthused to illustrate their land and practices.

Two questionnaires were used: one for Group B and C (PES + TA and PES) participants; and one for Group A (Control) participants. Both questionnaires were revised upon arrival and throughout initial interviews. Initial interviews and feedback from MAG agents suggested that I revise the questionnaires to include questions and re-phrase others; this accounts for a lack of response to several questions from all participants. These questions are noted in Appendices A and B.

Key Informants Interviews

Five interviews were conducted with key informants that included: non-randomly selected participants of the RISEMP; ranchers in the Esparza watershed; and employees of the MAG offices of Esparza, more specifically agents involved in helping to carry out the project itself.

Official RISEMP Data

Official RISEMP data collected between 2002 and 2007 were provided to the author by CATIE; these data offered both individual-level and aggregated information about project participants and measures of environmental service points. At the individual level, the data documented the following from each participant: landholding size at the start of the project; the quantity of environmental services provided every year of the project; and the payment size (if any) received per year. The data also provided aggregate measures of the amount of each silvopastoral practice adopted by participants per year and the total provision of environmental services every year of the RISEMP.

Data Preparation, Processing, and Interpretation

Data processing and interpretation for this study were done using the Statistical Package for the Social Sciences (SPSS) computer program. Past land use and RISEMP project data provided by the Center for Tropical Agriculture Research and Education (CATIE), one of the partners and managers of the RISEMP program, were combined with the data collected during the study. This information and findings were coded to create indices of environmental consciousness and education that this study uses to analyze the effects of RISEMP PES on the program participants' motivations to engage in long-term conservation behavior in Chapters 5 and 6. Key informant interviews and observational data were used primarily for background information and were not included in the statistical analyses of this study.

This section discusses the operationalization of key terms used in the data analysis and the construction of the environmental consciousness index used to gauge long-term behavior change. It begins by discussing the coding of responses. It then

explains the process through which these variables were combined to create a measure of environmental consciousness.

Coding

Responses from semi-structured interviews were coded to identify common themes and understandings which were then used to create an operationalized list of responses from which later data analysis occurred. This coding was used to explore: the motivations for participating in the RISEMP; the primary silvopastoral practices adopted by each landowner; the components of the environment; the processes of the environment and conservation; and the consequences of environmental degradation.

Motivations

Each respondent was asked what motivated them to participate in the RISEMP and, though each response varied, several common motivations were identified.

Participants' motivations were operationalized as one of the following ten motivations:

- 1.) "none;"
- 2.) "payments;"
- 3.) "physical incentives;"
- 4.) "social norms and expectations;"
- 5.) "education;"
- 6.) "financial empowerment to improve land;"
- 7.) "conservation;"
- 8.) "conservation and payments;"
- 9.) "improvement of land and payments;"
- and 10.) "other."

Table 4-2 shows the motivations reported by respondents and how they were coded into the general motivations used in this study.

Respondents whose motivation was classified as "none" had no recollection of the project, either due to memory loss associated with old-age, or their participation in the control group that didn't receive any payments. The "physical incentives" respondents cited included the physical provisions of the RISEMP, such as the seeds and trees delivered to each landowner. Responses classified as "social norms and expectations" indicated that respondents' main motivation to join was because they

were asked by a member of the community whom they respected and with whom they had a good relationship. The “education” responses suggested that a primary motivation was to learn about how to implement silvopastoral practices and about their relationship to conservation. Those classified as “financial empowerment to improve the landholding” indicated that they were already convinced of the benefits of implementing silvopastoral practices, but had lacked the financial resources necessary to invest in them; while “payments” responses expressed a desired increase in general disposable income, “financial empowerment” responses expressed a desire to be empowered to invest in their landholding. The “improvement of the landholding” respondents desired to make their landholdings more profitable by implementing silvopastoral practices. Participants classified as motivated by “conservation” cited the desire to help the environment as the primary motivation. In the remaining classifications, respondents said that they were unable to identify one motivating factor, but rather joined for several reasons.

Practices

Respondents were asked what practices they engaged in, and this study categorized these cited practices into 10 general conservation behaviors. The behaviors were classified on the basis of the goal of the practice, as cited by the respondent, and the type of action involved in achieving it, as defined by the author. These general behaviors were operationalized as: 1.) “anti-environmental;” 2.) “halting anti-environmental;” 3.) “non-active carbon sequestration;” 4.) “biodiversity conservation;” 5.) “active carbon sequestration;” 6.) “active water protection;” 7.) “improved pasture;” 8.) “organic practices;” 9.) “recycling;” and 10.) “other.” Table 4-3

shows the practices reported by respondents and how they were coded into the general behaviors used in this study.

“Anti-environmental” practices were cited by one respondent who didn’t believe that trees in his pasture were helpful, and believed that they were instead detrimental to his pasture system. Responses classified as “Halting Ant-Environmental” reported discontinuing a practice that they acknowledged was detrimental to the environment, such as burning pastures. “Non-Active Carbon Sequestration” classifies responses in which respondents reported protecting the trees on their land, a practice that requires little effort on their part. “Active Carbon Sequestration” on the other hand, applies to respondents who reported actively planting trees, not just protecting the ones that were already present. Similarly, “Biodiversity Protection” and “Active Water Protection” apply to responses in which respondents cited taking active measures to protect and foster the biodiversity and water resources on their land. “Improved Pastures” classifies responses in which respondents reported improving their pastures with improved grasses. Several respondents also reported “organic practices” and “recycling;” recycling refers to the reuse of any farm materials, in these cases referring to composting to make fertilizer on-site. “Other” refers to one respondent’s response that he engaged in a “little bit of everything” but didn’t name specific practices.

The number of practices reported by respondents is operationalized by this study as a rough measure of the labor commitment that each participant has to silvopastoralism. Although labor commitment can be independent of other measures of environmental consciousness, it is used to monitor whether respondents actually engage in the behavior that they may or may not discuss. Respondents were assigned

a point for every practice named and organized into an ordinal scale in which he/she practiced few, some, or many silvopastoral practices. Figure 4-1 shows the relative number of practices reported by each respondent; this scale provides a comparative measure and was arranged to capture a normal distribution.

Components

Respondents were asked if they believed the environment was important, and if so, for what reason. The responses were coded into general environmental components mentioned by respondents. These general environmental components were operationalized as: 1.) “water;” 2.) “trees;” 3.) “tree cover;” 4.) “organics;” 5.) “biodiversity;” 6.) “soil;” 7.) “nature;” and 8.) “heat.” Table 4-4 shows these general environmental components and the frequency and proportion of respondents who cited each; many respondents cited more than one environmental component.

The “water” component includes all mentions of water in any form, such as rivers which was cited by one respondent. The “trees” component includes responses that cited trees outside of forest, such as trees in the pasture, while “tree cover” includes responses that cited the grouping of trees such as forest. “Organics” includes responses that mentioned organic practices when talking about the environment. Responses that mentioned flora and fauna, biodiversity, or the biological corridor, were all included in “biodiversity.” The “soil” component includes responses that mentioned either soil itself or the “vitamins” and minerals found in the ground. Those responses that identified aesthetic beauty, recreation, or nature as important environmental components were classified under “nature.” Finally, several responses included the mention of temperature and the importance of not burning as environmental components that are classified as “heat.”

Respondents' understanding of environmental components may be relatively superficial, often connected to the rhetoric of every day conversations about conservation. Thus, many respondents were able to say that trees were an important component of the environment and conservation, but were unable to cite a process or consequence that explained why. In this sense, the ability to name environmental components might be a simple measure of exposure to environmental rhetoric. Respondents were given a point for every component named and organized into an ordinal scale in which he/she was able to identify few, some, or many environmental components. Figure 4-2 shows the amount of environmental components cited by each respondent; this scale provides a comparative measure and was arranged to capture a normal distribution.

Processes

Respondents were asked why the environment was important and how the practices pursued during the RISEMP had improved their lives. Respondents answered in two ways: a description of environmental processes; and/or an identification of consequences if the environment was not protected. After the first initial interviews, the author probed respondents about their knowledge of each. The environmental processes related to silvopastoral practices cited by respondents were operationalized as: 1.) "biodiversity conservation;" 2.) "climate change prevention;" 3.) "economic returns;" 4.) "health benefits;" 5.) "water protection;" 6.) "non-sequestration benefits provided by trees;" 7.) "carbon sequestration provided by trees;" 8.) "pollution from chemicals;" and 9.) "other." Table 4-5 shows the environmental processes cited by respondents and how each was coded into general processes.

“Biodiversity conservation” refers to responses that discussed the biological corridor or the importance of forest to animals. Responses that discussed the processes of climate change and/or the atmosphere, preventing the depletion of the ozone layer, or using trees to cool down the earth, were labeled “climate change prevention.” “Economic returns” included responses that identified the processes through which the use of silvopastoral practices improved the land and, in turn, financial returns to landowners. These processes included: an increased carrying capacity of the land; and an increased food and shade supply, leading to healthier animals. “Health benefits” were mentioned in responses and include those that were able to elaborate the process through which the environment improves people’s health. Responses that discussed the processes and benefits of water were coded as “water benefits.” Responses that discussed the importance of trees were split into two categories: one that cited the process of carbon sequestration; and the other that cited processes other than carbon sequestration. “Non-sequestration benefits provided by trees” included responses that identified the relationship between trees and the protection of water, biodiversity, and maintaining nutrients in the soil, all processes outside of carbon sequestration. “Sequestration benefits provided by trees” referred to responses that cited the carbon intake of trees. Finally, responses that discussed the process through which the application of chemicals could be harmful to the environment were labeled “pollution from chemicals.”

The ability to explain environmental processes is considered a more tangible measure of the knowledge, awareness, and consciousness of actual environmental factors because respondents were forced to formulate responses internally; they

weren't able to simply repeat common rhetoric. Respondents were given a point for every process named, and organized into an ordinal scale in which he/she was able to identify few, some, or many environmental processes. Figure 4-3 shows the relative number of processes reported by each respondent; this scale provides a comparative measure and was arranged to capture a normal distribution.

Consequences

When respondents were asked why the environment was important and how the practices pursued during the RISEMP had improved their lives, they also answered by identifying the consequences of environmental degradation. The environmental consequences cited by respondents were operationalized in the following nine categories: 1.) "water problems;" 2.) "tolls on animals;" 3.) "air problems;" 4.) "food problems;" 5.) "health problems;" 6.) "global warming;" 7.) "irreversibility;" 8.) "land degradation;" and 9.) "moral consequences."

"Water problems" included responses that cited threats of pollution and scarcity if actions were not taken to protect it. Responses coded "toll on animals" cited threats to biodiversity as a major consequence, most commonly saying that the destruction of forest habitat kills animals. "Air problems" included responses that mentioned the increased pollution of the air and decreased oxygen, as trees were cleared. Responses classified as "food problems" cited food shortages that might result from lower land productivity. "Global warming" included responses that mentioned either global warming specifically, or the warming of the atmosphere associated with the phenomenon. Responses coded "irreversibility" expressed concerns about irreversible destruction if the environment wasn't conserved. "Land degradation" responses included mentions of land degradation, specifically in the context of pastureland, as an

environmental consequence. Finally, one participant expressed his belief in the “moral consequence” of environmental degradation; he said “It is a sin to cut down trees” (interview, June 2012, trans. Korey Force).

The ability to explain consequences of environmental destruction is also considered a more tangible measure of the knowledge, awareness, and consciousness of actual environmental factors. The consequences of environmental destruction composed an integral part of gauging environmental consciousness and using it to predict behavior. As Stern (2000) discusses, when people feel that something that they value is in danger, they are more likely to act to protect it. Thus, consequences imply knowledge about a process as well as the realization that something that is valued is under threat. Responses were given a point for every consequence named and organized into an ordinal scale in which he/she was able to identify few, some, or many consequences to the environment. Figure 4-4 shows the relative number of consequences reported by each respondent; this scale provides a comparative measure and was arranged to capture a normal distribution.

Construction of Environmental Consciousness Index

This study operationalized the concept of environmental consciousness (EC) through measures of the number of silvopastoral practices implemented by respondents and their ability to name components of the environment, environmental processes, and the consequences of failing to conserve. Thus, EC was created as a summary index, combining the four independent measures of number of practices, and the ability to cite environmental components, processes, and consequences. Figure 4-5 shows the ability of respondents to report “few,” “average,” and “many” aspects of environmental consciousness. All four tasks show a relatively normal distribution of responses,

enabling the inclusion of each in a statistical index. All aspects of the index of environmental consciousness are correlated and statistically significant at less than a 0.05 level, except for the practices and consequences variables. Because of the other correlations, this study includes the practices and consequences in the same index but notes the insignificant relationship between these two variables. The index makes the following four statements true:

1. The more practices cited by respondents, the more likely they were to cite more components and processes.
2. The more components cited by respondents, the more likely they were able to cite more practices, processes, and consequences.
3. The more processes cited by respondents, the more likely they were able to cite more practices, components, and consequences.
4. The more consequences cited by respondents, the more likely they were able to cite more components and processes.

Looking Ahead

This chapter provided an explanation of the methods used by the author in the collection, preparation, and processing of the data. The official data provided by the RISEMP are the primary data source used to analyze the first question of this study in Chapter 5: to what extent did the RISEMP affect participants' motivation to engage in conservation behavior during the project, what factors contribute to these motivations, or lack thereof, and what are the implications of these findings for future PES programs? The semi-structured interviews and the index of environmental consciousness then become the primary source of data used to analyze the second question posed by this study in Chapter 6: to what extent did the RISEMP affect participants' motivation to engage in long-term conservation behavior and levels of

environmental consciousness, what are the factors that contribute to this, and what are the implications of these findings for future PES programs?

Table 4-1. Division of payment classes.

Class	Range (USD)	Total # of Participants	% of Total	Interviews Needed
1	0 – 500	4	4.34	1
2	501 – 1000	14	15.22	5
3	1001 – 1500	18	19.56	6
4	1501 – 2000	12	13.04	4
5	2001 – 2500	4	4.34	1
6	2501 – 3000	6	6.52	2
7	3001 – 3500	8	8.7	3
8	3501 – 4000	3	3.26	1
9	4001 – 4500	22	23.91	7
10	4501 – 5000	1	1.09	0

Table 4-2. Motivations for participation reported by respondents coded into general categories

General Category	Motivations Reported by Respondents
None	No memory
Payments	Money Payments Incentives Not motivated to be in the group I am (I wanted payments) Make more money
Physical Incentives	Take advantage of physical assets given by the program (ex. trees, seeds, etc.) Provision of Materials Trees, seeds, etc.
Social Norms and Expectations	Accepted an invitation Trust in MAG/Project personnel Neighbor's previous participations
Education	Education Education offered by technical assistance To learn more about the practices Learn about silvopastoral practices Chance to learn and share
Financial Empowerment to Improve Land	Money to enable conservation Financial help Help Obtain help for small farmers Improving land Motivation to pursue silvopastoral practices Benefit the "finca" To get higher returns off cattle
Conservation	Conservation
Conservation and Payments	Conservation and Payments
Improvement of Land and Payments	Improve land and payments
Other	A little bit of everything

(interviews, May – June 2012, trans. Korey Force)

Table 4-3. Practices reported by respondents coded into general behaviors.

General Behavior	Practices Reported by Respondents
Anti-Environmental	Cutting trees from pastureland
Halting Anti-Environmental	Halting burning practices Not cutting as many trees Using few chemicals
Non-Active Carbon Sequestration	Maintaining Tree Cover Natural reforestation Protect Trees Protect growth of plants and trees Doesn't cut trees Regenerate the soil
Biodiversity Conservation	Certified Ecological Zones Conserving biodiversity
Active Carbon Sequestration	Planting Trees Riparian Forest Living Fences Nursery
Active Water Protection	Protect water Not contaminate water
Improved Pastures	Improved Pastures Forage Banks Improved fodder (ex caña) Trees in the pasture Rotational grazing
Organic Practices	Organic production Organic Fertilizer Certified Organic Production Stopping the use of chemicals Halting chemical use Halting use of herbicides
Recycling	Composting
Other	Silos

(interviews, May – June 2012, trans. Korey Force)

Table 4-4. Environmental components cited by respondents coded into general categories.

General Component	Environmental Component cited by Respondents
Water	Water Rivers
Trees	Trees
Tree Cover	Forests Shade
Organics	Organics
Biodiversity	Biological Corridor Flora and Fauna Biodiversity
Soil	Soil Vitamins
Nature	Nature (naturaleza) Recreation/Enjoyment Aesthetic Beauty
Heat	Not burning Temperature

(interviews, May – June 2012, trans. Korey Force)

Table 4-5. Environmental processes cited by respondents coded into general processes.

General Process	Environmental Process Cited by Respondent
Biodiversity Conservation	Expansion of biological corridor Forest for animals
Climate Change Prevention	Preventing Climate Change Preventing Global Warming and depletion of O-zone Trees cool down the earth
Economic Returns	Carrying capacity of land increases Higher rates of production (carrying capacity of land increases) Carrying capacity increases; extra land can be used for more trees Animals are prettier and fatter Healthier cattle Food supply helps animal nutrition Improving the lives of animals Vitamins in the pasture make cattle healthier Less cattle fatalities in the summer due to heat exhaustion and hunger Shade improves cattle's lives
Health Benefits	Health benefits for people
Water Benefits	Water is protected
Non-Sequestration Benefits provided by Trees	Planting trees to protect water Different types of biodiversity are attracted by different types of trees Some trees are better for the soil than others With more trees, the soil is better and doesn't dry out as easily Conserving trees and forest conserves biodiversity Trees prevent things from washing away Trees protect water Planting trees leads to more water Planting trees protects the water and animals

Table 4-5. Continued

General Process	Environmental Process Cited by Respondent
Carbon Sequestration provided by Trees	Carbon sequestration (oxygen) Reforestation adds more oxygen to the air Conservation gives us purer air and leads to less contamination
Pollution from Chemicals	Organic Production Less herbicides makes the environment better Less contamination Dirty things contaminate water
Other	The help it gives Projects keep moisture in the air Rotational grazing protects ground from being degraded Living fences provide a wind breaker

(interviews, May – June 2012, trans. Korey Force)

Table 4-6. Environmental consequences cited by respondents coded into general consequence.

General Consequence	Environmental Consequences cited by Respondents
Water Problems	Water Pollution Water Problems Water will dry up if we deforest Water scarcity Water will be contaminated without conservation
Tolls on Animals	No Animals If we don't conserve animals will be killed off
Air Problems	Less oxygen in the air Without conservation, water and air will be contaminated
Food Problems	There will be no food
Health Problems	Sickness from contamination
Global Warming	Hot Climate Climate change Warming of the planet Without trees we will die from dryness If we don't save trees we are going to die of heat
Irreversibility	If we destroy it, it will be gone Humans are slowly destroying everything We can't live on earth if we don't conserve If everyone keeps destroying, our problems will continue to get worse The planet will be destroyed
Land Degradation	Degradation of Pasturelands Land degradation
Moral Consequences (interviews, May – June 2012, trans. Korey Force)	It's a sin to cut down trees

Number of Respondents who Reported Few, Average, or High Numbers of Silvopastoral Practices

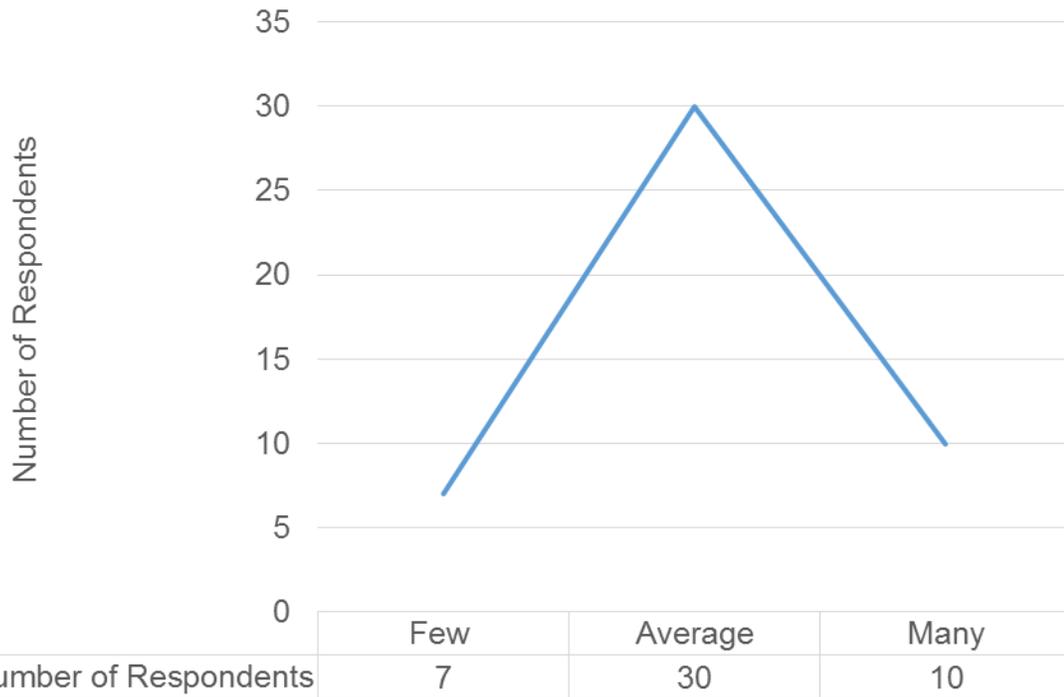


Figure 4-1. Number of respondents who reported few, average, or high numbers of silvopastoral practices.¹

(interviews, May – June 2012)

¹ This scale provides a comparative measure and was arranged to capture a normal distribution.

