

NEIGHBOURHOOD EFFECTS OF PAYMENTS FOR ENVIRONMENTAL SERVICES

CASE STUDY IN THE SARAPIQUÍ REGION,
HEREDIA PROVINCE, COSTA RICA

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Declaration

I, Julian Valentin Michel, declare that this thesis is a result of my research investigations and findings. Sources of information other than my own have been acknowledged and a reference list has been appended. This work has not been previously submitted to any other university for award of any type of academic degree.

Signature:

A handwritten signature in blue ink, appearing to read 'Julian Michel', with a stylized flourish at the end.

Date: *13. December 2012*

Payments for Environmental Services

Payments for environmental services - short, PES - are defined as “1) a voluntary transaction in which (2) a well-defined environmental service (or a land use likely to secure that service) (3) is ‘bought’ by a (minimum of one) buyer (4) from a (minimum of one) provider (5) if and only if the provider continuously secures the provision of the service (conditionality)” [Wunder, 2006, p.50]. The definition given by Wunder is the most widely cited one throughout the literature, even though he is well aware that criteria are stylised and PES schemes constantly fail to meet all criteria, for example through intermediate government interventions, a lack of well-functioning monitoring systems and/ or ill-defined environmental services. The definition given serves more as a ‘theoretical reference point’ [Vatn, 2010], assisting in the analysis of to what degree a certain PES scheme suffices the theoretical description.

Since the publication of ‘The Economics of Ecosystem Services and Biodiversity’ (TEEB) study, the debate over quantitative and monetary assessment methods of ecosystem services has gained public and political attention, going beyond the purely academic sphere which discovered the topic years before [Loft and Lux, 2010]. Costa Rica is considered an ‘early mover’ in the field, a country which laid the foundation for monetary compensation for ecosystem service provision as early as 1996 through the establishment of the Forest Law No. 7575, emerging out of heated discussions between various civil society and governmental bodies [Porrás et al., 2006]. In chapter one, article 3, paragraph k, the Forest Law recognises four environmental services: i) Mitigation of greenhouse gases (fixation, reduction, sequestration, storage and absorption), ii) water protection for urban, rural or hydroelectric usage, iii) biodiversity protection for conservation and sustainable, scientific and pharmaceutical usage, iv) ecosystem protection and protection of landscape beauty for touristic and scientific ends. Instead of a polluter-pays principle, which is commonly implemented by means of command-and-control approaches, PES is based on the rational of beneficiary-pays [Engel et al., 2009] and is “conceptualized as a non-compulsory, negotiated framework” [Wunder, 2006, p.50]. These characteristics find their economic justification in the Coase theorem. The theorem, written in 1960, states that market participants can overcome problems caused by external effects through bargaining or voluntary market-like transactions, given that transaction costs are low and well defined property rights are in place. Under these conditions, the market secures the efficient distribution of resources and external effects are thus internalised. However, and as already stated above, government interventions as well as constantly found high transaction costs in PES schemes cast doubt upon the fulfilment of the Coasian pre-conditions (cf. Vatn (2010), Porrás (2010)).

The focus of this study will be placed on answering the research questions and outlining the various theoretical considerations leading to the formulation of these. A broad description of the different aspects circling around the Costa Rican payments for environmental service schemes will not be given, as they have frequently been documented by other authors. For a comprehensive overview of the PES programme in Costa Rica, see Camacho et al. (2000), Porras et al. (2006), Wünsch et al. (2008) Daniels et al. (2010) or, for the most recent and comprehensive overview of lessons learnt over the last 20 years in the field of PES in Costa Rica, consult Porras et al. (2012). For studies undertaken on more specific aspects of PES, such as the question of the programme's impact, see Sierra and Russman (2006), Sills et al. (2006), Sánchez-Azofeifa et al. (2007) or Pfaff et. al (2008). For the literature on potential trade-offs between conservation and poverty alleviation goals, constituting another block frequently discussed with reference to PES, refer to Pagiola et al. (2002), Pagiola et al. (2005), Zbinden and Lee (2005) or Engel and Palmer (2008).