Number of Respondents who Reported Low, Average, or High Awareness of Environmental Components

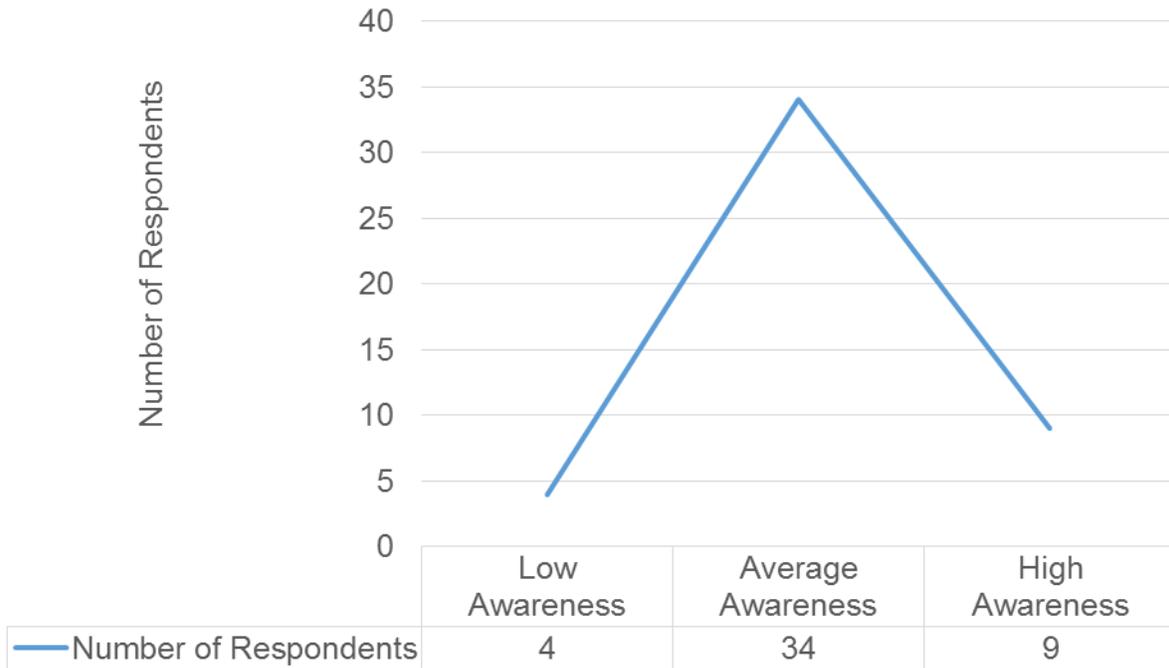


Figure 4-2. Number of respondents who reported low, average, or high awareness of environmental components.²

(interviews, May – June 2012)

² This scale provides a comparative measure and was arranged to capture a normal distribution.

Number of Respondents Classified as Low, Average, or High Awareness of Environmental Processes

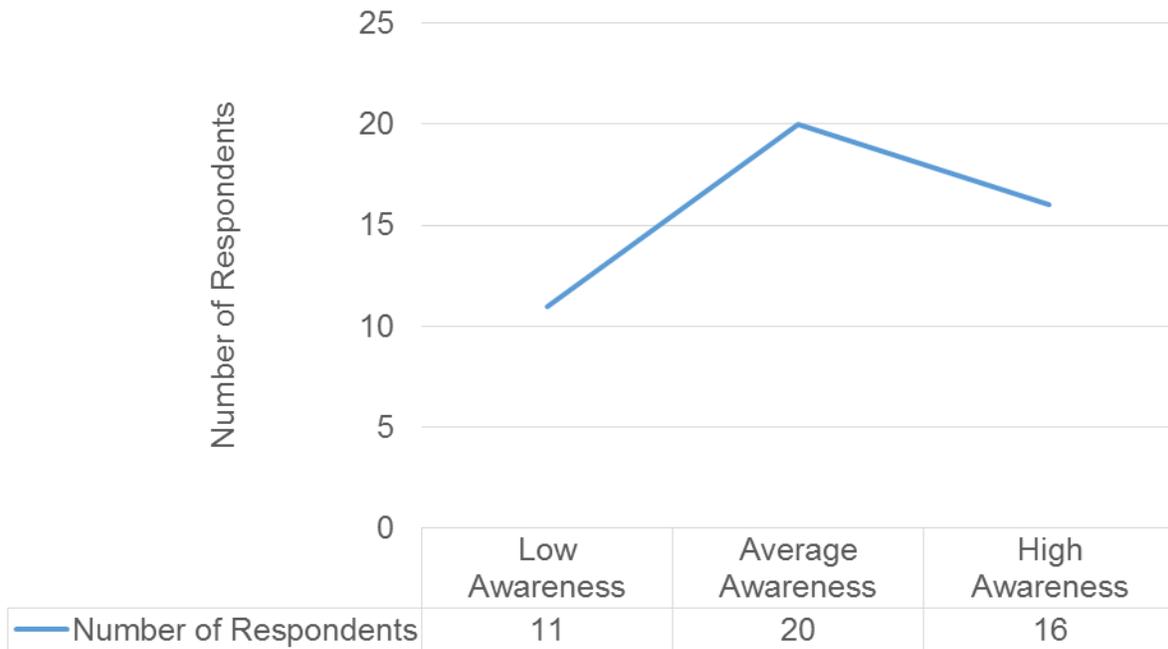


Figure 4-3. Number of respondents classified as low, average, or high awareness of environmental processes.³

(interviews, May – June 2012)

³ This scale provides a comparative measure and was arranged to capture a normal distribution.

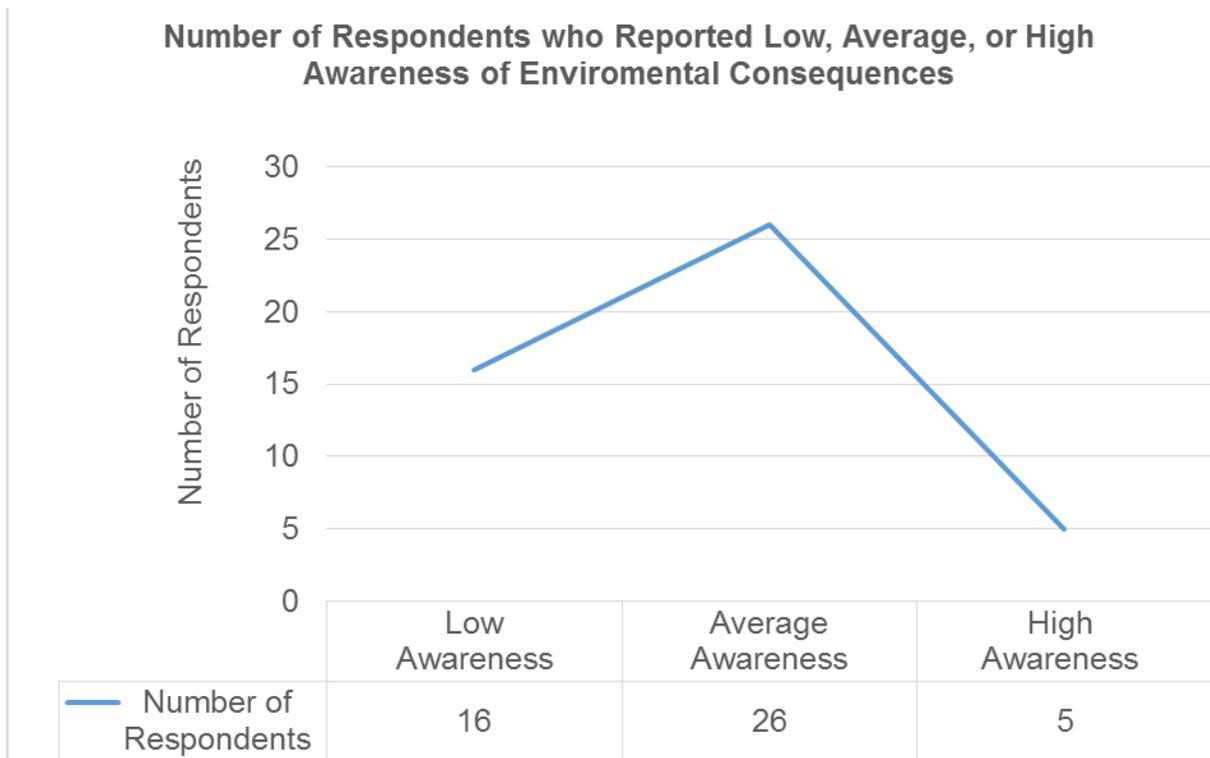


Figure 4-4. Number of respondents who reported low, average, or high awareness of environmental consequences.⁴

(interviews, May – June 2012)

⁴ This scale provides a comparative measure and was arranged to capture a normal distribution.

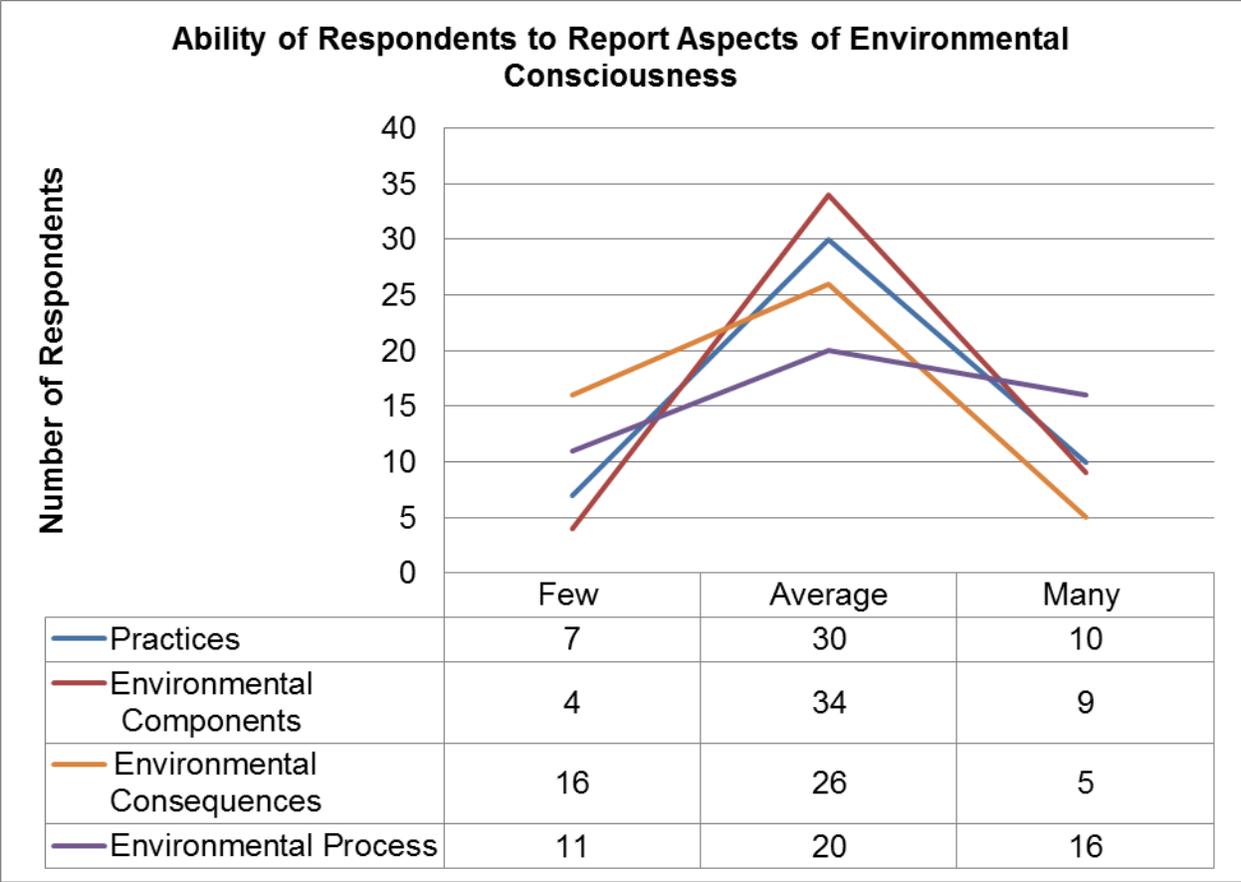


Figure 4-5. Ability of respondents to report low, average, or high awareness of aspects of environmental consciousness.⁵

(interviews, May – June 2012)

⁵ This scale provides a comparative measure and was arranged to capture a normal distribution.

CHAPTER 5 SHORT TERM EFFECTS OF THE RISEMP ON CONSERVATION BEHAVIOR

The previous chapters were used to emphasize how the project design of the RISEMP makes it ideal for analyzing the effects of different behavioral incentives and pressures on recipients. This chapter will focus primarily on the first question posed by this study: to what extent did the RISEMP affect participants' motivation to engage in conservation behavior during the project, what factors contribute to these motivations, or lack thereof, and what are the implications of these findings for future PES programs? To answer this question, this chapter will discuss the RISEMP in the context of the net changes in the provision of environmental services in overall terms and by project group. Each of these contexts will begin with a statistical analysis of the data and will be followed by a discussion of the behavioral factors and implications. This chapter begins with an analysis of the overall changes that occurred during the RISEMP by addressing the trends in the net land-use changes of participants of the RISEMP and the rates of adoption. The chapter then transitions to a comparison between project groups in mean ESI point accumulation and rates of adoption. The differences, or lack thereof, of these comparisons are then discussed within the behavioral framework introduced in Chapter 2.

The data used in this chapter are derived from two sources: the RISEMP official data and data collected by the author. The RISEMP official data included the quantitative measures taken and documented by the project over time, such as the type and rate of silvopastoral practices adopted, the ESI point accumulation by participant, and the payments received by each participant. The second source of data was collected from the semi-structured interviews discussed in Chapter 4.

Net Changes in the Provision of Environmental Services

This section begins with an analysis of the net changes in the provision of environmental services during the RISEMP. These net changes are then analyzed through a discussion of both net land-use changes and the rates of adoption over time. Finally, data analysis is discussed in the context of the behavioral factors and implications of both the existence and/or lack of trends.

Net Land-Use Changes

Data from the RISEMP indicate that the total environmental service points provided by participants increased by 3.9% per year between 2002 and 2007. The environmental service points increased from 3727.60 per year at the baseline survey in 2001 to 5173.64 per year in 2007. As shown in Figure 5-1, primary land uses that explain this increased accumulation of environmental service points. The total area enclosed by both simple and layered living fences increased by 39.41 hectares and by 225.17 hectares respectively. Although there was a decline in the length of simple living fences between 2004 and 2006, interviews suggest that this occurred due to the conversion of simple living fences to layered living fences. The total area of forest cover increased by a total of 21.1 hectares, or 1.8%. The total area of pastures with trees increased by 1460.4 hectares, or 215.5%.

These trends shows improved pastures and living fences, both simple and layered¹, as the most popularly adopted practices. In fact, these practices were the most commonly cited in interviews as the primary activities pursued during the RISEMP and as those still maintained. The significant and quick rise in the establishment of

¹ Simple living fences refer to the use of single-rowed trees or bushes. Layered living fences refer to the combined use of trees and low growing vegetation.

improved pasture, through the incorporation of trees, is most likely due to the provision of trees by the RISEMP to program participants and a general familiarity with tree planting.

The increase in living fences was the second most popular activity, most likely because, although it requires large amounts of labor input, it combines carbon sequestration and practicality for landowners. The living fences established were not necessarily new practices, but rather replacements of dead-post fences; once established and properly managed, living fences provide a durable and cost efficient fencing option. Additionally, it is important to mention that a tradition of living fences was well-established in Costa Rica, and the practice was therefore familiar. Thus, landowners selected this practice to increase ESI point accumulation and, over time, reduce labor costs (fences must be built and maintained anyway, regardless of type). Figure 5-2 shows a living fence in the Esparza watershed in 2012.

Other silvopastoral practices, such as fodder banks and forest cover, were also established, although at a slower rate. In the case of fodder banks, landowners indicated that high labor requirements dissuaded them from establishment. Many respondents cited an increase in the carrying capacity of the land as enabling an increase in forest cover on their land: less land was needed to raise the same number of cattle, thus leaving extra land that landowners could then convert to forest. The modesty of the increase in forest cover is due to both the labor requirements of planting large quantities of trees, and to the desire to keep the land “active.” In some ways, this need to keep “using” the land is connected to the traditional treatment of pastureland:

one landowner remarked about the belief that landowners who weren't clearing their land and utilizing all of it for cattle production were lazy and worthless.

It is important to note the relationship between landholding size and total accumulations of ESI points. A regression analysis showed a statistically significant and positive relationship between land size (ha) and total payments (USD); this relationship explains 55.7% of variance in payments. For every one hectare increase in property size, payments increased by 37.20 USD. The likelihood of finding this relationship by chance is less than 0.05. This relationship was not due to an increase in investment per hectare, however. A regression analysis showed no statistically significant relationship between the ESI points accumulated per hectare and property size. Thus, large landowners were paid more because they had more property with which to provide environmental services, but each hectare provided similar quantities of ESI, regardless of property size.

Changes in Rates of Adoption

Throughout the duration of the project, the average accumulation of ESI points per year, a value operationalized as the adoption of silvopastoral practices, was consistently positive; the rates of change in accumulation, however, fluctuated tremendously. Table 5-1 shows the rate of adoption of silvopastoral practices through the yearly accumulation of ESI points and the rate of change. After the first year of the project, ESI points increased at a rate of 0.2 from the baseline survey; the highest rate of increase throughout the entirety of the project. Rates of adoption fell significantly between 2004 and 2005 and 2006 and 2007, with a rate of adoption of 0.02. The adoption rate between 2005 and 2006 was 0.12, a rate higher than the years directly preceding and following, but lower than the first year of the project.

The relatively high rate of change in ESI point accumulation between the base measurements and 2004 is most likely due to the state of degradation of the landholdings prior to the project, and landowners' initial selection of the easiest practices with the quickest returns and/or those practices that landowners were most familiar with. The first year of the project marked the first intensive² use of silvopastoral practices for many landowners in the RISEMP, which meant that most farmers focused first on establishing improved pastures. This accounts for the 110% increase in improved pastures between the base survey and 2004. The establishment of improved pasture continued to increase for the duration of the project, but at a slower rate: 30% between 2004 and 2005; 11% between 2005 and 2006; and 5% between 2006 and 2007. After the initial conversion of improved pastures, other practices were adopted at slower rates due to higher labor requirements as well as time lapses in between implementation and the provision of environmental services.

Behavioral Factors and Implications

These results show that the RISEMP was successful in positively affecting the motivations of landowners to implement silvopastoral practices on their landholdings and, in so doing, increase their provision of environmental services. It is important to address the behavioral implications of these overall trends found within the official RISEMP data. From the data that deal with net changes in the provision of environmental services, it is impossible to determine the strength or weakness of each incentive; this will be done by the comparison of mean point accumulations and rates of

² While silvopastoral practices had been present in Esparza for more than 20 years, "intensive" use in this case refers to a commitment to the practices that was focused and intensive.

adoption among project and payment groups, which will be discussed in the next section.

The extent to which the incentives offered by the RISEMP existed independently from other influences such as the fall in beef prices, and existing motivations to engage in silvopastoral practices, remains unclear and is virtually impossible to measure post-RISEMP. Figure 5-3 shows the comparison of international beef prices (USD) to the percent rate of adoption of silvopastoral practices. Beef prices returned to their previously high level in 2004 and remained relatively constant for the duration of the project. The percent rate of adoption between the baseline survey and 2004 was 20%; this rate fell to 1.8% by 2005 and did not surpass 2.5% for the remainder of the project. While it is probable that the uncertainty in the beef market may have motivated participants decision to join the RISEMP and influenced their behavior after, it is unlikely that it is the sole determining factor of the low rates of adoption after the first year of the project. Interviews with respondents suggested that a more likely explanation for an initially high rate of adoption and subsequently low rates was due to the situation discussed previously in which the easiest and/or least time intensive practices were adopted first on degraded land, leading to a high rate of adoption. After this point, adoption occurred at a slower pace as practices became more intensive.

This trend is also suggested in the positive relationship between property size and total payments, but insignificant relationship between ESI point accumulation per hectare and property size. Although it is probable that larger landowners invested more total time, not necessarily time per hectare, it is difficult to measure any differences between the behavior of large and small landowners because it is possible that small

landowners would have done the same practices on the same number of hectares if they had had the choice. Smaller landowners have higher incentives to intensify their land for two reasons: they are unable to expand and must therefore intensify; and their smaller income is more greatly affected by increasing the direct returns of silvopastoral practices. Thus, under normal, economically rational conditions, small landowners would still be motivated to adopt silvopastoral practices at higher rates than large landowners even when beef prices returned to those before the fall in prices in 2003. The fact that this wasn't the case suggests that once landowners adopted the easiest practices in the first year of the project, they were all similarly slow in adopting more intensive practices in spite of the international beef market prices.

Changes by Project Groups

The analysis and discussion of total project changes in the previous section made it clear that the total amount of environmental services provided by participants in Esparza increased. Thus, the program, overall, was a motivation to engage in conservation behavior. In order to understand the differences between different project groups however, this section compares each project group by both mean point accumulation and the rates of adoption. This section concludes with an analysis of the behavioral factors and implications of data analyzed.

Changes in Mean Point Accumulation by Project Group

The RISEMP data indicates that there were few differences in the mean point accumulation per hectare between project groups after each 2-year payment interval. With the exception of two groups after the base survey, Group A (Control) and Group B2 (PSA + TA), a One-Way Analysis of Variance (ANOVA) found no statistically significant difference between the mean point accumulations of each group at different

payment intervals. Figure 5-4 shows the mean point accumulation per hectare of each project group after the baseline, 2005, and 2007 surveys.

A One-Way ANOVA test shows a .031 statistically significant level of difference between the mean ESI points per hectare provided by participants in Group A (Control), and Group B2 (PSA + TA) at the time of the baseline survey. A Bonferonni post-hoc test showed that the difference in mean ESI points per hectare between participants in the two groups was statistically significant. This shows that the participants of Group A (Control) were providing higher quantities of environmental services (0.1808 more ESI points) than participants of Group B2 (PSA + TA) at the time of the baseline survey before the project began. A Levene's Test of Homogeneity of Variance shows a 0.978 homogeneity of variance between the mean points per hectare held by participants of the remaining groups after the baseline survey.

After the 2005 survey, a One-Way ANOVA comparison of means showed no statistically significant difference between the mean points accumulated per hectare by participants of each of the five project groups after 2 years of the project. Furthermore, a Levene's Test of Homogeneity of Variance showed a 0.336 homogeneity of variance between the mean point accumulations per group.

Similarly, a One-Way ANOVA comparison of means showed no statistically significant difference between the mean point accumulations per hectare of each group after four years. A Levene's Test of Homogeneity of Variance showed, after the 2007 survey, a 0.541 homogeneity of variance between project groups.

It is important to note that the size of Group C2 (PES) and C4 (PES), 12 and 14 respectively, makes statistical mean comparisons inappropriate. A sample size of at

least 30 is recommended for the use of One-Way ANOVA's. Thus, the mean comparisons between Groups C2 (PES) and C4 (PES), though not statistically significant, are not valid indicators of the presence or absence of a relationship.

Changes in Rates of Adoption by Project Group

The rates of accumulation of ESI points were positive for all four years of the program for each of the project groups. Figure 5-5 shows the average rate of change in ESI point accumulation by hectare by group every 2 years. This means that regardless of the type of incentive, on average, ESI points continued to increase. With the exception of Group A (Control) and Group B2 (PES + TA) at the baseline survey, there were no statistically significant differences between the mean points accumulated by each project at every two year interval, and therefore no significant differences in the rates of adoption. In the case of Group A (Control) and B2 (PES + TA), Group B2 (PES + TA) increased its provision of ESI points at a statistically significant faster rate than Group A (Control), increasing at a rate of 2.9 between the baseline survey and 2005; Group A (Control) increased at a rate of 2.25.

In the cases of statistically insignificant relationships, the rate of adoption for Group A (Control) participants was the lowest rate for all four years of the project, with the exception of Group B2 (PES + TA) after the baseline survey. The rates of adoption for groups that received no technical assistance were lower than those groups that did receive it. It is important to note however, that Group C4 (PES) had the highest accumulation of ESI points at the end of 4 years.

The adoption rates for the 2-year participants³ were not higher than those of 4-year participants, counter to RISEMP predictions. Instead, adoption rates for the 2-year participants continued to be similar to those of the 4-year participants⁴ and Group B2 (PES + TA) had a greater rate of adoption in the last two years of the project than did group B4 (PES + TA), despite not receiving payments in the last two years. Adoption rates decreased significantly after the first 2 years; this was anticipated by the project, but the project anticipated that only the rates of the 2-year participants would significantly drop off. However, the 4-year participants showed a similar trend, even showing lower rates of adoption during the last two years than 2-year groups.

Behavioral Factors and Implications

The data of the previous section show the general absence of a relationship between project groups, given both the mean ESI points accumulated and the rates of adoption. The only exception to this is the statistically significant difference in mean point accumulation between Group A (Control) and Group B2 (PSA + TA) at the time of the baseline survey, and the corresponding difference in rates of adoption in the first two years of the project. The question at the individual level then, is what motivated participants of each group to adopt the practices that they did, and what are the behavioral implications of these adoption decisions for the effects of the RISEMP's project incentives? Thus, this section draws connections between the results of data analysis among the RISEMP project groups and the behavioral theories introduced in Chapter 2. The effects of positive external incentives, subjective norms, and intrinsic

³ Group B2 (PES + TA) and Group C2 (PES).

⁴ Group B4 (PES + TA) and Group C4 (PES).

motivations are all potentially important in identifying the motivations behind each participant's decision to join the project, and the extent to which he/she changed his/her behavior to implement silvopastoral practices. This section addresses the implications of the differences between Group A and B2 at the onset of the project, as well as the absence of a difference between other project groups.

Difference between groups A and B2

In the first 2 years of the project, Group A (Control) provided more ESI points at the baseline survey and Group B2 (PSA + TA) had a higher rate of adoption in the first two years; these findings have several possible explanations. First, it is possible that the RISEMP incentives, payments and technical assistance offered to Group B2 (PSA + TA) were more effective in the first two years of the project than those offered to Group A (Control) (none in this case), motivating Group B2 (PSA + TA) to invest more heavily in increasing ESI point provision. This explanation however, does not hold true for the 4-year RISEMP groups (PES and PES + TA), that also received the same project incentives but did not show any statistically significant difference in the rate of adoption. An alternative explanation, one that accounts for the absence of a statistically significant relationship between other RISEMP project groups, is that the level of degradation of the landholdings of Group B2 (PSA + TA) was greater, leading to a higher return on invested labor than Group A (Control) with regard to the quantity of ESI points accumulated.

Effects of subjective norms and intrinsic motivations

The analysis of Group A (Control) in relation to other project groups, which showed indistinguishable mean point accumulations and rates of adoption (except for the one exception discussed previously), enables a discussion about the relevance of

Azjen's (1991) notion of subjective norms and DeYoung's concept of intrinsic motivations as targeted by the RISEMP. Table 5-2 shows the behavior-change components that correspond to Group A (Control) participants and the results that this study can draw. The increase in ESI points by participants in Group A (Control) suggests that they were motivated by something besides RISEMP incentives, and the important question is: was it subjective norms (an individual's perceived expectations of his/her social network) or intrinsic motivations (the satisfaction of striving for behavioral competence, frugality, and/or maintaining a sense of community)?

Because members of Group A (Control) were not receiving technical assistance this study assumed that they did not have the same regular interactions with other members of the project group that participants in incentive groups had. Thus, this study explored the subjective norms of respondents through their relationships with their neighbors. Several of the Group A (Control) members did not even remember the RISEMP occurring in the community, and it was thus impossible to ask several questions concerning their involvement and/or the involvement of their neighbors. This is significant in itself, in that if many respondents could not remember the project, then it is unlikely that they were motivated to improve their land through the subjective pressure of those involved. Those who did remember the RISEMP did not report knowing their neighbors or sharing advice and information with their neighbors at a higher incidence than respondents of other project groups.

Of 10 respondents from Group A (Control) who remembered the project, 8 reported that their land-use practices were either similar or very similar to their neighbors. Respondents even reported that they believed that their land was similar but

better conserved than the land of their neighbors. This makes it unlikely that the motivations to improve the land came from the subjective norms of neighbors. Subjective norms motivate individuals when the individual feels that there is a conflict or difference between what he/she believes that those in his/her significant social circle believe he/she should do, and what he/she is actually doing (Azjen, 1981). Group A (Control) respondents reported that they believed that their practices were similar to others, and they were therefore unlikely to have been motivated by a subjective norm to improve what they already viewed as a commonality between them.

There is greater evidence that the presence of intrinsic motivations proved influential in motivating Group A (Control) to continue improving land at rates similar to other project groups. The statistically significant difference between the land-use practices of Group A (Control) and Group B2 (PSA + TA) at the time of RISEMP's baseline survey, suggests that Group A (Control) participants were already motivated to improve their land more than other members of the region. Furthermore, 9 out of 10 Group A (Control) respondents reported previous exposure and practice of silvopastoral systems, the highest proportion of respondents asked. Table 5-3 shows the proportion of respondents in each group that reported practicing silvopastoral systems prior to the RISEMP. This suggests that Group A (Control) respondents had stronger intrinsic motivations to engage in silvopastoral practices; respondents most commonly reported that their motivation for the use of silvopastoral systems was the effect they had on the health of their cattle and the conservation benefits of more trees. A further exploration of intrinsic motivations will be discussed in the next chapter in which the long term effects of RISEMP on levels of environmental awareness are discussed.

Effects of positive external incentives

The project design of the RISEMP enabled the analysis of the effects of PES, PES and technical assistance, and length of involvement project participants. Table 5-4 shows the relationship between the positive external incentives offered by RISEMP and the results from the project. The data indicate that the positive external incentives offered by the project affected participants and motivated the increase in the provision of environmental services. Except for the case of Group A (Control) and Group B2 (PSA + TA), none of these incentives proved significantly more effective than the others, and in this case, the externally incentivized project group (Group B2 (PES + TA)) appeared to have adopted at faster rates than the non-externally incentivized group (Group A (Control)). Otherwise, the mean point accumulations per hectare indicated no statistically significant differences between project groups; this means that PES and PES combined with technical assistance were equally effective in motivating conservation behavior. What the project failed to control for was the effect of only technical assistance in comparison to the other incentives, something that the interviews in this study suggest was a more appreciated incentive offered by the RISEMP.

During the semi-structured interviews, respondents were asked what motivated them to participate in the project. The distribution of answers by project group can be found in Table 5-5. While 20.5% of respondents cited PES as their motivation for joining the project, an equal proportion listed education about silvopastoral practices as the main motivation and over 50% cited motivations that had no association with PES. One respondent from Group B4 (PSA + TA) remarked that the payments were so small that they covered less than 4% of the total annual costs of his farm; other respondents

echoed the feeling that it was unfair to cite the payments as the main incentive when they were so small. Although this sentiment proved more common among larger landowners than smaller ones, due to a positive correlation between farm size and income, smaller landowners also indicated that although the money was helpful, they didn't view themselves as significantly more prosperous than before. In fact, the positive outcomes of the project that most respondents were eager to talk about were the improvement of their landholdings and the bettered health of their cattle, which meant better returns, not the income from PES.

Data from the RISEMP and the results from this study infer that technical assistance was a more appreciated factor, with many landowners citing its importance over PES. Many respondents remarked that they wouldn't have participated in the project at all without technical assistance, and those who claimed they would have, said that they wouldn't have been able to accomplish nearly as much without it. They viewed technical assistance as enabling them to do practices that would improve the quality of their landholding, something that they indicated they would always want.

This testimony seems contradictory, however, in light of the fact that motivation levels between Groups B (PES + TA) and C (PES) showed no statistically significant difference. This can be explained by several possibilities about participants from PES-only groups⁵: they already had the technical knowledge needed to engage in silvopastoral practices; they were interacting and sharing with participants of groups that did receive it; or they managed to achieve the same level of ESI accumulation, just at higher costs.

⁵ Groups C2 and C4.

Results from the interviews suggest that all three factors played a role. Table 5-3 shows the respondents who reported engaging in silvopastoral practices before the RISEMP. In Group C2 (PES) and Group C4 (PES), 57% and 50%, respectively, of respondents reported engaging in silvopastoral practices before the beginning of RISEMP. This suggests that over half of the participants in PES-only groups (both 2- and 4-years) were familiar with silvopastoral systems and had sufficient technical knowledge to implement them. Respondents from PES-only groups were the highest proportion of respondents that reported talking and sharing advice with their neighbors frequently. This suggests that PES-only participants were talking with participants of groups that received technical assistance for advice. It is also probable that these participants accessed informational resources and advice offered by MAG. Finally, interviews with respondents showed that in some cases, landowners without technical assistance neither knew anything previously nor learned from others, instead expending more labor (because of ill-managed establishment and/or maintenance) to get the same returns. One respondent expressed anger and frustration towards the project for not educating him in effective practices. He said that he could and would have accomplished much more if he had only “known what to do at the start.”

Effects of habitualization and environmentality

The creation of 2-year and 4-year project groups allowed for the analysis of the effects of the length of involvement on each participant, and the potential to explore the concepts of habitualization and environmentality discussed in Chapter 2 (Geller, 2002; Agrawal, 2005). As previously discussed, sample size constraints made it difficult to draw statistical conclusions about the effects of the RISEMP. Table 5-6 shows the relationship between the length of involvement and the results of the project, and the

effects of habituation and environmentalism. Surface level observations of the data suggest that there was no difference in the quantity of ESI points accumulated per hectare between project groups of 2-year and 4-year involvement. This lack of difference however, suggests that a motivation existed for 2-year participants after payments (and technical assistance) had stopped; otherwise, why would they have continued to increase the provision of environmental services at the same rate as 4-year participants?

In the discussion of the theories of habituation (Geller, 2002) and environmentalism (Agrawal, 2005) in Chapter 2, it was suggested that once behaviors are repeated frequently enough, individuals will either incorporate the behavior into their habitual routines or incorporate it into their value system. In interviews with participants, there seemed to be two types of actions: those that required active implementation of new silvopastoral practices; and those that required maintenance of already established silvopastoral practices. The involvement lengths of the project groups, 2 years or 4 years, appeared to have been too short for either group to develop a sense of habituated practices, or beliefs about the environment, in terms of the active implementation of new silvopastoral practices. Most respondents talked about the labor required to implement the practices, something that they showed no indication of getting used to or, as will be discussed in Chapter 6, continuing. Instead, respondents exhibited a sense of habituation in the maintenance of the practices on their own land or seeing them on the land of others. Respondents indicated that they were becoming accustomed to seeing silvopastoral practices whereas “10 years ago,” remarked one respondent, “if you had trees in your pasture, everyone thought that you

were a lazy person” (interview, May 2012, trans. Korey Force). Similarly, many respondents remarked that the practice of silvopastoral systems was slowly becoming the way that everyone treated their land.

What the interviews from this study suggest was more likely, is that respondents had already begun the development of intrinsic motivations and norms that made them prone to adopt the practices enabled by the RISEMP. Many respondents remarked that they had either already begun to implement silvopastoral systems in their pastures, to the extent they were financially able, or that they had wanted to begin silvopastoral practices, but had been financially unable. Table 5-3 shows that 7 of 11 respondents from Group B2 and 4 of 7 from Group C2 reported that they had already begun the use of silvopastoral practices before the RISEMP began.

Tying Everything Together

The data analyzed in this chapter, both that of RISEMP and that of this author, were used to explore the effects of the aspects of the project design of the RISEMP on participant behavior during the project. This analysis showed that the project was undoubtedly successful in motivating the adoption of silvopastoral practices. The exact extent to which the project itself as well as the project’s different aspects motivated this behavior, however, still remains unclear because of the relative similarity in project outcomes among different project groups and the impossibility of knowing, in real time, what landowners were thinking before and during the project. However, the outcomes discussed in this chapter suggest that the incentives offered by the RISEMP were more than were necessary to motivate landowners in the Esparza watershed who were already ready and willing to establish silvopastoral systems.

The connections between project outcomes and behavioral theory discussed in this chapter suggest that respondents were not the money-maximizing “rational” economic actors that are present in the strictly economic theory of PES. In fact, the provision of payments seemed to have no greater effect on conservation behavior during the project than any other incentive or non-incentive. Similarly, positive external incentives didn’t prove to play a significant role in “acting people in to thinking,” as proposed by Geller (2002) and Agrawal (2005). The achievement of Group A (Control) suggests that intrinsic motivations were more influential in motivating conservation behavior, in the case of Esparza, something attributable to the context in which the project took place.

This chapter suggests that several of the contextual conditions discussed in Chapter 3, made payments unnecessary for the adoption of silvopastoral practices in Esparza, Costa Rica. The national rhetoric of conservation, payments for environmental services, and agroforestry combined with a local previous, positive, and observable exposure to silvopastoral practices, created a participant base that was ready and willing to adopt silvopastoral practices. In fact, half of the respondents of this study had already begun adoption before the RISEMP began in 2002. This would suggest that participants were participating not for payments, but to establish, extend, and/or improve practices that they had already thought about and/or began establishing independently. This would imply that landowners did not provide “additionality” during the project, a feared flaw of PES discussed in Chapter 2.

While this chapter discussed the effects of the RISEMP on short term behavior, or behavior during the project, the next chapter will address the presence of long-term

effects. Chapter 6 will address the research question: to what extent did the RISEMP affect participants' motivation to engage in long-term conservation behavior and levels of environmental consciousness, what are the factors that contributed to this, and what are the implications of these findings for future PES programs? Chapter 6 explores these questions and their implications for an understanding of behavioral change.

Table 5-1. Changes in ESI Point accumulation.

Year	Yearly ESI Point Accumulation	Rate of Change in ESI Point Accumulation
Base	3727.6	
2004	4478.22	0.2
2005	4557.29	0.02
2006	5087.95	0.12
2007	5173.64	0.02

(RISEMP, 2007)

Table 5-2. RISEMP effects of subjective norms and intrinsic motivations.