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1 Introduction

1.1 Introduction

Pursuing a quantitative approach, the aim of this study is to assess ex-post impacts of payment for environmental service (PES) schemes in the region of Sarapiquí, Heredia Province, Costa Rica. As unit of analysis, focus is placed on immediate neighbours to PES areas to elicit spatio-temporal effects that the existence of a scheme may cause on its surrounding environment. Therefore, this study is concerned with neighbourhood-effects of payment for environmental services, i.e. analysing the influences PES schemes exert beyond their demarcated areas over the surrounding environment (spill-over effects), and understanding from this neighbourhood-perspective the effects and reactions that are being triggered. The different notions inherent in the term ‘neighbourhood’ will be picked up by using a narrow definition of geographical neighbourhood on the one hand and a broader definition of neighbourhood dimension on the other. Furthermore, the study will draw on the economic as well as on the social psychology literature and theoretical concepts will include Self-Determination Theory, Cognitive Evaluation Theory and Equity Theory. The research design will rely mainly on quantitative survey methods with emphasis on Likert Scales (attitude measurements).

1.2 Purpose

Research is needed to identify what kind of influence the existence of a PES scheme in the geographical neighbourhood or the receipt of information regarding PES out of familiar and non-familiar information channels exercises over its surrounding environment. Generally, studies focus a) directly on the target group of PES schemes, assessing for example income/poverty affects¹, b) on overall PES participation, analysing profile differences between participants vs. non-participants², c) on the question of additionality³ or d) on leakage⁴. Potential spill-over effects have seldomly been assessed as the vast majority of studies focus either on direct PES payment receivers or on potential PES providers. The latter mentioned studies on leakage/slippage comprise an exception, as these frequently draw buffer zones around PES contracts (cf. [Alix-Garcia et al., 2010]) and control for displacement effects in the neighbouring area (e.g. increased/decreased deforestation). The lack of analysis on the non-targeted population who could still be affected by PES through neighbourhood effects might be explained through applied pre-matching methods in PES impact evaluation studies, which generally pre-screen non-participants for PES eligibility criteria (so called ‘potential providers’) before comparing them to PES participants, thus

¹[Pagiola et al., 2002, Pagiola et al., 2005, Zbinden and Lee, 2005, Engel and Palmer, 2008].

²[Ortiz Malavasi et al., 2003, Miranda et al., 2003, Zbinden and Lee, 2005, Arriagada et al., 2009].

³[Sierra and Russman, 2006, Sánchez-Azofeifa et al., 2007, Pfaff et al., 2008, Wunder et al., 2008].

⁴[Murray et al., 2004, Sohngen and Brown, 2004].

pre-set characteristics of study participants are favoured over distinct selection criteria, such as neighbourhood vicinity for instance. By shifting the focus and placing emphasis on these neighbourhood effects, the purpose of this case study is to explore potential spatio-temporal effects triggered due to vicinity to a PES area on the one side and effects being triggered due to the receipt of information regarding PES out of the broader neighbourhood dimension on the other. Findings will be relevant to increase the effectiveness of the PES policy instrument by fully realizing its unintended co-effects, investigating on the one hand effects that PES schemes cause over its surrounding neighbourhood (e.g. raise of fairness concerns) and on the other hand studying potential reactions to the newly introduced effects (e.g. in form of motivational adjustments).