Aspect of Project Design	Behavior-Change Component	Results from Project	Degree of Influence
Control group	Subjective norms	Participants didn't indicate pressure from their neighbors as a motivating factor	Low
	Intrinsic motivations	The RISEMP results suggest the presence of intrinsic satisfactions that led to an increase in environmental services equal to that of other project groups.	Higher

Table 5-3. Respondents who reported silvopastoral practices before the RISEMP.

Group	Reported No	Reported Yes	% Reported Yes
A	1	9	90
B2	4	7	64
C2	3	4	57
B4	5	4	44
C4	4	4	50

(interviews, May – June 2012)

Table 5-4. RISEMP effects of positive external incentives.

Aspect of Project Design	Behavior-Change Component	Results from Project	Degree of Influence
PES only group & PES and TA group	Positive external incentives	Positive incentives motivated the increase in the provision of environmental services. This was only significantly evident in the relationship between Group A and Group B2.	No greater than that of other incentives
	Knowledge and Information	Technical assistance was not controlled for. Respondents indicated that TA was a motivating factor.	N/A

Table 5-5. Motivations for participation by project group.

	Group A	Group B2	Group C2	Group B4	Group C4	Total
Payments	n/a	2	1	2	2	7
Socially Motivated	n/a	1	1	0	1	3
Physical Incentives	n/a	0	0	1	0	1
Education	n/a	2	1	4	1	8
Improving Land	n/a	2	2	1	1	6
Conservation &						4
Payments	n/a	1	2	0	1	
Improving Land &						5
Payments	n/a	3	0	0	2	
Other	n/a	0	0	1	0	1
Total	n/a	11	7	9	8	35

(interviews, May – June 2012)

Table 5-6. RISEMP effects by length of involvement.

Aspect of Project Design	Behavior-Change Component	Results from Project	Degree of Influence
2- and 4-year participation groups	Habitualization & Environmentalty	Sample size constraints makes conclusions hard to draw. Surface level observation of the data do not indicate differences in the accumulation of ESI points between 2-year participants and 4-year participants. The continued improvement of the 2-year group could suggest the presence of habits and environmentalty.	Low
	Intrinsic values and norms	The continuation of practices by the 2-year group suggests the presence of intrinsic motivations and norms.	Higher

Table 5-7. Effects of the RISEMP design on participant behavior.

Aspect of Project Design	Behavior-Change Component	Results from Project	Degree of Influence
Control group	Subjective norms	Participants didn't indicate pressure from their neighbors as a motivating factor	Low
	Intrinsic motivations	The RISEMP results suggest the presence of intrinsic satisfactions that led to an increase in environmental services equal to that of other project groups.	Higher
PES only group & PES and TA group	Positive external incentives	Positive incentives motivated the increase in the provision of environmental services. This was only significantly evident in the relationship between Group A and Group B2.	No greater than that of other incentives
	Knowledge and Information	Technical assistance was not controlled for. Respondents indicated that TA was a motivating factor.	N/A
2- and 4-year participation groups	Habitualization & Environmentality	Sample size constraints make conclusions hard to draw. Surface level observation of the data do not indicate differences in the accumulation of ESI points between 2-year participants and 4-year participants. The continued improvement of the 2-year group could suggest the presence of habits and environmentality.	Low
	Intrinsic values and norms	The continuation of practices by the 2-year group suggests the presence of intrinsic motivations and norms.	Higher

Net Changes in Living Fences, Forest Cover, Improved Pasture, and Fodder Banks 2003 – 2007

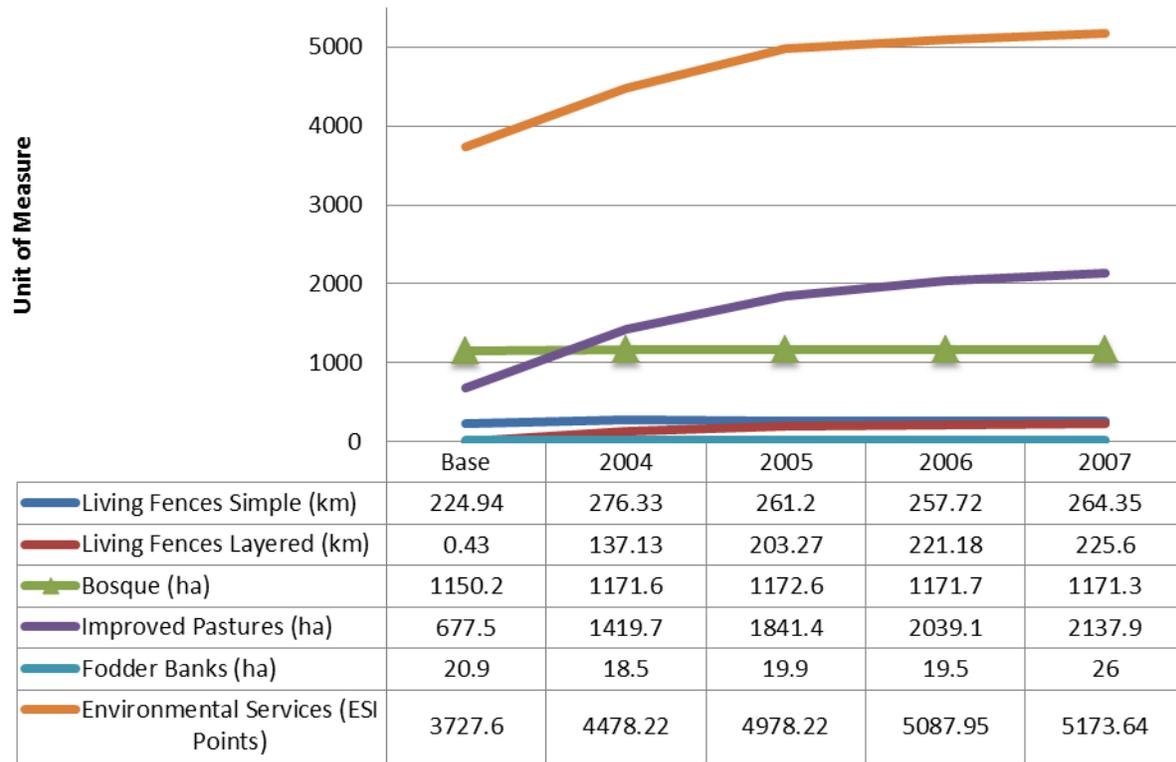


Figure 5-1. Net Changes in living fences, forest cover, improved pasture, and fodder banks.

(RISEMP, 2007)



Figure 5-2. Living fence in Esparza, Costa Rica (2012).

**Comparison of International Beef Prices and
% Adoption Rate of Silvopastoral Practices**

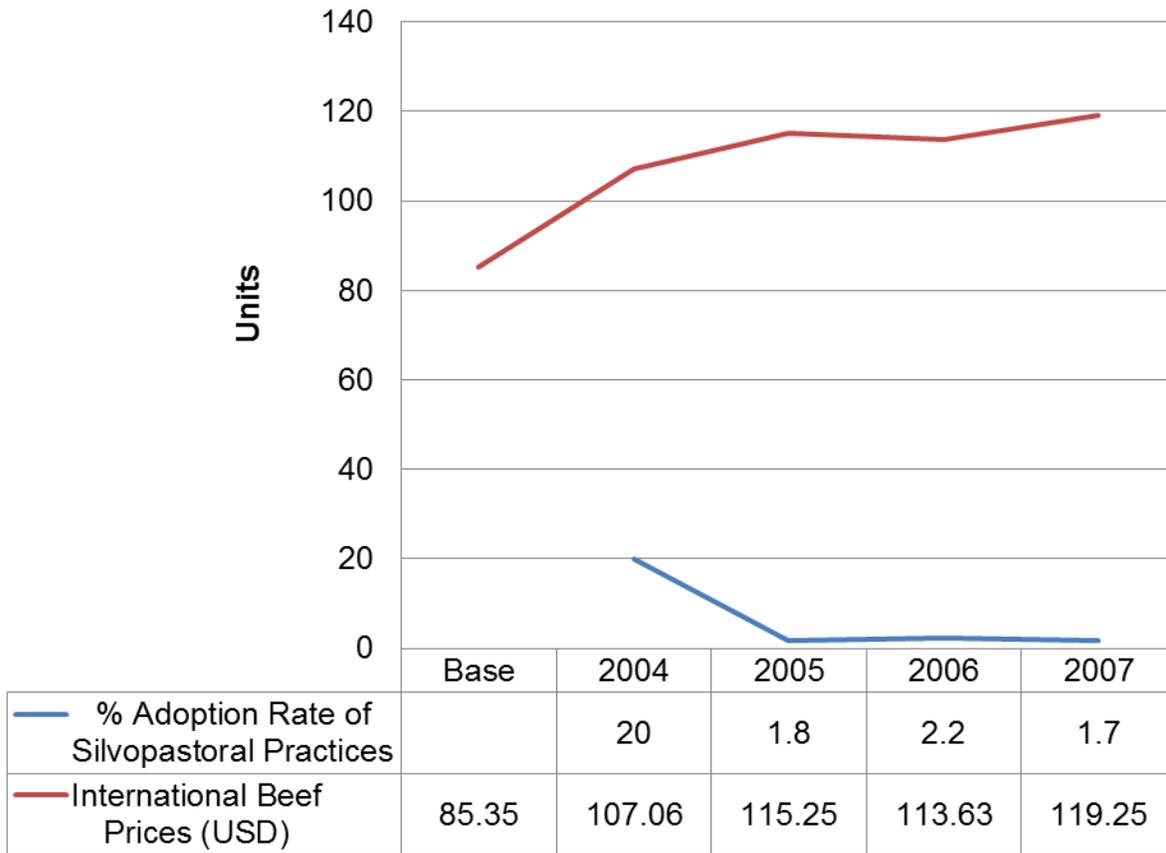


Figure 5-3. Comparison of international beef prices and percent adoption rate of silvopastoral practices.

(RISEMP, 2007)

Indexmundi.com. (2013). "Beef Daily Price." Retrieved from <http://www.indexmundi.com/commodities/?commodity=beef&months=120>

Average Points Accumulated by Group and Payment Intervals

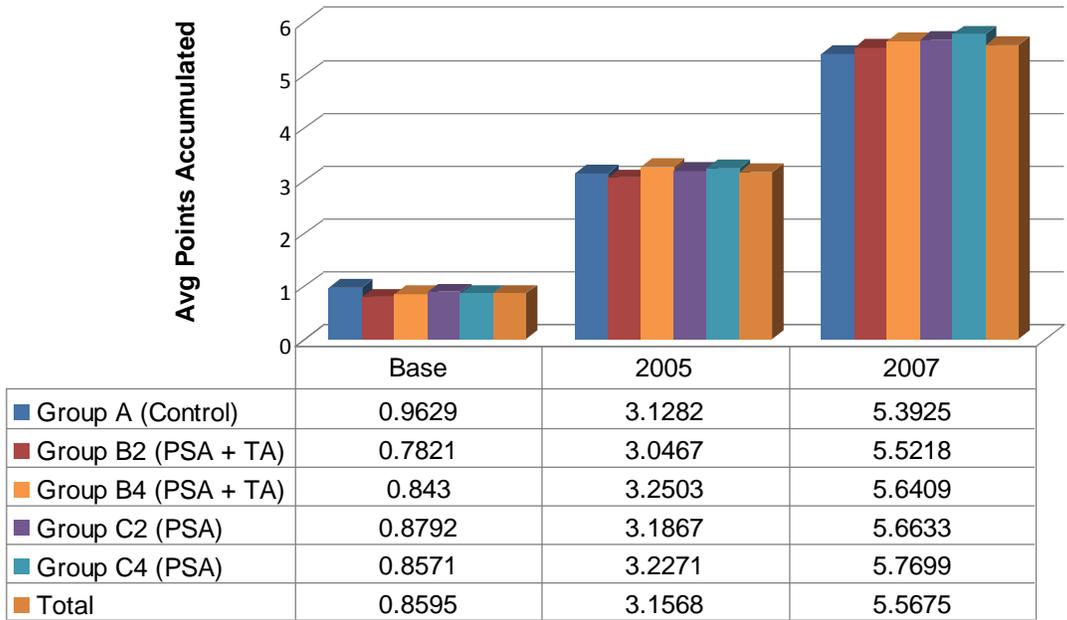


Figure 5-4, Average points accumulated by group and payment intervals.

(RISEMP, 2007)

**Average Rate of Change in ESI Point Accumulation per Hectare
by Group Every 2 Years**

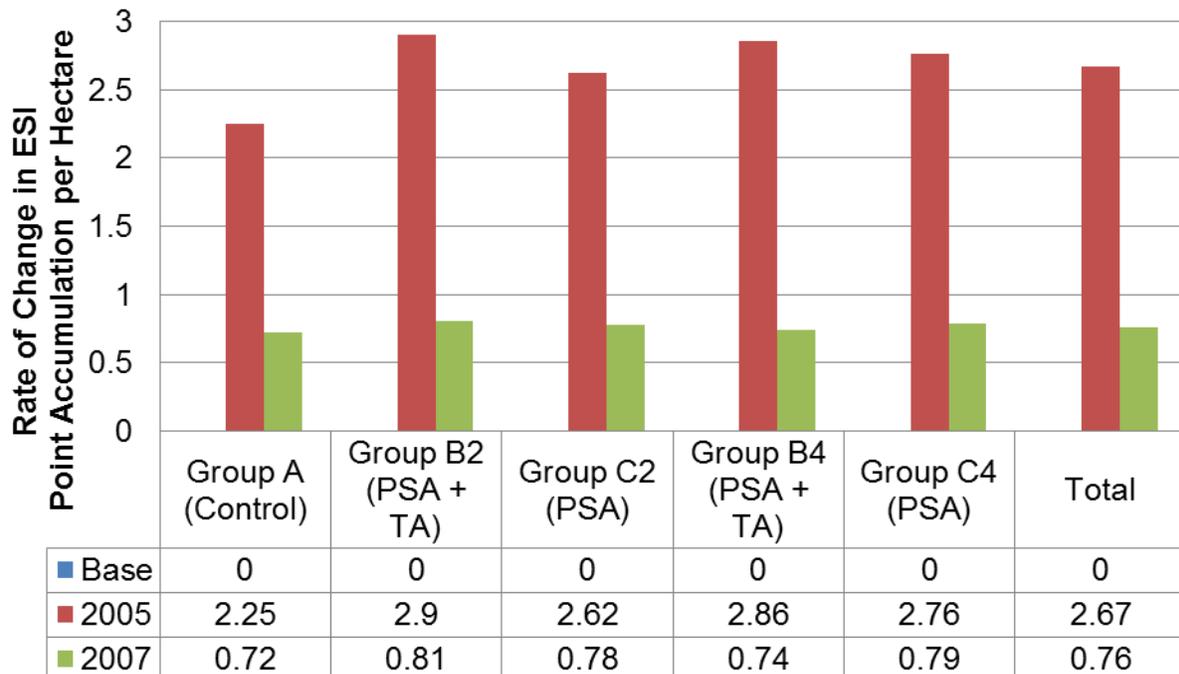


Figure 5-5. Average rate of change in ESI point accumulation per hectare by group every 2 years.

(RISEMP, 2007)

CHAPTER 6 EFFECTS ON LONG TERM BEHAVIOR CHANGE

The previous chapter discussed the increase in the provision of environmental services based on the short term analysis of the annual RISEMP land surveys from 2002 to 2007. These data presented only a short term analysis of the effect of payments for environmental services (PES), and PES combined with technical assistance, on the conservation behavior of landowners in Esparza, Costa Rica. The long-term effects of the incentives introduced by the RISEMP are equally, if not more, important for the future of Esparza and as a guide for future projects.

This chapter will discuss the long term effects of the RISEMP in three dimensions: the continuance of silvopastoral practices after the end of the RISEMP; the new implementation of silvopastoral practices after the end of the RISEMP; and the relative levels of environmental consciousness. While the continuance and/or new implementation of silvopastoral practices since the end of the RISEMP deal with current conservation behavior, the levels of environmental consciousness deal more directly with the biospheric knowledge, values, and norms discussed in Chapter 2. Chapter 5 analyzed the direct effects of the RISEMP incentives on measurable behaviors, but it is harder to control for the effects of each incentive on long-term behavior because of the limited capacity of this follow-up study. Thus, the behavior theory from Chapter 2 will be discussed more in terms of its possible relationships with current practices, trends, and beliefs, as cited by former participants, and what these findings might say about the RISEMP.

Data Notes

The data used to gauge the long-term effects of the RISEMP on conservation behavior came primarily from the semi-structured interviews conducted by this author in the summer of 2012; it is important to note the difference between these data and those collected by the RISEMP between 2002 and 2007. Official RISEMP data, collected between 2002 and 2007, provided individual-level and aggregated information about participants' landholdings, environmental service point accumulations, and payments received. Official RISEMP data provided by CATIE to the researcher were combined with semi-structured interviews conducted by the author during the summer of 2012.

The two main questions used to measure the long-term effects of the project were:

1. Have you continued the practices that you began during the RISEMP? If so, how many practices?
2. Since the end of the RISEMP, have you implemented any additional practices to those that you implemented during the project? If so, how many?

The nature of these questions is subjective, so the answers given were more difficult to compare to each other than quantitative data, for several reasons. First, the questions lacked a common scale, and were dependent on each respondents' conceptualization of what "continuing practices" means. Second, because the semi-structured interviews did not have the capacity to take land surveys like those in the RISEMP, respondents' answers were used as proxies of reality. Thirdly, it is possible that respondents claimed to continue more practices than they had in fact continued. These pitfalls were buffered during the interviews by asking respondents what practices they still continued, where they continued them, and to what extent the amount and location of practices had changed since the end of the RISEMP; in many cases, respondents were asked to illustrate their property and practices on each hectare with a

pen and paper (See Figure 6-1). Furthermore, the MAG agents helped in identifying respondents who were being openly dishonest, based on their observations and more in-depth knowledge of the respondents' practices. Despite these potential problems with the data, the author did not detect large differences between what respondents reported and their actual behavior.

The environmental consciousness index was constructed by counting the number of respondents' silvopastoral practices, and assessing their ability to name environmental components, processes, and consequences, as explained in Chapter 4. Thus, this index was also subjective, created based on answers to questions classified by the researcher. While the subjectivity of this index diminished the ability to talk about respondents in relation to a common and well defined scale, this wasn't the purpose of this study. The index instead allowed the comparison between groups, which was the purpose of this study. Thus the measures of environmental consciousness were based on respondents' ability to name environmental components, processes, and consequences in comparison to other respondents.

Table 6-1 shows the distribution of this study's sample respondents among project groups. The total number of interviews conducted by this study was 42; however, due to revisions and additions to the study questionnaire, the total number of respondents for some questions was as low as 37. This allowed the utilization of distribution analysis between project groups, but was not large enough to draw conclusions about statistical significance like those found in Chapter 5. A sample size of 30 is generally cited as the minimum necessary to conduct statistical analysis; when project groups were divided, the numbers fell far below 30. Thus, only when the

respondents were treated as a single sample, could statistical analysis be run and considered valid. Much of the comparative analysis in this chapter therefore relied on qualitative, subjective measures to complement the statistical analyses.

Continued Practices

The continuation, or lack thereof, of the practices implemented during the RISEMP allowed a superficial measure of the extent to which practices were accepted and viewed as positive land-use changes. Many of the practices introduced into pastureland, primarily trees and improved pastures, required labor to reverse. Therefore, the continuation of practices did not necessarily mean that landholders were in favor of the practices, simply that they didn't believe them to be bad enough that they should expend the energy to reverse them.

This study asked respondents whether or not they continued the practices that they had implemented during the RISEMP, regardless of whether or not they received an incentive. Only 2 of 47 respondents reported that they didn't continue any of the practices that they implemented during the RISEMP. In both of these cases however, the landowners had sold their property and no longer owned pastureland. Since the two landowners that didn't report any continuation of silvopastoral practices did so because they no longer had pastureland in which to practice them, they will not be discussed further except to say that in both cases, respondents reported two things: 1.) if they had the ability to buy pastureland, they would establish a silvopastoral system; and 2.) they did not know whether or not the new owners of the land continued silvopastoral practices. Nine respondents reported that they continued some of the practices, but said that some practices were stopped due to labor costs and/or environmental and management factors that destroyed trees and/or improved pasture. The overwhelming

majority of respondents, 36 of 47, reported, however, that they continued most, if not all, of the practices that they implemented during the RISEMP.