1.3 Rationale

Decision making never takes place in a completely individualistic, mutually independent or uncoordinated way. As Wilson (1997, p.73) highlights, the “analysis of dynamics within a farm district shifts the onus away from the assumption that farmers are autonomous actors, and acknowledges that in reality decisions are made in more complex and dynamic ways” (see also [Skerratt, 1994, Morris and Potter, 1995]). Thus, the existence of a PES scheme might, through the informational environment, stimulate information seeking behaviour in the surrounding population or shape perceptions over the whole scheme (usefulness); might change motivations towards the environment due to crowding-out of intrinsic motivations, due to an increased view on the environment as a commodity or due to fairness concerns; might influence attitudes towards the enforcement of environmental laws, towards views on the importance of forest conservation or towards perceptions over deforestation bans of person’s living close to the implementation area. In general, understanding factors such as neighbourhood effects is particularly relevant as they can influence the creation of local patterns of uptake. Especially for effective delivery and safeguarding of ecosystem services, these spatial clusters of uptake are important ingredients as environmental benefits normally take effect not on field scale or farm-level scale, but on landscape scale.

1.4 Research Questions and Hypotheses

The aim of this study is to assess ex-post neighbourhood-effects of payments for environmental services, i.e. to analyse the influences PES schemes exert beyond their demarcated areas over the surrounding environment (spill-over effects), and understanding from this neighbourhood-perspective the effects and reactions (modified perceptions, motivational adjustments etc.) that are being triggered. The different notions inherent in the term ‘neighbourhood’ will be picked up by using a narrow definition of geographical neighbourhood on the one hand and a broader definition of neighbourhood dimension on the other.

Applying quantitative survey methods, effects will be measured in terms of ‘changes’, ‘correlations’ and ‘differences’ (see part ‘research method’ for further explanation), relying mainly on 5-point Likert Scales (attitude measurements). Furthermore, open questions will complement the questionnaire, encouraging study participants to express their opinion in a more unstructured way, providing a second source to interpret quantitative findings. The unit of analysis will be the individual.

The first part of the research question investigates the general knowledge about PES, if neighbourhood effects can generally be identified and what perceptions people living close to a PES contract hold over certain parts of PES or the environment in general.

- How many people who receive/have received PES payments interviewees generally know?
- What are the main channels through which people hear and receive their information about PES?
- Are interviewees aware that a PES contract exists in the distance of maximum of 500m from their homes?
- Have interviewees who know PES ever spoken about the programme with their neighbours living at a distance of maximum of 500m?
- In which of the following areas are we able to identify the existence of neighbourhood effects⁵? Which of these areas demonstrate being significantly impacted by the introduction of a PES scheme close-by? Which areas demonstrate the least impact?
 - Changes in information seeking behaviour.
 - Changes in views over nature’s commodification and changes in motivations towards environmental goals.
 - Changes in views concerning the enforcement of environmental laws.
- Which perceptions do people located in the distance of maximum of 500m to a PES site hold over PES with reference to its usefulness?
- How do people located close to a PES site view the deforestation ban imposed by the Forest Law and the chances for illegal logging on private Fincas?
- How do people located close to PES site perceive the fairness of their neighbours receiving PES, even though their land is already under a deforestation ban by the Forest Law?

The second part of the research question investigates how identified neighbourhood effects can be explained, looking at relationships between variables on the one side and theories and their proposed effect-channels on the other. To this end, hypotheses will be tested.

⁵Note that a detailed description of the term ‘neighbourhood’ as well as of what the term encompasses will be given in chapter five

- Low motivations towards the environment are negatively correlated with self-reported negative motivational effects concerning the environment due to the introduction of a PES scheme close-by.
- Views on nature's commodification are correlated with self-reported negative motivational effects concerning the environment due to the introduction of a PES scheme close-by.
- Fairness concerns with reference to the neighbour who receives PES are negatively correlated with self-reported negative motivational effects concerning the environment due to introduction of a PES scheme close-by.
- Neighbourhood effects increase with the time of being located next to a PES site.
- Is the assessment of neighbourhood effects conducive to geographical analysis?

1.5 Thesis outline

In the following, chapter two will briefly introduce the case study's research location. After outlining summary statistics on Costa Rica in general, the focus will subsequently be narrowed down to the canton level where this study was undertaken by shortly describing Heredia (provincial level) as well as Sarapiquí (cantonal level). Chapter three will discuss relevant research conducted on the topic of PES, exploring specifications of neighbourhood effects as well as highlighting approaches undertaken in different studies. This will be a vital element to specify where the present research fits in.

Chapter four will built upon chapter three, picking up discussed effects and presenting a model for analysis. Chapter five will describe the methodology and the data collection method. At first, key terms and concepts will be explained, followed by a broad section focusing on the sampling process, as sampling criteria and thus site and household selection influenced the characteristics of the obtained sample. At the end of the chapter, the questionnaire as well as pre-test modifications will be outlined.

Chapter six pursues the objective to illustrate results. In a first step, the obtained sample will be described in more detail and, where feasible, compared to overall Costa Rican population statistics to gain an impression of the socio-economic composition of the sample. Then, questions belonging to part one of the formulated research questions will be assessed, followed by the analysis of questions belonging to part two.

Chapter seven will summarise conclusions, succeeded by chapter eight listing recommendations. Finally, Appendix I shows t-Test statistics for some selected variables in more detail, whereas Appendix II illustrates the English version of the questionnaire employed in this study.

2 Case-study site

The aim of this chapter is to briefly introduce this case study’s research location. After some summary statistics on Costa Rica in general, the focus will subsequently be narrowed down to the cantonal level where this study was undertaken by shortly describing Heredia (provincial level) as well as Sarapiquí (cantonal level). Fonafifo explicitly recommended the canton of Sarapiquí as research site, together with the region of San Carlos, when confronted with the research proposal. As the project PESILA-REDD⁶ is planning to carry out farmer surveys in Sarapiquí as basis for an impact evaluation of PES where also neighbourhood effects are addressed, it was decided to conduct interviews in Sarapiquí, so that thesis results could directly gain practical relevance by flowing into this project.

2.1 Costa Rica

With a total area of 51,100km², the Republic of Costa Rica is quite a small country in Central America, bordering Nicaragua to the north and Panama to the south, having access to both the Atlantic (east) as well as to the Pacific Ocean (west). According to the most recent census, Costa Rica has a population of 4,3 million people [Census-CR, 2011] and a GDP based on purchasing-power-parity (PPP) per capita GDP of roughly 14,1TInt\$ [IMF-Stat, 2012], ranking top among Central American countries (see Figure 1), together with Panama where the Gini-coefficient is, with 0.52 (2006), slightly higher than Costa Rica’s 0.507 (2006) [WB, 2012]. The Happy Planet Index, an index trying to capture the