Continued Practices by Project Group

Although statistical comparisons between groups were not useful, the frequency and distribution of respondents' continuation of silvopastoral practices shows that there was not a large indication that any one of the controlled incentives offered by the RISEMP proved more effective than another in affecting long-term behavior decisions to continue the use of silvopastoral practices. Figure 6-2 shows the proportion of respondents from each project group who answered that they continued either “none,” “some,” or “most, if not all,” of the practices that they implemented during the RISEMP.

The highest proportion of respondents that reported continuing most, if not all, of the practices were from Group C4 (4-Year PSA), 100%. This however, is nearly indistinguishable from the 89% of respondents from Group B4 (4-Year PSA + TA) and the 80% of respondents from Group A (Control) that reported the same. In all three cases, the same number of respondents reported continuing most, if not all, of the practices, 8 out of 8 from Group C4 (4-Year PSA), 8 out of 9 from Group B4 (4-Year PSA + TA), and 8 out of 10 from Group A (Control). Respondents from Group B2 (2-Year PSA + TA) reported the lowest rate of continuing most, if not all, of the practices, the only group from which less than half, 45%, of the respondents reported this. The proportions from this group of respondents are skewed because two reported selling their property. Thus, of respondents that continued to own pastureland, 5 out of 9, or 56%, reported that they continued most, if not all, of the practices implemented during the RISEMP.

All other respondents who continued to own their pastureland, reported that they continued at least some of the practices but acknowledged that they were unable to continue most or all. The primary reasons that respondents reported for not continuing silvopastoral practices were the difficulty of high labor requirements, and unexpected environmental factors. Many respondents reported discontinuing labor intensive practices, such as fodder banks, because they didn't feel that they could afford the labor investment. Other respondents reported unexpected environmental and management factors; one respondent cited a parasitic worm that killed most of the improved pasture that he had planted, while another said that his cattle had eaten so much of the small trees before they had time to sufficiently develop, that they died.

Continued Practices by Payment Group

While each project group received different incentives, the quantity of payments received by each landholder varied significantly, depending on baseline ESI points, labor investment, and landholding size. Figure 6-3 shows the proportion of respondents who reported continued practices, to some degree, within each payment group of the RISEMP. At least half of all the respondents in each payment group level (in 1000 USD increments) reported that they continued most, if not all of the practices that they were paid to implement during the RISEMP. Although only 50% of respondents in the 0-1000 USD payment group reported that they continued most, if not all of the practices, this number is not statistically significant due to a low sample size.

Beyond this comparably low report of the continuation of most, if not all, practices, by those who received the smallest payments, there is no observable trend within the data. Respondents who fell within the 1001-2000 USD payment group reported continuing a higher proportion of practices than those in both the 2001-3000

USD payment group and the 3001-4000 USD payment group. Those respondents from the highest payment group reported the highest proportion of continuation, with 86%. The small sample sizes make these differences inconsequential and they are treated by this study as insignificant.

Behavioral Factors and Implications

While counter-intuitive, the lack of an identifiable difference among project and payment groups has implications about the effects of the RISEMP on the behavior of individuals in the Esparza watershed. It allows for the discussion of the effectiveness of the RISEMP in the Esparza watershed, the behavior of incentivized individuals after incentives have ended, and the potential of silvopastoral practices. The reported continuation of behavior suggests that the RISEMP was successful in facilitating the implementation of silvopastoral practices in the region. Chapter 5 highlighted the increase in silvopastoral practices during the project, while data from this study show the continuation of those practices. After the end of incentives, most landowners reported that they continued the silvopastoral practices to the extent that they believed that they were able. Both of these trends are attributable to the presence of the RISEMP.

Effects of subjective norms and intrinsic motivations

The effects of Azjen's (1991) subjective norms and DeYoung's (2000) intrinsic motivations seem to be more important in the continuation of silvopastoral practices than in the decision to engage in the practices to begin with. Table 6-2 shows the relationship between respondents' reported continuation of silvopastoral practices and the subjective norm and intrinsic motivation behavior change components.

Respondents' reports of the continuation of practices strongly suggest the presence of

these behavioral factors, because payment incentives have stopped. Furthermore, respondents reported feeling that silvopastoral practices were becoming the norm, and openly recognized the benefit of silvopastoral practice for their own life, the life of their cattle, the future of the community, and the environment. It is also important to remember the labor costs involved in reversing the silvopastoral practices which undoubtedly contributed to the continuation of practices.

While participants didn't report high rates of talking with neighbors, respondents continually commented on the significance of the RISEMP in making silvopastoral practices more commonly seen in the Esparza area. Although respondents didn't indicate any open feelings of pressure, many remarked that it was becoming the new way that "everyone" treated their pastureland. Thus, the existence of subjective norms was more visible in the aftermath of the project, as landowners saw the practices implemented during the RISEMP continued on their neighbors' land. Furthermore, destruction or discontinuation of these practices would mean a visible deviation from what respondents were beginning to consider the status-quo. A deviation like this would challenge the intrinsic motivation discussed by DeYoung (2000), in which individuals strive to maintain a positive position within a community.

The nature of silvopastoral practices and its relationship to individuals' intrinsic motivation to be frugal and thoughtful in practice and consumption are also important to discuss. In this, eliminating practices that individuals viewed as beneficial or frugal would be a behavior that contradicted the need to feel frugal. Respondents were asked a series of questions to gauge the extent to which they believed that silvopastoral practices were beneficial to themselves, the community, and the future. Figure 6-4

shows the collective pattern of respondents' answers. The majority of respondents reported that they believed that the silvopastoral practices from the RISEMP had bettered both their own life and the life of their cattle. In most cases, respondents reported these two beliefs as a causal relationship: their lives were bettered because the life of their cattle was bettered. Respondents most commonly mentioned that there was more shade, food, and nutrients for the cattle which meant that the cattle weighed more and were healthier throughout the entire year.

Respondents easily connected the rhetoric of conservation with the silvopastoral practices of the RISEMP, with 83% reporting that the well-being of the environment was improved "a lot." The extent to which respondents could discuss environmental components, processes, and consequences of failing to conserve, will be discussed later in this chapter. Respondents were less sure however, of the effects of the RISEMP on the future of the community. Many were aware of the positive influence of the practices on themselves and the environment as a whole; they were often unsure of how this was connected to the neighbors with whom they interacted. Conceptualizing and talking about the effects beyond the farm or global level proved difficult. Those who did believe the future of the community was better as a result of the RISEMP, cited the increase in resources to the region as a result of the project, both environmental resources and financial in the form of increased returns on cattle.

Effects of positive external incentives

The data show that there were no observable relationships between the reported continuation of silvopastoral practices and the incentive system of the RISEMP. Table 6-3 shows the behavior-change component that corresponds to the positive external incentives offered to participants in PES and PES + TA groups, and the relationship

between these incentives and respondents' reported continuation of silvopastoral practices. While the positive external incentives ended in 2007, the majority of landholders reported continuing most, if not all, of the practices implemented during the RISEMP. The degree of influence that each positive external incentive had on landowners behavioral decisions to continue the practices is indistinguishable; no positive incentive was more motivating than another in terms of continuing the practices implemented during the RISEMP.

These findings suggest, however, several possibilities about the relationship between the positive external incentives offered by the RISEMP and their relationship with the motivations for adopting the practices in the first place. The high rates of reported continuation of practices, regardless of project group and/or payment group, suggest that participants' motivations to engage in the project in the first place were not solely the payments offered, as discussed in Chapter 5. If this had been the case, a more logical trend would be a neglect of the practices once payments were stopped, or a true market response, the halt of environmental services when payment was no longer provided. Table 6-4 shows the motivations reported by respondents in each project group during semi-structured interviews. While 20.5% of respondents cited PES as their motivation for joining the project, an equal proportion listed education about silvopastoral practices as the main motivation and over 50% cited motivations that had no association with PES. The continuation of the practices after the end of the RISEMP, suggests that respondents were truthful in reporting that they were motivated by incentives other than payments, such as education and improving their land.

Effects of habitualization and environmentality

The lack of difference between project and payment groups' continuation of silvopastoral practices makes it difficult to draw conclusions about the relationship between this behavior and habitualization and environmentality. This study shows that 2-year participants continue the silvopastoral practices that they implemented during the project at the same level of those that participated for 4 years. This could mean that both groups were affected by the habitualization of practices, but that 2 years of practice was enough to create the same level of habitualization as 4 years. Data from Chapter 5 showed that there were no differences in average ESI point accumulation between groups, even after 2-year participants¹ stopped receiving payments (and technical assistance). This explanation would either not account for Group A (Control) or it would assume that all groups were affected by the same level of habitualization. The latter is probably the most likely because it explains the uniformity in results that has been found in this study. This sense of habitualization and environmentality will be discussed later in the discussion of environmental consciousness.

New Implementation of Practices

The continuation, or lack thereof, of the practices implemented during the RISEMP allows a surface-level look at the extent to which practices were accepted and viewed as positive land-use changes. Many of the practices introduced into pastureland, primarily trees and improved pastures, required labor to reverse, meaning that continuing the practice can be referred to as "inactive behavior." Thus, the continuation of practices does not necessarily mean that landholders are in favor of the

¹ Groups B2 (PSA + TA) and C2 (PSA)

practices, simply that they don't believe them bad enough that they should expend the energy to reverse them. The examination of new implementation of practices since the end of the project, however, yields a more accurate picture of the effects of the RISEMP on conservation behavior and future trends in land-use changes.

Respondents were asked whether they had implemented any new practices since the end of the RISEMP or just maintained what they had established during the program. While the majority of participants reported continuing what they had implemented during the project, much fewer reported implementing anything new. Twenty-four of the 47 respondents (51%) reported that they hadn't implemented any new practices since the RISEMP ended. Twelve respondents (26%) reported that they had implemented some new practices, but not many, and 9, 19%, reported that they had implemented many new practices since the project's end.

New Implementation by Project Group

A look at the new implementation of silvopastoral practices by project group allows for a more accurate discussion of the effects of the RISEMP on active establishment of new practices.² Figure 6-5 shows the proportion of respondents from each project group who reported the implementation of new practices since the end of the RISEMP. Over half of respondents in each group, except for Group A (Control) reported that they had not implemented any new practices since the project's end. The significance of Group A (Control) then, is that 90% of respondents from Group A (Control) said that they had implemented at least some new practices, while 60% said

² It is important to note that the new implementation of practices is simply a measure of effort to intensify not a measure of total labor put into silvopasture. The continuation of silvopastoral systems requires labor, and the implementation of new practices requires additional. New implementation of practices also does not make any assumptions about the quality of management of those practices.

they had implemented many. This proportion is drastically different from the 9% of respondents from Group B2 (2-Year PSA + TA) and the 17% from Group C4 (4-Year PSA) that reported that they had implemented many new practices; the other groups had no respondents that reported this.

Beyond this trend, in which Group A's (Control) reports of new implementation were drastically higher than groups that received incentives, there are no other observable differences between incentive groups. Although Group C4 (4-Year PSA) has slightly higher proportions than the other groups, sample size constraints prevent any statistical analysis of this difference. Interviews with respondents didn't suggest differences beyond that found between Group A and all other Groups; this will be discussed later in the Behavioral Factors and Implications section.

New Implementation by Payment Group

When respondents were divided based on payment groups, similar trends emerged in that not many respondents implemented new practices after the RISEMP ended. Figure 6-6 shows the proportion of respondents from each payment group who reported the implementation of new practices since the end of the project. In all cases except respondents who were in the 4001 – 5000 USD payment group, over half of respondents reported that they had not implemented new practices since the project ended. Although the difference between the 4001 – 5000 USD payment group appears significant, the sample size of this payment level is skewed because participants were not paid over a total of 4500 USD. A similar difference can be seen within the lowest paid respondents, 0-1000 USD; however, only one respondent who was paid under 500 USD was interviewed. Thus, no statistical conclusions can be made about the differences shown by these groups.

Behavioral Factors and Implications

The low rates of implementation of new practices since the end of RISEMP, but the wide-acceptance and continuation of already implemented practices, have several implications about the project as a whole. If respondents were convinced of the benefits that silvopastoral practice offered, why wouldn't they have continued to implement new practices as they were able? The answer has several financial and behavioral components that will be discussed in more detail in this section.

Effects of subjective norms and intrinsic motivations

Subjective norms are unlikely to have played a role in Group A (Control) respondents' decisions to implement new silvopastoral practices after the RISEMP. Ajzen's (1991) subjective norms motivate individuals when the individual feels that there is a conflict or difference between what he/she believes that those in his/her significant social circle believe he/she should do, and what he/she is actually doing. Since Group A (Control) respondents reported that they believed that their practices were similar to others, they were therefore unlikely to have been motivated by a subjective norm to improve what they already viewed as a commonality between them. Respondents in other groups were likely to have felt similar complacency, in the context of subjective norms, in that if they were continuing the practices that they implemented during the RISEMP, they were already outperforming their neighbors in terms of conservation. Thus, new implementation of practice wouldn't have been pressured by the belief that they should have been "doing more."

Group A's (Control) reports of new implementation suggest that intrinsic motivations played a larger role in their behavior but still not the most significant. Table 6-5 shows the behavior change components of subjective norms and intrinsic

motivations and their relationship to reported implementation of new silvopastoral practices. Group A's (Control) respondents were part of a group that was consistently motivated by factors other than positive external incentives before, throughout, and after the RISEMP. Thus, it is likely that respondents from this group were motivated by DeYoung's (2000) intrinsic satisfaction of frugality, or the satisfaction derived from being a thoughtful and resourceful individual. In this case, the frugality of Group A (Control) respondents is operationalized through the conservation behavior of adopting new silvopastoral practices. While this is a common motivation that under perfect circumstances would motivate all individuals, this study suggests that the effects of positive external incentives may have inhibited this motivation. This will be discussed in the next section.

Effects of positive external incentives

Although the provision of positive external incentives ended in 2007, their effect on respondents' attitudes appeared to remain. Groups that received incentives had lower rates of implementing new practices, while over half of Group A (Control) respondents reported implementing many new practices. The explanation of this pattern is likely due to the removal of positive incentives and financial constraints. Table 6-6 shows the relationship between the positive incentive aspect design of the RISEMP and the behavior change components involved in implementing new practices.

Interviews with respondents suggest that the payments may have actually been detrimental to the adoption behavior of respondents of new practices after the payments ended. While respondents continued practices that they had already adopted and implemented, and indicated that they knew of additional practices that they could implement on their property, they were hesitant to adopt the practices without

payments. Respondents from every project group that received positive external incentives indicated that although they would like to implement more practices, they wanted to wait until the same project or a similar project returned to offer them payments. Many respondents, in fact, asked the author, hopefully, if she was there to establish another project. Group A (Control) respondents, however, had no reason to wait for payments to implement silvopastoral practices in the first place, indicating this as the explanation for their implementation of new practices even after the RISEMP finished.

Although the attitude of respondents toward adopting a behavior for free that they had previously been paid to adopt was influential, it is also important to note financial and labor constraints cited by respondents. Many respondents indicated that they wanted to implement more silvopastoral practices but were limited by money and were unable to invest in the necessary inputs to implement new practices. Other participants cited that they didn't have the necessary labor to implement new practices, either because labor costs were too high, or they were old and didn't have the energy necessary for new behaviors.

Effects of habitualization and environmentality

While the interviews with respondents indicated that the continuation of practices implemented during the RISEMP became habitual, the new implementation of practices shows no indication of the same. Table 6-7 shows the relationship between the length of involvement in the project, the behavior change component targeted by this project feature, and the new implementation of silvopastoral practices. There was no difference between landowners who were involved for two years and those who were involved for four. The habituality and environmentality of continuing practices came from the ability

to remain inactive: one had to actively reverse the practices implemented during the project. As discussed, however, landowners were still very conscious of the fact that they were implementing new practices. The actual act of establishing silvopastoral practices had not become part of their normal routine, and in fact many didn't do it at all. Respondents from Group A (Control) were the most likely to have developed habituality and environmentality, but interviews did not suggest that respondents were "used to" the behaviors yet.

Geller's (2002) and Agrawal's (2005) hopes that actions will lead to pro-environmental values, norms, and behaviors were unobservable in this comparison of the implementation of new practices by different project and payment groups. It is possible that the detrimental effects of positive incentives during the project on the propensity to begin new practices independently, was masking this trend. The investigation of environmental consciousness in the next section should make it easier to take a closer look at this relationship, or lack thereof.

Differences in Environmental Consciousness

While the continuation and new implementation of silvopastoral practices were indicators of some of the specific behavioral effects of the RISEMP, they shed no light on the internal conceptualization of the environment. Although this study operationalized silvopastoral practices as conservation behavior, did respondents conceptualize it the same way? The nature of silvopastoral practices, in that they provide direct returns to landholders, creates the possibility that respondents in Esparza did not view their "conservation behavior" as conservation, but rather as "good business" by recognizing the direct benefits of the practice. This section strives to

analyze the degree to which respondents were knowledgeable and conscious about the environment, its importance, and their participation in protecting it.

In this analysis, it is important to identify the factors that this study uses to define environmental consciousness and the importance of each factor in this definition.

Secondly, because the environmental consciousness index of this study is a relative measure, it is important to ask how respondents compare to each other. This section will compare respondents between project groups and between payment groups in attempts to identify the effects of the RISEMP on levels of environmental consciousness. For a list of respondents' answers to questions about aspects of environmental consciousness, refer to the methodological discussions of Chapter 4.

Breaking-Down Environmental Consciousness

This study operationalizes environmental consciousness through the number of silvopastoral practices implemented by respondents and their ability to name components of the environment, environmental processes, and the consequences of failing to conserve. Figure 6-7 shows the ability of respondents to report “few,” “average,” and “many” aspects of environmental consciousness. All four tasks show a relatively normal distribution of responses, a distribution that was used to create a measure of environmental consciousness compared to other respondents. All aspects of the index of environmental consciousness were correlated, which meant that the more respondents were able to talk about one aspect, the more they were able to talk about another.

The number of practices reported by respondents presented a rough measure of the labor commitment that each participant had to silvopastoralism. Although this could have been independent of other measures of environmental consciousness, it was used

to create a behavioral measure to monitor whether respondents actually engaged in the behavior that they might or might not discuss. In other words it was used to check if those who “who walked the walk” actually “talked the talk.”

The ability to name environmental components proved easiest for all respondents; respondents were able to name more components than any other factor in the environmental consciousness index. The naming of components was relatively superficial because it was often connected to the rhetoric of every day conversations about conservation. Thus, many respondents were able to say that trees were an important component of the environment and conservation, but were unable to cite a process or consequence that explained why. In this sense, the ability to name environmental components was a simple measure of exposure to environmental rhetoric.

The ability to explain environmental processes and consequences of environmental destruction proved a more tangible measure of the knowledge, awareness, and consciousness of actual environmental factors. The consequences of environmental destruction composed an integral part of gauging environmental consciousness and using it to predict behavior. As Stern (2000) discusses, when people feel that something that they value is in danger, they are more likely to act to protect it. Thus, consequences imply knowledge about a process as well as the realization that something that is valued is under threat.

Differences in Environmental Consciousness by Project Group

Figure 6-8 shows the proportion of respondents within each project group who had a low, average, or high environmental consciousness. A Pearson Chi Squared test showed a significance level of 0.654, indicating that the results were statistically

independent. More simply, the state of being in one particular project group was unrelated to the state of having a particular environmental consciousness; this means that there was no relationship. With the exception of Group C2 (2-Year PSA), the environmental consciousness of respondents followed a normal distribution; this study attributed this deviation to the small sample size from the group. The largest proportion of respondents with a high environmental consciousness was from Group A (Control), 40%.