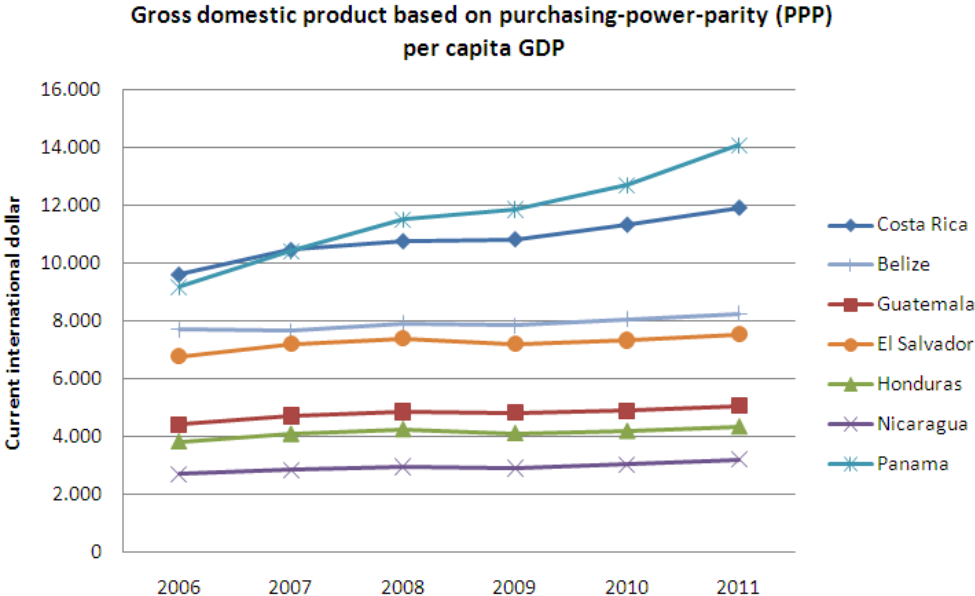


Figure 1: Latin American PPP GDP's in TInt\$, source: IMF-Stat (2012)

⁶Payments for Ecosystem Services in Latin America in the context of REDD: Integrating methods for evaluating the enabling conditions and cost-effectiveness of PES.



Figure 2: Map of Costa Rica. Squares: Heredia (province) and Sarapiquí (canton)

extent to which countries “deliver long, happy, sustainable lives for the people that live in them” by using data on life expectancy, experienced well-being and ecological footprints, ranks Costa Rica on top out of its 151 countries [Nef, 2012]. The human development index (HDI) published by UNDP, which uses a composite measure to evaluate three dimensions of human development, namely health, education and income, lists Costa Rica on position 69 out of 187 countries with a HDI of 0.744. This value is slightly higher than the average of the whole Latin American and the Caribbean region, which is given with 0.731 [HDI, 2011].

Overall, Costa Rica is a stable country compared to its neighbours and has no standing army, which was abolished in 1948. With more than two million international visitors in 2010, tourism is an important sector and contributed 5.5 percent to national GDP in 2010 [ICR, 2011]. An extensive network of national parks, biological reserves, forest reserves, wildlife refuges, protected areas etc. continues to attract foreign investments

the rest of the province, a decisive characteristic appear to be its inhabitants: Remembering that around 86 percent of Heredia’s population lives in urban areas, Sarapiquí only represents 2.7 percent of these. By contrast, 77 percent of Heredia’s total rural population is explained by Sarapiquí [Census-CR, 2011]. Thus, it becomes clear that this extensive canton is heavily dominated by rural areas.

Social Development Index To further characterise the Sarapiquí canton, it is useful to look at the Social Development Index (SDI), a tool developed by MIDEPLAN (Ministerio de Planificación Nacional y Política Económica) to evaluate the degree of development of the country’s various geographical zones. The index uses 11 indicators from four areas - education, political participation, health and economics - permitting to identify low-developed areas which can then be targeted more directly by government interventions [Mideplan, 2007]. Figure 5 displays the various indicators and shows the quartiles of the social development index for the canton as well as for the district level.