Differences in Environmental Consciousness by Payment Group

Figure 6-9 shows the proportion of respondents within each payment group who had a low, average, or high environmental consciousness. A Pearson Chi Squared Test showed that the payment groups and index of environmental consciousness were statistically independent, with a significance of 0.489. We can see from the distribution that there was no evidence to suggest that there was a correlation between the quantity of payments respondents received, and their level of environmental consciousness. Respondents in the 4000 – 5000 USD payment group were the lowest proportion of respondents with a high environmental consciousness, while they were the highest proportion with an average environmental consciousness. Respondents from mid and mid-high payment groups, 2001 – 3000 USD and 3001 – 4000, had the second highest proportion of respondents with high environmental consciousness. Respondents from the mid-low payment group, 1001 – 2000 USD, had the highest proportion of respondents with low environmental consciousness.

Behavioral Factors and Implications

The lack of differences in environmental consciousness between respondents in both project and payment groups has several implications about the behavioral effects

of the RISEMP. While the data indicate that during the semi-structured interview there was no difference in environmental consciousness between project or payment groups, this may not have been the case before the project began or during its implementation. Thus, this study cannot say whether or not one project aspect had a greater effect than another, it can simply comment on the current level of environmental consciousness of each respondent and what factors may explain this level.

Effects of subjective norms and non-project exposure

While it is impossible to measure the trends in environmental consciousness over time, it is unlikely that all project and payment groups achieved indistinguishable levels of environmental consciousness independently. While it is possible to claim that the RISEMP was responsible for raising environmental awareness to a certain level, this only explains cases in which respondents were given technical assistance. What is more likely is that the sharing of information within the community, or respondents' subjective circles, through several channels, facilitated a participant-wide distribution of environmental consciousness. Table 6-8 shows the possible relationships between levels of environmental consciousness and subjective norm and intrinsic motivation behavior change components.

Many respondents, even those who didn't receive technical assistance, cited the education, both about practices and about the environment in general, as one of the most helpful parts of the project. Respondents talked about three primary ways in which they gained information, either during the project or before: by attending information sessions at the MAG office; participating in other MAG programs; and or participating in other PES programs. The information sessions provided by the MAG office were open to whomever attended and did not turn participants away; thus, there

wasn't a complete control on technical assistance and education. Furthermore, 21 of 46 respondents (46%) said that they had been part of another PES program and 22 of 46 (48%) said that they had been part of a MAG project in the past. Esparza was the site of another silvopastoral program in the 1990's. It is likely that these involvements outside of RISEMP played a large role in raising the environmental consciousness of many participants before, during, or after the end of the RISEMP.

Effects of positive external incentives

The analysis of the environmental consciousness index suggests that positive external incentives did not affect respondents' levels of environmental consciousness any more than any other project component. Table 6-9 shows the possible relationships between the effects of positive external incentives on levels of environmental consciousness. Although it is impossible to say that the positive external incentives did not affect respondents, it is evident that their effect on environmental consciousness was equal to or less than the effects of other behavioral pressures. Interviews with respondents suggested that technical assistance was more crucial in affecting levels of environmental consciousness. Many respondents indicated that technical assistance was one of the most helpful aspects of the project and taught them an immense amount about both silvopastoral practices and the environment in general. Thus, it is unlikely that payments directly affected environmental consciousness, but rather the accompaniment of technical assistance with payments. This however, does not account for the environmental consciousness of PES-only groups, which will be discussed in the next section.

Effects of habitualization and environmentality

It is likely that in the participant-wide sharing of information through these various channels, habituality and environmentality were factors that helped to create uniformity in environmental consciousness between project and payment groups. The implementation of silvopastoral practices within a group of individuals who were both already exposed to these practices and even already practiced some on their own property was likely easier because participants had already begun to change their levels of environmental consciousness through their actions and the actions of their neighbors. As discussed in Chapter 5, over 50% of respondents from each project group reported that they had already used some silvopastoral practices before participating in the RISEMP (See Table 6-11).

Tying Everything Together

The data analysis of this chapter offers several findings about the relationship between the long term effects on conservation behavior and the behavioral literature discussed in Chapter 2. Positive external incentives had no greater effect on respondents' decisions to continue silvopastoral practices than non-incentives, and actually had detrimental effects on the propensity to adopt new behaviors after the end of the RISEMP. The continued adoption of silvopastoral practices by Group A (Control) participants suggests that intrinsic motivations motivated respondents who were striving for feelings of frugality. Although subjective norms did not play a clear and strong role, the indistinguishable difference between the levels of environmental consciousness among respondents suggests that there was social sharing going on in the community between members of different project groups.

This chapter uses several measures to analyze the long-term effects of the RISEMP on conservation behavior: the continuation of practices implemented during the RISEMP; the implementation of new practices since the end of the RISEMP; and the levels of environmental consciousness. In this analysis, it appears that the RISEMP served as both a catalyst and enabling tool for the adoption of silvopastoral practices during the project. In a sense, this effect was long term because of the mass continuation of the practices implemented during the RISEMP, and therefore positive for both the environment and the landowners involved.

In another sense, however, this chapter suggests that the positive external incentives used to motivate the adoption of these practices during the RISEMP, served as an obstruction to the adoption of additional practices after the project ended in 2007. Group A (Control) was the only group that reported implementing new practices, while respondents from positive external incentive-groups expressed that they were waiting to receive more payments before they adopted additional practices. In this sense then, the long term effect of payments on respondents' propensity to adopt new practices was negative for the environment and for the landowners involved.

This doesn't necessarily mean that all external incentives negatively affected respondents' motivations to adopt new practices; payments are a limited way in which to conceptualize external incentives. For many landowners, the physical incentives (trees, seeds, etc.) and technical assistance proved invaluable, with many respondents reporting that they would not have participated without it. The project design, however, limits the ability of this study to measure the effects of technical assistance on

participants in relation to other incentives because the project did not control for technical assistance alone.

Table 6-1. Distribution of respondents by project group.

Group	Number of Respondents
Group A (Control)	10
Group B2 (PSA + TA)	11
Group C2 (PSA)	7
Group B4 (PSA + TA)	9
Group C4 (PSA)	8

(RISEMP, 2007; interviews, May – June 2012)

Table 6-2. Effects of subjective norms and intrinsic motivations on the continuation of silvopastoral practices.

Aspect of Project Design	Behavior-Change Component	Reported Continuation of Silvopastoral Practices	Degree of Influence
Control group	Subjective norms	Although respondents didn't indicate feeling pressure to continue practices, it was often said that "everyone" is beginning to adopt silvopastoral practices.	High
	Intrinsic motivations	Respondents' reports suggest intrinsic motivations for three reasons: 1.) they are no longer being incentivized; 2.) they report feelings that silvopastoral practices are becoming the norm; and 3.) they openly recognize the benefit of silvopastoral practice on their own life, the life of their cattle, the future of the community, and the environment	High

Table 6-3. Effects of positive external incentives on the continuation of silvopastoral practices

Aspect of Project Design	Behavior-Change Component	Reported Continuation of Silvopastoral Practices	Degree of Influence
PES only group & PES and TA group	Positive external incentives	Positive external incentives ended in 2007 and the majority of landholders reported continuing most if not all of the practices implemented during the RISEMP. There are no observable differences in the continuation of practices by project or payment group.	Low
	Knowledge and Information	Technical assistance was not controlled for. There was no difference in the reported continuation of practices between groups that received technical assistance and those that did not.	N/A

Table 6-4. Motivations for participation by project group.

	Group A	Group B2	Group C2	Group B4	Group C4	Total
Payments	n/a	2	1	2	2	7
Socially Motivated	n/a	1	1	0	1	3
Physical Incentives	n/a	0	0	1	0	1
Education	n/a	2	1	4	1	8
Improving Land	n/a	2	2	1	1	6
Conservation & Payments	n/a	1	2	0	1	4
Improving Land & Payments	n/a	3	0	0	2	5
Other	n/a	0	0	1	0	1
Total	n/a	11	7	9	8	35

(interviews, May – June 2012)

Table 6-5. Effects of subjective norms and intrinsic motivations on the new implementation of silvopastoral practices.

Aspect of Project Design	Behavior-Change Component	Reported New Implementation of Silvopastoral Practices	Degree of Influence
All Groups	Subjective norms	Respondents already felt that their land-use use was equivalent to or better than their neighbors. This means there would have been no pressure to implement new practices.	Low
	Intrinsic motivations	Group A's (Control) reports of new implementation suggest that intrinsic motivations played a role.	Higher

Table 6-6. Effects of positive external incentives on the new implementation of silvopastoral practices.

Aspect of Project Design	Behavior-Change Component	Reported New Implementation of Silvopastoral Practices	Degree of Influence
PES only group & PES and TA group	Positive external incentives	Groups that received incentives had low rates of implementing new practices. Interviews with respondents indicate the feeling that the previous receipt of payments is obstructing the motivation to engage in new ones.	High
	Knowledge and Information	Technical assistance was not controlled for. There was no difference in the reported new implementation of practices between groups that received technical assistance and those that did not.	N/A

Table 6-7. Effects of length of involvement on the new implementation of silvopastoral practices

Aspect of Project Design	Behavior-Change Component	Reported New Implementation of Silvopastoral Practices	Degree of Influence
2- and 4-year participation groups	Habitualization & Environmentalty	Sample size constraints makes conclusions hard to draw. Surface level observation of the data do not indicate differences in the accumulation of ESI points between 2-year participants and 4-year participants. The continued improvement of the 2-year group could suggest the presence of habits and environmentalty.	Low
	Intrinsic values and norms	The continuation of practices by the 2-year group suggests the presence of intrinsic motivations and norms.	Higher

Table 6-8. Effects of subjective norms and intrinsic motivations on environmental consciousness.

Aspect of Project Design	Behavior-Change Component	Environmental Consciousness	Degree of Influence
All Groups	Subjective Norms	While it is impossible to measure trends in environmental consciousness over time, it is unlikely that all project and payment groups achieved equivalent levels of environmental consciousness among participants without subjective influence.	Low
	Intrinsic Motivations	Similarly, it is unlikely that participants achieved indistinguishable levels of environmental consciousness without affecting each other through interactions motivated by the need to be a part of and maintain a community.	High

Table 6-9. Effects of positive external incentives on environmental consciousness.

Aspect of Project Design	Behavior-Change Component	Levels of Environmental Consciousness	Degree of Influence
PES only group & PES and TA group	Positive external incentives	The analysis of the environmental consciousness index suggests that positive external incentives did not affect respondents' levels of environmental consciousness any more than any other project component; their effect on environmental consciousness was equal to or less than the effects of other behavioral pressures.	Low
	Knowledge and Information	Interviews with respondents suggested that technical assistance was more crucial in affecting levels of environmental consciousness.	Higher

Table 6-10. Effects of length of involvement on environmental consciousness.

Aspect of Project Design	Behavior-Change Component	Environmental Consciousness	Degree of Influence
All Groups	Habitualization & Environmentality	It is likely that in the participant-wide sharing of information through these various channels, habituality and environmentality were factors that helped to create uniformity in environmental consciousness between project and payment groups.	Medium

Table 6-11. Respondents who reported silvopastoral practices before the RISEMP.

Group	Reported No	Reported Yes	% Reported Yes
A	1	9	90
B2	4	7	64
C2	3	4	57
B4	5	4	44
C4	4	4	50

(interviews, May – June 2012)

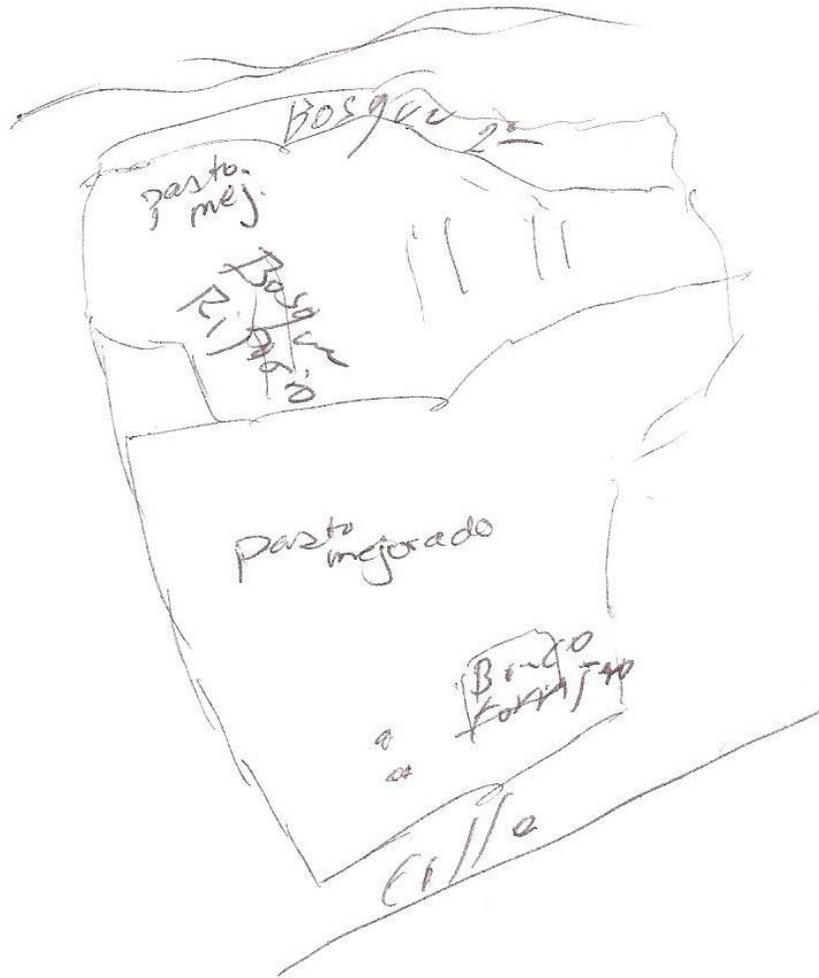
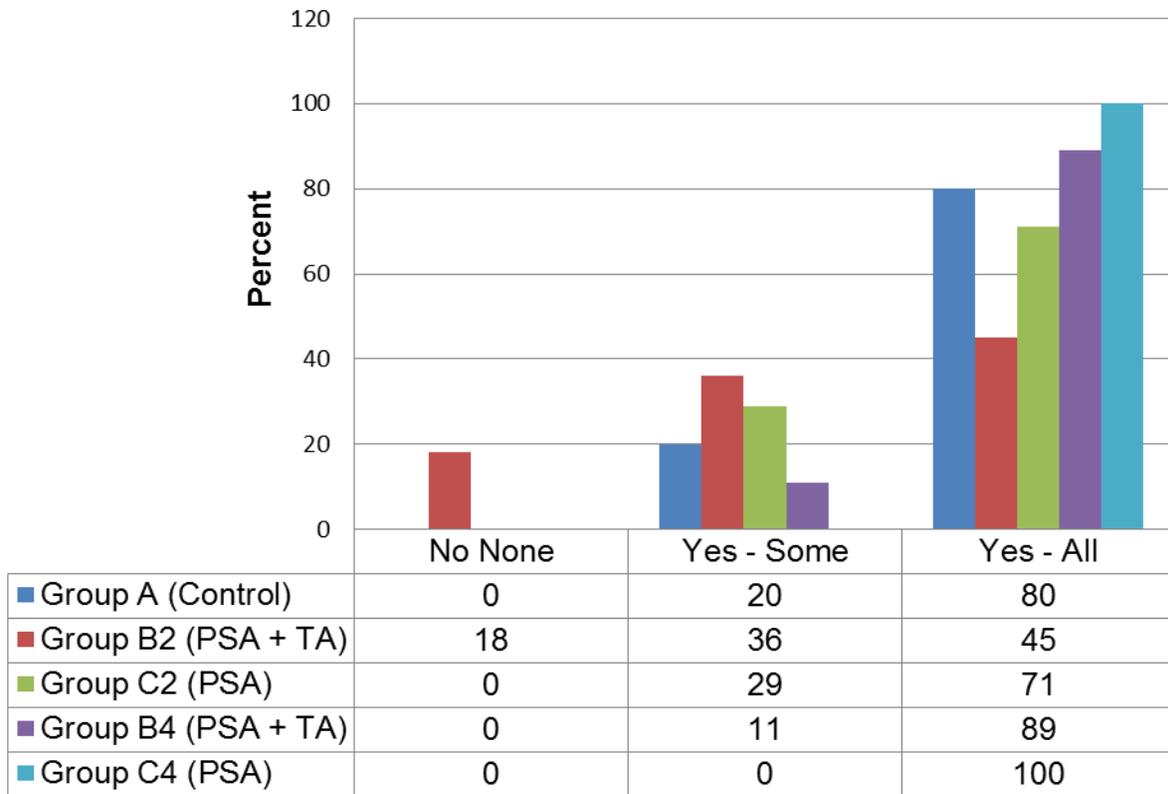


Figure 6-1. Drawing by a respondent of his landholding and the land-uses in each hectare.

(interview, May 11, 2012)

Continuation of Silvopastoral Practices by Project Group Since RISEMP by Percent



* Sample size = 37

Figure 6-2. Continuation of silvopastoral practice by project group since RISEMP by percent.

(interviews, May – June 2012)

**Continuation of Silvopastoral Practices by Payment Group
Since RISEMP by Percent**

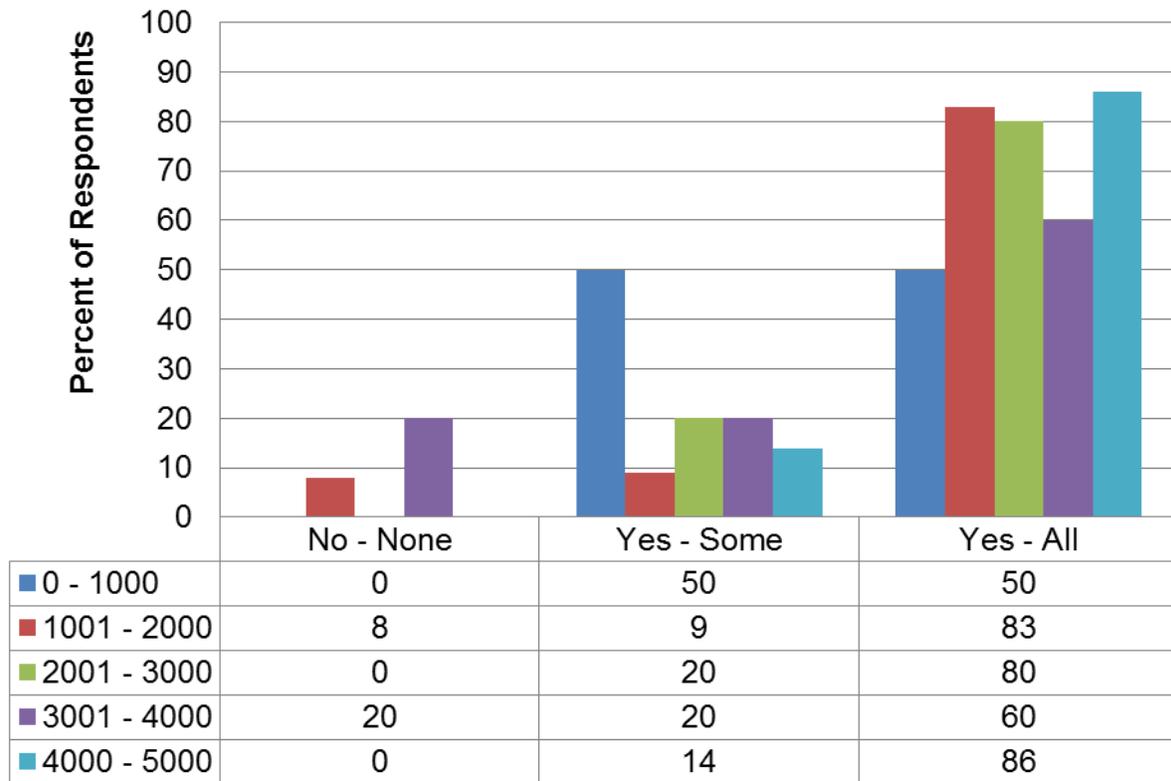


Figure 6-3. Continuation of silvopastoral practices by payment group since RISEMP by percent.