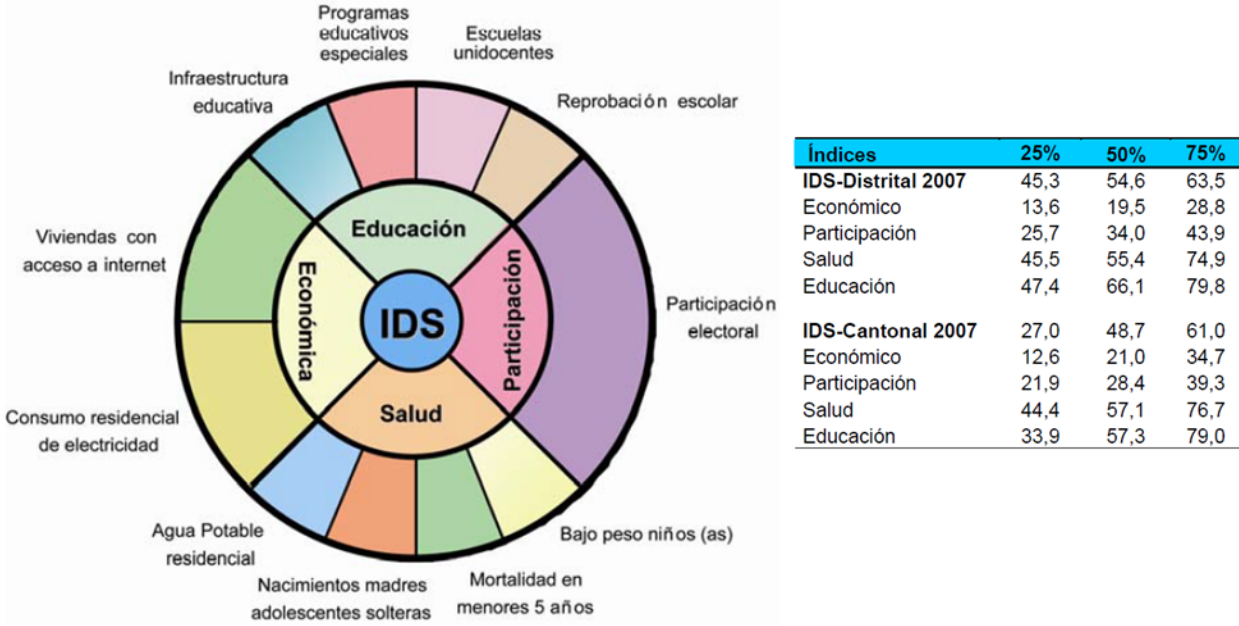


Figure 5: Composition and quartiles SDI, canton/district level, source: Mideplan (2007)

Looking at Sarapiquí in the whole, the SDI gives a value of 21.2, placing the canton clearly in the first and lowest category of all national cantons as the 25 percent quartile has a value 27.0 (national average). Therefore, Sarapiquí has a position of 68 out of the 81 analysed cantons in the statistics of MIDEPLAN, indicating that the area is lacking behind in terms of key socio-economic variables. MIDEPLAN’s data allow a more detailed breakdown to district level, where the distributional dimension can be assessed further. The two northern districts Llanuras del Gaspar (no. 41004, see Figure 6) and Cureña (no. 41005) represent one of the least developed areas in the whole country, ranking 465 and 465 respectively out of 469 national districts. Puerto Viejo (no. 41001), the place where

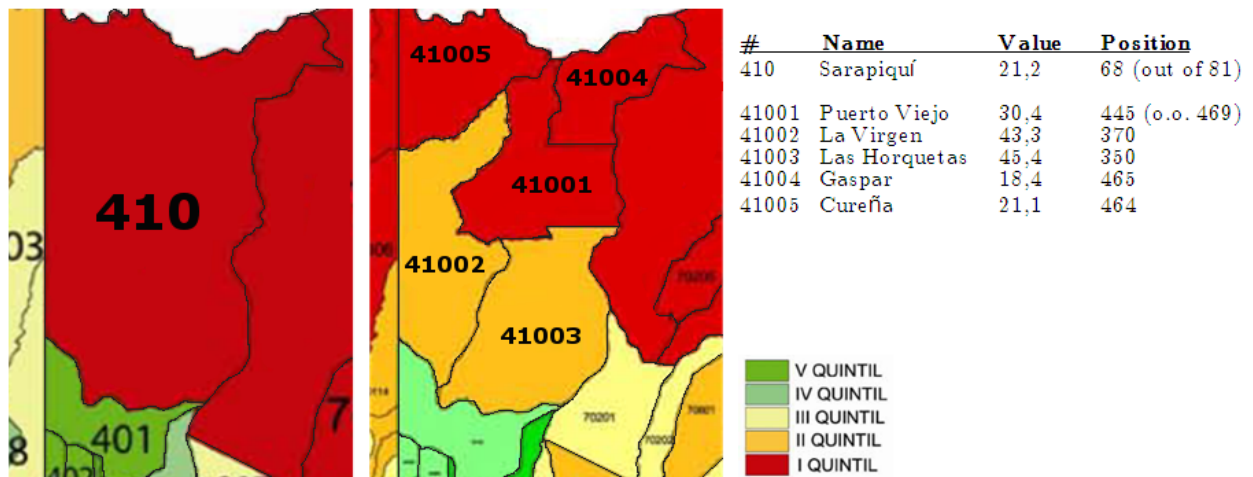


Figure 6: Canton and district SDI's Sarapiquí, source: Mideplan (2007)

the cantonal capital is located, ranks 445, thus it becomes clear that the research location belongs to one of the least developed parts in Costa Rica. With a SDI of 45.5, only Las Horquetas (no. 41003) to the south manages to cross the 45.3 threshold into the second quartile.

PES in Sarapiquí As Sarapiquí is sparsely populated and characterised by a rural, forest-rich landscape, it is here where the lion's share of payments for environmental services has been channelled into. Out of Heredia's total 548 PES contracts protecting 41,534ha, 500 contracts and almost 90 percent of total hectares are absorbed by Sarapiquí, thus the canton is heavily targeted by PES [Fonafifo, 2012]. The implications for the present research have to be kept in mind: Only the canton of San Carlos in the Alajuela province has, with 678, received more PES contracts than Sarapiquí. The similarly sized canton of Perez Zeledon in the San Jose province ranks fourth with 309 contracts and the canton of Nicoya in the Guanacaste province has received 352 contracts and ranks third, though being smaller in size. Thus, PES contracts are widespread in Sarapiquí, a fact that created difficulties at a later stage during site selection (problems related to this issue will further be elaborated on in the methodology chapter).

Since the inauguration of the programme, Sarapiquí's southern regions have received most contracts, above all La Virgen (no. 41002, see Figure 6), with 254 contracts protecting 18,249ha, followed by Puerto Viejo with 107 contracts protecting 7,914ha and Horquetas with 104 contracts protecting 7,523ha. The two northern districts Llanuras del Gaspar and Cureña account together for only 34 of all 500 contracts in Sarapiquí, protecting an area of 3,557ha or 9.5 percent of total hectares [Fonafifo, 2012]. Looking at the most common PES types, Fonafifo's data show that forest protection contracts rank top with 215 contracts, followed by the protection of wildlife refuges with 111 contracts, accounting together for around 81 percent of total hectares protected. As forest protection and

protection of wildlife refuges represented the most common PES contract types, it was decided to conduct interviews around areas which received PES payments for one of the two respective modalities. With this decision, a first criterion was established, narrowing down possibilities for site selection.

3 Literature review

In the following, research on the topic will be discussed by exploring specifications of neighbourhood effects as well as by highlighting approaches undertaken in different studies. This will be a vital element to identify where the present research fits in. In the literature, spatial effects that targeted conservation policies may cause on its surrounding, non-targeted environment are treated under the term spillover [Jaffe et al., 2005, Galdeano-Gómez et al., 2008, Blackman, 2012] which can be either positive or negative, implying beneficial or costly side effects. Depending on the definition of neighbourhood assumed, different channels have been outlined through which these effects work: In geographical neighbourhood definitions, distance is decisive [Robalino and Pfaff, 2011]; using political divisions, the whole unit is key (country, state, district etc.) [Grubb et al., 2002]; in market definitions, dependencies are crucial [Brock and Durlauf, 2001]; using a network definition, social selection criteria (belief, political conviction etc.) might be deciding [Parker and Van Alstyne, 2005]. This study will employ a narrow definition of geographical neighbourhood on the one hand (i.e. distance) and a broader definition of neighbourhood dimension encompassing neighbourly feelings and relations as of neighbours on the other (see 5.1, ‘Definition of neighbourhood’ for a detailed description).