(interviews, May – June 2012)

**Respondents' Belief that Silvopastoral Practices Were Beneficial
in Life, the Well-Being of their Cattle, the Future of the
Community, and the Environment**

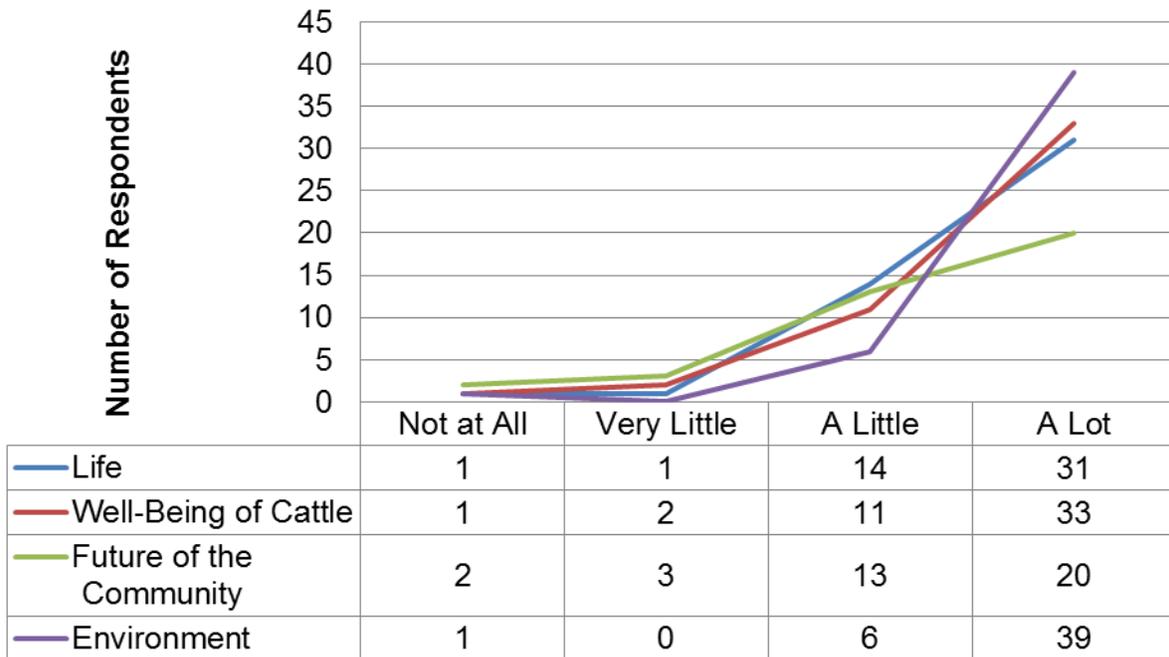


Figure 6-4. Respondents' belief that silvopastoral practices were beneficial in life, the well-being of their cattle, the future of the community, and the environment.

(interviews, May – June 2012)

New Implementation of Silvopastoral Practices by Project Group Since RISEMP by Percent

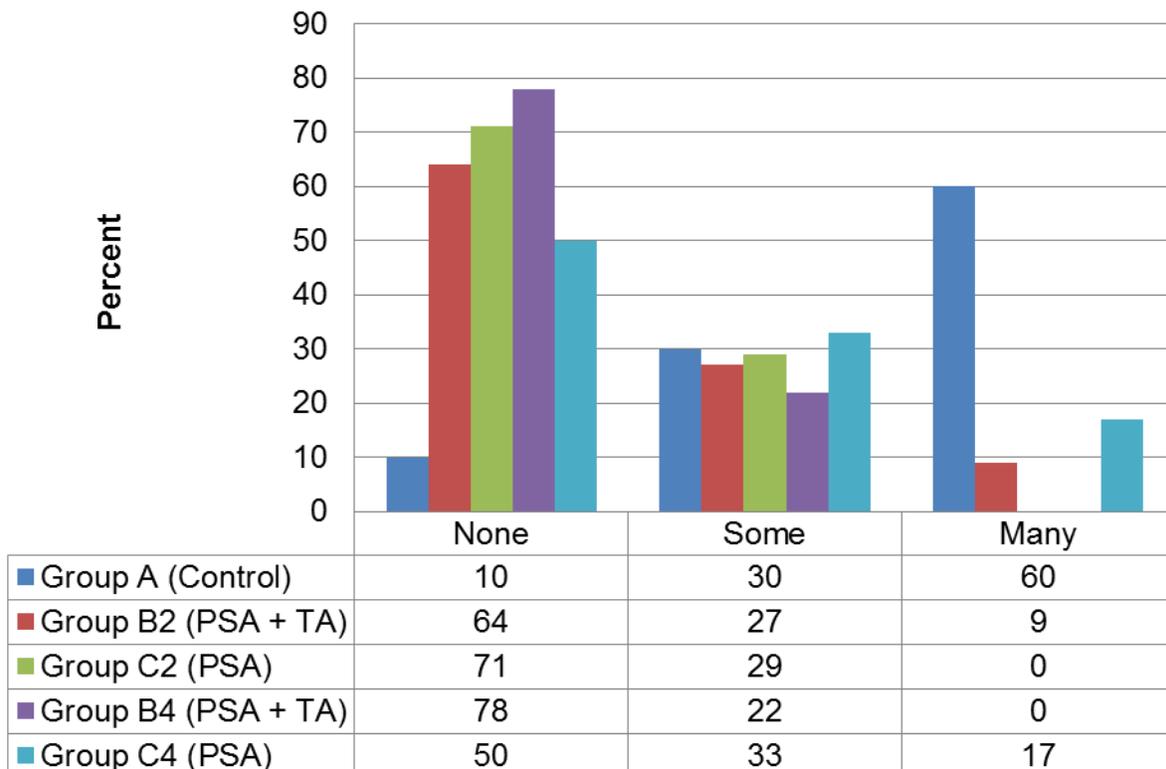


Figure 6-5. New implementation of silvopastoral practices by project group since RISEMP by percent.

(interviews, May – June 2012)

New Implementation of Silvopastoral Practices by Payment Group Since RISEMP by Percent

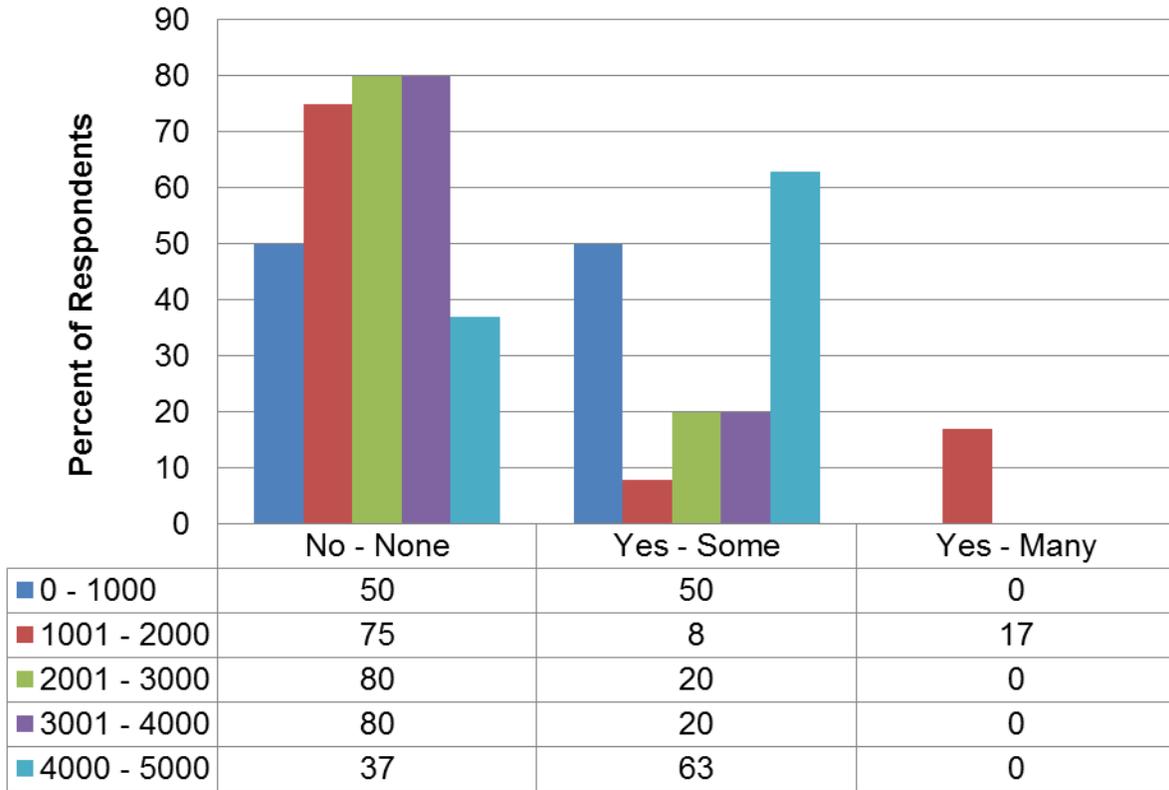


Figure 6-6. New implementation of silvopastoral practices by payment group since RISEMP by percent.

(interviews, May – June 2012)

Ability of Respondents to Report Aspects of Environmental Consciousness

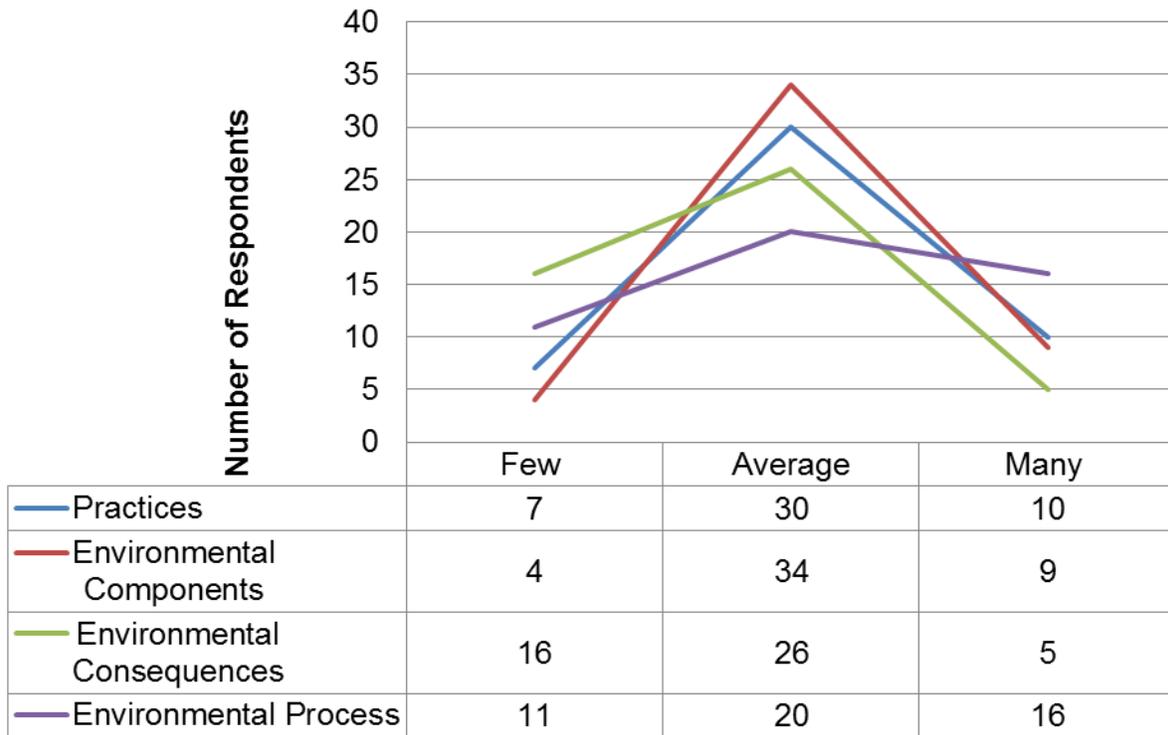


Figure 6-7. Ability of respondents to report aspects of environmental consciousness. (interviews, May – June 2012)

Environmental Consciousness by Percent Project Group

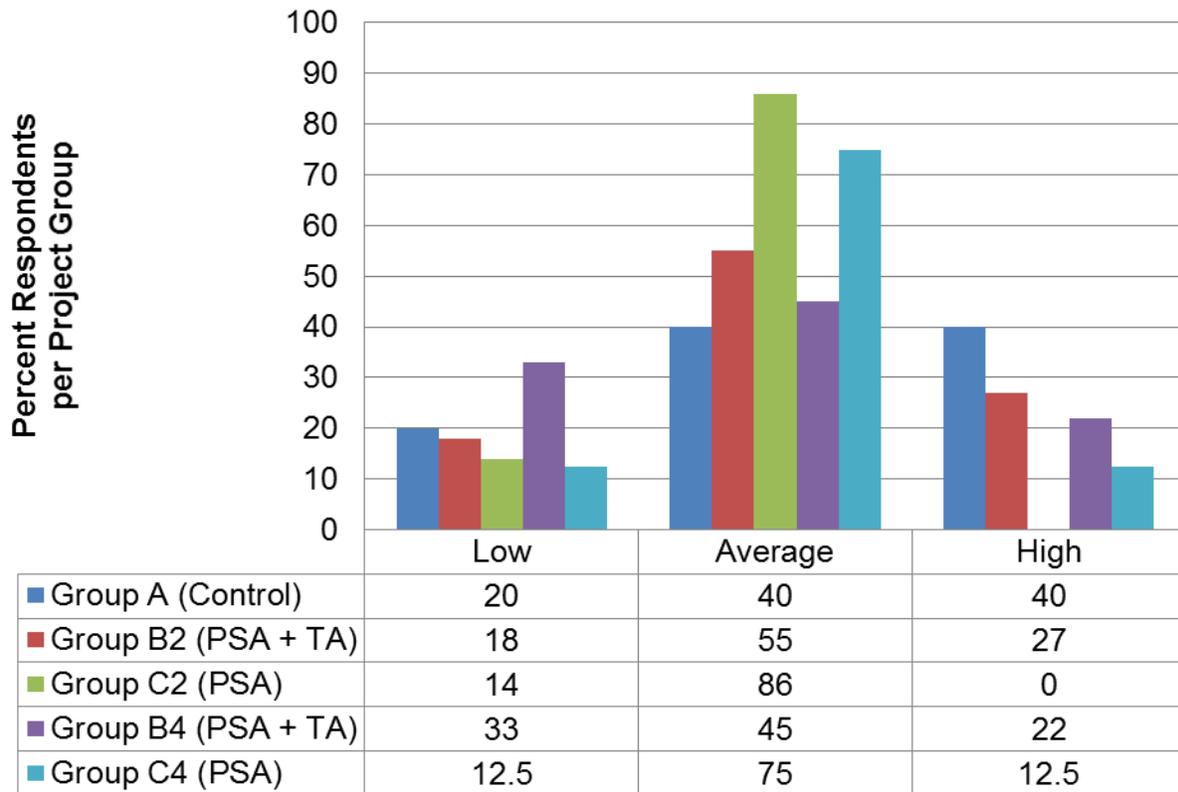


Figure 6-8. Environmental consciousness by percent project group.
(interviews, May – June 2012)

Environmental Consciousness by Percent Payment Group

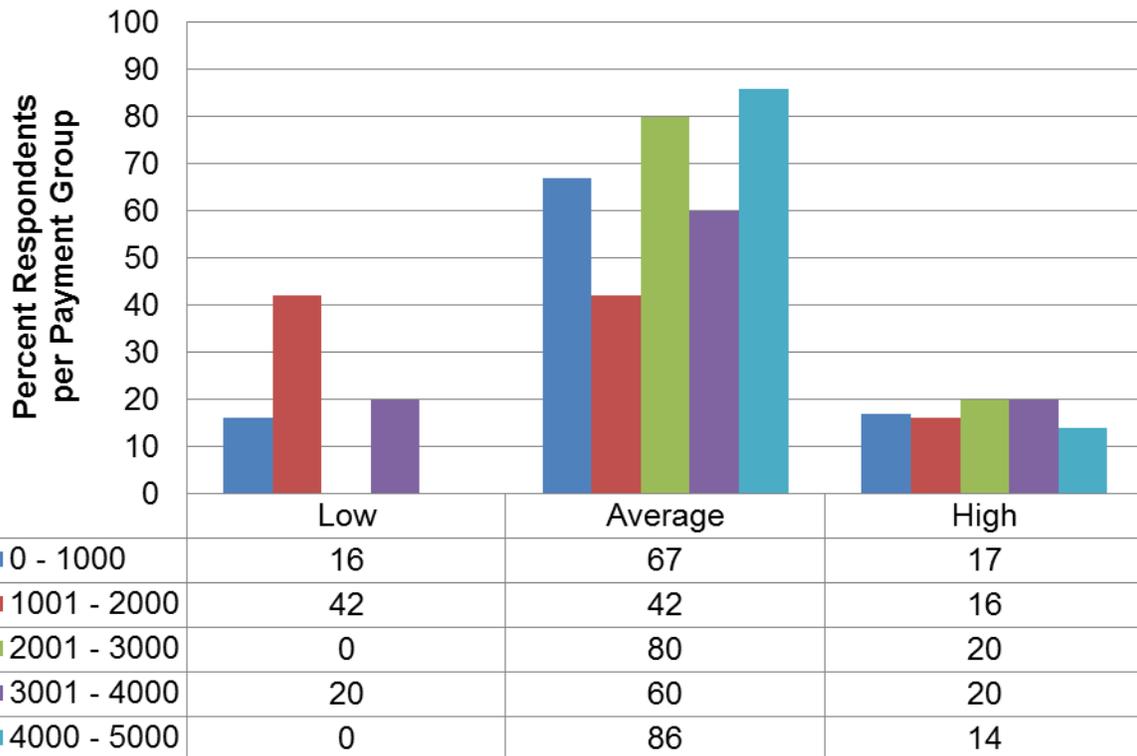


Figure 6-9. Environmental consciousness by percent payment group.

(interviews, May – June 2012)

CHAPTER 7

CONCLUSION: THE EFFECTS OF THE RISEMP ON CONSERVATION BEHAVIOR

This study seeks to analyze how convincingly money talked to participants of the RISEMP in Esparza, Costa Rica, and the effects of this conversation after the project ended in 2007. More specifically, it strives to uncover the effects of the program's different incentives on the conservation behavior of landholders in both the long and short term. To do this, Chapter 5 explores the outcomes of the RISEMP between 2002 and 2007, while Chapter 6 explores the long-term effects of the program. The analysis within these chapters shows that it is impossible to separate the data used in this study from the context in which it takes place.

Data analysis from Chapter 5 showed that the RISEMP was successful in motivating an increase in the adoption of silvopastoral practices, and therefore environmental services, between 2002 and 2007. The total number of environmental service points per year provided by participants increased by an average of 3.9% between 2002 and 2007. The most popular practices adopted by participants were living fences and pasture improved with trees, increasing by a total of 117.4% and 215.5% respectively. This catalyst for this adoption of silvopastoral practices is attributable to the presence of the RISEMP, though several questions arise within the comparison between groups of this study.

The project design of the RISEMP assumed several things about participants' behavior. First, it assumed that the more incentives offered to an individual in the project, the more silvopastoral practices he/she would adopt. This would mean that groups would adopt silvopastoral practices in descending magnitudes, with the group receiving the most incentives (B4 (PES + TA)) adopting the most, and the group

receiving the least incentives (A (Control) would adopt the least. Second, it assumed that in attempts to maximize access to project incentives, participants that were involved for shorter periods of time, would adopt practices at higher rates than those that were involved for longer.

Statistical analysis failed to support these assumptions. With the exception of a difference between the mean points per hectare between Group A (Control) and Group B2 (PSA + TA) after the baseline survey in 2002, project groups showed no statistically significant differences in mean point accumulations per hectare or rates of adoption per year. The lack of differences suggested that all motivations had effects of similar magnitude on participants, an interesting finding given the fact that Group A (Control) participants were not offered incentives at all. The rates of adoption showed a spike of 20% in the first year of the project, but fell to significantly lower levels for the remainder of the RISEMP, never rising above 2.2%.

This study suggests that there are several factors that explain the lack of variation between participants who received different behavioral incentives offered by the program. First, the statistically significant greater rate of adoption by Group B2 (PSA + TA) over that of Group A (Control) is most likely explained by a higher level of land degradation of the landholdings of Group B2 (PSA + TA) participants, giving these participants greater returns on their invested labor. Second, silvopastoral practices provide direct returns to the practitioner, thus presenting a self-interested motivation for participants. Third, the RISEMP was not the first program to expose silvopastoral practices to landowners of Esparza. The previous exposure of landowners in the region, which them aware of the rhetoric of the use of trees in pastureland, and the

observations of silvopastoral practices by local landowners, either created a desire within them to establish their own silvopastoral systems, or increased the propensity that they would be willing to consider establishing them. Fourth, the motivations for participants to engage in the behavior were not necessarily driven by the desire for an increase in income. Many respondents' motivation for participation was the education and technical assistance offered (driving them to seek this type of assistance from other sources). Finally, this study suggests that the spike in rates of adoption the first year of the project and subsequent fall were influenced by both the international beef market and the increased difficulty of intensifying silvopastoral systems.

This study's analysis of the RISEMP's effect on participants' behavior during the project showed that positive incentives did motivate the increase in the provision of environmental services, however, only significantly between two groups; otherwise, positive external incentives had no greater influence on behavior than any other project incentive. Unfortunately, technical assistance was not controlled for, though this study suggests that this was one of the most helpful and desired aspects of the project. Findings also showed, to the extent that sample size limitations would allow, that length of involvement in the project made no difference to adoption rates. What is likely in this case, however, is a sense of habituality in the presence of silvopastoral practices in that respondents often remarked that it is now the new way that everyone is maintaining pastures. The comparison of project groups by length of involvement did suggest the presence of intrinsic biospheric values and norms in 2-year participants that continued to increase their provision of environmental services, even after payments had stopped. Finally, this study suggests that Group A (Control) participants were motivated by

intrinsic satisfactions to provide environmental services at the same rate as other groups (except B2 (PES + TA)).

In this study's analysis of the long-term effects of the RISEMP, virtually all landowners reported a continuation of at least some, if not most, of the silvopastoral practices implemented during the project. The implementation of new practices showed a different trend. Group A (Control) respondents reported the highest rate of implementing "many" new practices since the end of the RISEMP; 60% of Group A (Control) respondents reported continuing "many" new practices while the next highest reports were from Group C4 (PES) with 17%. The majority of the remaining project groups reported that they hadn't implemented any new practices since the end of the RISEMP.

In these findings, this study suggests that the provision of payments acted as an obstruction to the adoption of new practices by respondents after the project ended. Respondents expressed the belief that because they had been paid once to adopt practices, they should wait until payments came again. The relatively overwhelming response by Group A (Control) respondents that they have implemented "some" or "many" new practices since the end of the RISEMP supports this assertion. Group A (Control) respondents had always been financially responsible for the implementation of new practices and therefore were relatively unaffected by the RISEMP; they simply continued their lives as normal.

In the continuation of the long-term analysis, this study showed that levels of environmental consciousness did not appear to vary among project groups at the time of this study, a finding that has many behavioral implications. While it is impossible to

measure trends in environmental consciousness over time, it is unlikely that all project and payment groups achieved equivalent levels of environmental consciousness without subjective influences and the intrinsic motivation of maintaining a community. This study suggests that positive external incentives were no more effective at changing respondents' level of environmental consciousness than any other project incentive; interviews with respondents suggested that technical assistance and the physical resources were more crucial in affecting the adoption of silvopastoral practices.

This study suggests that in places, such as Esparza, Costa Rica, where the following conditions are met, payments may not be necessary to incentivizing the adoption of silvopastoral practices:

1. There are relatively high standards of living, economically, socially, and environmentally
2. There exists a national rhetoric of environmental conservation, payments for environmental services, and agroforestry
3. There was a previous, positive, and observable exposure to silvopastoral practices
4. Silvopastoral practices return direct benefits to landowners in addition to indirect global benefits
5. There exist relatively high levels of degradation such that the first practices adopted are relatively less labor intensive
6. There is a respected and active agency and/or source of trusted information

White et al. (2001) extend upon these conditions by citing the fact that Costa Rica has relatively high land costs, which forces farmers to intensify their land, rather than simply expand, and therefore makes them more likely to seek the profitable benefits of silvopastoral systems.

The connections between project outcomes and behavioral theory discussed in this chapter suggest that respondents were not the money-maximizing “rational” economic actors that are assumed in the strictly economic theory of PES. In fact, the provision of payments as extra income seemed to have no greater effect on conservation behavior during the project than any other incentive or non-incentive. Similarly, positive external incentives didn’t prove to play a significant role in “acting people into thinking,” as proposed by Geller (2002) and Agrawal (2005). The similar achievement of Group A (Control) suggests that intrinsic motivations were more influential in motivating conservation behavior, in the case of Esparza, something attributable to the context in which the project took place.

This study tends to support the FAO’s claim that the main barriers to adoption to silvopastoral systems are the lack of knowledge and investment capital. As shown in this study, respondents in the Esparza watershed expressed satisfaction with silvopastoral practices and interest in implementing new ones, but cited the investment capital necessary as a barrier. This study doesn’t suggest that positive incentives have no role in helping farmers implement silvopastoral practices, simply that positive incentives in the form of payments as extra income were unnecessary and limiting to the establishment of new practices in the case of Esparza. Operationalizing the strongest positive external incentive as payments as extra income is an extremely limiting approach to motivating behavior change. Indeed, this study suggests that positive external incentives in the form of investment capital and physical assets were more important in Esparza, Costa Rica.

On a larger scale, although this study deals specifically with landowners in the Esparza watershed, it does highlight a key question about the theory of PES. In the strictly economic system of environmental services, the provision of services would follow market rules of supply and demand, and nothing would be supplied without demand. In the specific case of Esparza under these theoretical market rules, Group A (Control) would not have increased the provision of environmental services on their land because they were not being compensated for it. Thus, the theory of PES assumes that individuals will only engage in a conservation behavior if they are paid. This study suggests instead that non-economic motivations may be far more important, and that payments should be carefully targeted to address needed investment costs, instead of creating expectations for on-going payments.

This study of the RISEMP showed that there needs to be more emphasis placed in the analysis of individual level behavior for two reasons. First, individual behavior analysis allows a measure of the extent to which a biospheric value system is established so that practices become internalized and therefore have carry over effects. If individuals engage in a particular behavior because they align with the values of that behavior, they are more likely to engage other behaviors that they associate with the same value system. Second, individual analyses help to buffer against the risk of additionality, or paying individuals to adopt a behavior when payments were not required, since the individual would have adopted the practice with or without payments.

New dimensions to consider in the case of Esparza include the role of gender, socio-economic status, and non-titled landowners. The overwhelming majority of RISEMP participants and the respondents of this study were male for two main reasons:

most property is titled in the name of the male; and even in cases in which the woman was titled, she had not been the main implementer of silvopastoral practices during the RISEMP. This study did not deal directly with the socio-economic status of landowners, though smaller landholdings tend to mean smaller incomes; however, it is important to address the effects of the RISEMP on different socio-economic classes. Relatedly, a community wide analysis of the Esparza watershed would help to establish larger sample sizes and run more statistically significant tests of the effects of the RISEMP against those who have no affiliation with the project. Another area of future study involves the analysis of the presence or absence of spill-over effects of the conservation behavior defined as silvopastoral practices; that is, does the increased practice of this particular conservation behavior lead to an increase in the adoption of other practices?

APPENDIX A
QUESTIONNAIRE FOR GROUPS B AND C

* Questions developed and incorporated after arrival and initial interviews. Not all respondents answered.

Questions that were open-ended and respondents were asked to elaborate and explain.

Note: Answers listed were answers suggested to participants. Actual answers received were noted and categorized; this process is discussed in Data Preparation.

1. How many hectares do you own?
2. Is this value more or less than before the project?
3. How many cattle do you own?
4. Is this more or less than before the project?
5. Do you consider your land-use before the project healthy or unhealthy for the well-being of the environment?#

Very unhealthy

Unhealthy

Neither healthy nor unhealthy

Healthy

Very Healthy

6. How long did you participate in the project?

7. What motivated you to participate?#

Payments

Conservation

Benefits for my animals

All of my neighbors participated

Personal satisfaction

Technical assistance

Other

8. Do you know your neighbors?

9. Did your neighbors participate in the project?#

None

Some

Many

10. Have you talked about the project with your neighbors?#

11. How often do you and your neighbors share information and advice?#

Frequently

Sometimes

Rarely

Never

12. Are the land practices of yourself and your neighbor similar?#

Very similar

Somewhat similar

Hardly similar

Completely different

13. If there hadn't been technical assistance, would you still have participated?#

14. When you decided to join the project, how many obstacles were there for you and your family?#

Many

Some

Hardly Any

None

15. Do you believe that the project has improved your life?#

A lot

A little

Very little

Not at all

16. Do you believe that what you did during the project has improved the life of your cattle?#

A lot

A little

Very little

Not at all

17. Do you believe that what you did during the project has improved the future of the community?#

A lot

A little

Very little

Not at all

18. Do you believe that what you did during the project has improved the well-being of the environment?#

A lot

A little

Very little

Not at all

19. Have you continued the practices?#

Yes, all of them

Yes, most of them

Yes, some of them

No, not many

No, none

20. Since the end of the project, have you started new practices or simply maintained those of the project?# *

Yes, many

Yes, some

No, none

21. Are you able to do all of the conservation practices that you think that you should?#

Yes, all of them

Yes, the majority of them

Yes, only some

No, hardly any

No, None

22. Have you participated in other payments for environmental services programs?#

23. Have you participated in other MAG projects?# *

24. To you, how important is the well-being of the environment?

Very important

Important

Slightly important

Not important

25. How important do you think conservation is to the community?

Very important

Important

Slightly important

Not important

26. How important do you think conservation is to the country?

Very important

Important

Slightly important

Not important

APPENDIX B
QUESTIONNAIRE FOR GROUP A

* Questions developed and incorporated after arrival and initial interviews. Not all respondents answered.

Questions that were open-ended and respondents were asked to elaborate and explain.

Note: Answers listed were answers suggested to participants. Actual answers received were noted and categorized; this process is discussed in Data Preparation.

1. Why didn't you participate in one of the payment groups of the project?#
2. Did you want to participate in one of the groups that received payments?#
3. Right now, do you do any of the practices from the project?#
4. How long have you done these practices?# *
5. Do you consider your land-use healthy or unhealthy for the well-being of the environment?
6. Do believe that the practices have improved your life? #

A lot

A little

Very little

Not at all

7. Do you believe that the practices have improved the life of your cattle? #

A lot

A little

Very little

Not at all

8. Do you believe that the practices have improved the well-being of the environment? #
- A lot
 - A little
 - Very little
 - Not at all
9. To you, how important is the well-being of the environment? #
- Very important
 - Important
 - Slightly important
 - Not important
10. How important do you think conservation is to the community? #
- Very important
 - Important
 - Slightly important
 - Not important
11. How important do you think conservation is to the country? #
- Very important
 - Important
 - Slightly important
 - Not important
12. Are you able to do all of the conservation practices that you think that you should?#
- Yes, all of them
 - Yes, the majority of them

Yes, only some

No, hardly any

No, None

13. Have you participated in other payments for environmental services programs?#

14. Do you know your neighbors?

15. Did your neighbors participate in the project?#

None

Some

Many

16. How often do you and your neighbors share information and advice?#

Frequently

Sometimes

Rarely

Never

17. Are the land practices of yourself and your neighbor similar?#

Very similar

Somewhat similar

Hardly similar

Completely different

18. Since the end of the project, have you started additional practices or simply maintained those that you had or did during the project? #

REFERENCES

- Agrawal, A. (2005). Environmentalism: Community, intimate government, and the making of environmental subjects in Kumaon, India. *Current Anthropology*, 46(2), 161-190. Retrieved from <http://www.umich.edu/~ifri/Publications/R051-9.pdf>
- Arriagada, R.A., Sills, E.O., Pattanayak, S.K., & Ferraro, P.J. (2009). Combining qualitative and quantitative methods to evaluate participation in Costa Rica's program of payments for environmental services. *Journal of Sustainable Forestry*, 28(3), 343-367. doi 10.1080/10549810802701192
- Azjen, I. (1981). From Intentions to Actions: A Theory of Planned Behavior. In J. Kuhl and J. Beckman (Eds.), *Action-control: From Cognition to Behavior*. Heidelberg: Springer.
- Center for Research on Environmental Decisions (CRED). (2009). The Psychology of Climate Change Communication: A Guide for Scientists, Journalists, Educators, Political Aides, and the Interested Public. Retrieved from http://guide.cred.columbia.edu/pdfs/CREDguide_full-res.pdf
- Central Intelligence Agency (CIA) WorldFactbook. (2013). "Costa Rica." Retrieved from <https://www.cia.gov/library/publications/the-world-factbook/geos/cs.html>
- De Young, R. (2000). Expanding and evaluating motives for environmentally responsible behavior. *Journal of Social Issues*, 56(3), 509-526. doi 10.1111/0022-4537.00181
- Evans, S. (1999). *The Green Republic*. Austin, Texas: University of Texas Press.
- Food and Agriculture Organization (FAO). (2005). Livestock Policy Brief 03. Retrieved from <http://www.fao.org>.
- Geller, E.S. (2002). The Challenge of Increasing Proenvironment Behavior. In R.B. Bechtel and A. Churchman, *Handbook of Environmental Psychology*. New York: John Wiley & Sons Inc.
- Global Environment Facility (GEF) Evaluation Office. (August 2009). *Assessing the potential for experimental evaluation of intervention effects: The case of the Regional Integrated Approaches to Ecosystem Management Project (RISEMP)*. Impact Evaluation Information Document No. 15. Retrieved from http://www.thegef.org/gef/sites/thegef.org/files/documents/Impact_Eval_Infodoc15.pdf
- Indexmundi.com. (2013). "Beef Daily Price." Retrieved from <http://www.indexmundi.com/commodities/?commodity=beef&months=120>

- Inglehart, R. (1981). Post-Materialism in an Environment of Insecurity. *American Political Science Association* 75 (4), pp. 880-900. Retrieved from <http://www.jstor.org/stable/1962290>.
- Kaimowitz, D. (1996). Livestock and deforestation in Central America in the 1980s and 1990s: A policy perspective. Center for International Forestry Research. Retrieved from http://www.cifor.org/publications/pdf_files/SPubs/SP-LStock-n.pdf.
- Kilbert, C., Monroe, M., Peterson, A., Plate, R., & Thiele, L. (2012). "Improving our thinking about sustainability." In *Working toward Sustainability: Ethical Decision Making in a technological world*, pp 209-222. New York: John Wiley & Sons.
- Matthews, J.A. & Herbert, D.T. (2008). *Geography: A very short introduction*. New York: Oxford University Press.
- Millennium Ecosystem Assessment. (2005). *Ecosystems and human well-being: Synthesis*. World Resources Institute. Washington D.C.: Island Press.
- Ministry of Livestock and Agriculture (MAG). (2007). *Caracterización de la Agrocadena de Carne Bovina*. Retrieved from <http://www.mag.go.cr/bibliotecavirtual/a00050.pdf>
- Ministry of Livestock and Agriculture (MAG). (2013). "Dirección Regional Pacífico Central: Esparza, Puntarenas." Retrieved from <http://www.mag.go.cr/regionales/pacificocentral.html>
- Nair, P.K. (1993). *Introduction to Agroforestry*. Dordrecht, the Netherlands: Kluwer Academic Publishers in cooperation with the International Centre for Research in Agroforestry.
- Nationsonline.org. (2013). "Political Map of Costa Rica." Retrieved from http://www.nationsonline.org/oneworld/costa_rica.htm
- Pagiola, S., Agostini, P., Gobbi, J., de Haan, C., Ibrahim, M., Murgueitio, E., Ramírez, E., et.al. (2004). Paying for biodiversity conservation services in agricultural landscapes. *Environment Department Papers: Environment Economics Series*, 96. Retrieved from <ftp://ftp.fao.org/docrep/nonfao/lead/x6154e/x6154e00.pdf>
- Pagiola, S., Arcenas, A., & Platais, G. (2005). Can payments for environmental services help reduce poverty?: An exploration of the issues and the evidence to date from Latin America. *World Development*, 33 (2), 237 – 253. doi 10.1016/j.worlddev.2004.07.011
- Pagiola, S., Rios, A., & Arcenas, A. (2007). Can the poor participate in Payments for Environmental Services?: Lessons from the Silvopastoral Project in Nicaragua. *The World Bank*. Retrieved from <http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/ENVIRONMENT/EXTEE>

I/O,
,contentMDK:21648051~isCURL:Y~menuPK:1187844~pagePK:210058~piPK:210062~theSitePK:408050,00.html

- Porras, I. (2010). Fair and green? Social impacts of payments for environmental services in Costa Rica. *International Institute for Environment and Development*.
- Rojas, M. & Aylward, B. (2003). What are we learning from experiences with markets for environmental services in Costa Rica: A review and critique of the literature. *Environmental Economics Programme*. Retrieved from [http://www.ecosystemeconomics.com/Resources_files/Rojas%20%26%20Aylward%20\(2003\)%20CR%20Markets%20for%20Env%20Services.pdf](http://www.ecosystemeconomics.com/Resources_files/Rojas%20%26%20Aylward%20(2003)%20CR%20Markets%20for%20Env%20Services.pdf)
- Stern, P.C. (2000). Toward a coherent theory of environmentally significant behavior. *Journal of Social Issues*, 56(3), 407-424. doi 10.1111/0022-4537.00175
- Schultz, P.W. (2002). Knowledge, information, and household recycling: Examining the knowledge-deficit model of behavior change. In T. Dietz and P.C. Stern (Eds), *New Tools for Environmental Protection: Education, Information, and Voluntary Measures*. Washington DC: National Research Council.
- United Nations Development Program (UNDP). (2013). "Country Profile: Costa Rica." Retrieved from <http://data.un.org/CountryProfile.aspx?crName=COSTA%20RICA>.
- White, D., Holmann, S.F., Reategui, K., and Lascano, C. (2001). Will intensifying pasture management in Latin America protect forests – or is it the other way round? In CIFOR's *Agricultural Technologies and Tropical Deforestation*. Retrieved from http://www.cifor.org/publications/pdf_files/Books/BAngelsen0101E0.pdf
- World Bank. (2013). "Costa Rica at a Glance." Retrieved from http://devdata.worldbank.org/AAG/cr_aag.pdf
- Wunder, S. (2005). Payments for environmental services: Some nuts and bolts. *Center for International Forestry Research*, 42. Retrieved from <http://www.cifor.org/online-library/search/sitewide-search/search/Payments%20for%20environmental%20services/gsearch/Payments%20for%20environmental%20services.html?searchtype=normal>

BIOGRAPHICAL SKETCH

Korey Force is the third of four daughters born to Stan and Letty Force. While Force's family moved several times during her childhood, she spent the majority of her life in the state of Michigan. In 2007, she graduated from Quincy High School as valedictorian, and the same year entered Saginaw Valley State University, Michigan. While at Saginaw Valley, Force traveled to Costa Rica, the Dominican Republic, and Mexico for university studies, volunteer initiatives, and grant-supported research. In 2010, she was selected as one of the fellows of the university's Roberts Fellowship program, traveling to China, Taiwan, and Japan. Force graduated magna cum laude with a Bachelor of Arts in Spanish and international studies in 2011 from Saginaw Valley.

In 2011, Force entered the Master of Arts in Latin American studies program at the University of Florida, choosing a tropical conservation and development concentration. At the University of Florida, she was active in the service committee of the Tropical Conservation and Development student group and the Student Association of Latin American Studies, serving as the president from 2012 to 2013. She conducted the field research for her master's thesis in Esparza, Costa Rica in the summer of 2012. Force graduated with her Master of Arts in Latin American studies in May 2013.