3.1 Substitution and slippage effects

As already indicated in chapter one (‘Introduction’), substitution and slippage effects represent one of the few effects which focus on the immediate surrounding environment, thus comprising one set of studies dealing with neighbourhood effects in the literature. The former term describes the displacement of activities that should be prevented by a scheme (e.g. deforestation) to neighbouring areas [Blackman, 2012], reducing conservation efforts to a ‘zero-sum game’. Alix-Garcia et al. (2010), for example, test substitution effects by analysing an early cohort of payments for hydrological services in Mexico, assessing if enrolment of one parcel leads to increased deforestation on other parcels belonging to the same landholder. Using matched counterfactuals, empirical results indicate that the probability for substitution to occur increases with poverty levels, thus this effect was observable only for a certain group of people. Furthermore, areas with high poverty levels also demonstrated lower levels of programme impact, a result that the authors attribute to relaxed credit-constraints. Besides substitution effects, price slippage effects describe price increases in local markets due to reductions in, for example, timber, leading to increased production of these products in neighbouring areas [Blackman, 2012]. For this to occur, markets have either to be sufficiently localised and unable to pass on these changes to the entire national market or one has to make the assumption that protection is large across the country. Alix-Garcia et al. (2010) empirically test this effect within a 50km buffer zone, using road density to proxy for market access. Results illustrate that

a high degree of enrolment within the buffer zone is significantly related to changes in deforestation in all buffer zones, with results varying with road density. Nevertheless, the authors caution that the output price slippage test is not conclusive, “as it is possible that high enrolment of area in the program is correlated with some other unobserved characteristic of a region that also increases deforestation” [Alix-Garcia et al., 2010, p.30]. As substitution and slippage effects are already addressed in other studies, they will not be considered here, thus testing for them lies beyond the scope of this study.

3.2 Labour demand and NTFP

Pagiola et al. (2005) serve as another source where neighbourhood effects, i.e. effects which are felt by the surrounding population, have been identified. As Table 1 shows, they find that PES establishment can change labour demand through land use change, with the extent and direction of this effect depending on overall employment opportunities and the relationship between current and future PES labour demand. Referring to Costa Rica, PES programmes are targeted mostly at existing forests. Therefore, only minor changes can be expected, with negative labour effects seeming unlikely to occur as this would imply that the area would have been used for labour intensive agricultural purposes beforehand [Miranda et al., 2003]. A second potential impact on non-participants through the introduction of PES concerns access to non-timber forest products (NTFP), with the impact’s extent depending on availability of such products before and after programme establishment. Nevertheless, also this effect seems neglectable in the case of Costa Rica as PES programmes are implemented mostly not on communal but on private land, thus NTFP have not been accessible for third parties in the first place.

3.3 Participation factors

A promising first entry point to further identify neighbourhood effects is to gain a better understanding of the variables that affect the decision to participate in PES⁸. It is clear that these variables are somewhat different from variables measuring effects that are caused on the surrounding geographical environment due to results of a programme activity, as the general accessibility to the Costa Rican PES application pool for all people interested implies self-selection (only people fulfilling the basic requirements will apply. For a list of requirements, see text-box on the following page). Thus, participation factors might already imply some sort of eagerness of eligible individuals to gain funding, and it is unclear what motivates this eagerness and the desire to implement a PES area at a proposed location. Indeed, Kosoy et. al (2007) point towards substantial differences between participants and non-participants (potential providers) in PES schemes, with the

⁸[Ortiz Malavasi et al., 2003, Miranda et al., 2003, Zbinden and Lee, 2005, Grieg-Gran et al., 2005].

Farm workers	Change in labor demand (+/-)	<ul style="list-style-type: none"> • Relative labor needs for PES-promoted practices compared to current practices (+/-) • Other employment opportunities (+/-)
People dependent on NTFP collection	Change in availability and access to nontimber products (+/-)	<ul style="list-style-type: none"> • Nature of current and PES-promoted practices (+/-) • Local context

^a Hypothesized impacts: (+) positive impact: poverty reduction, or increased welfare of the poor; (-) negative impact: poverty increase, or reduced welfare of the poor; (+/-) uncertain impact: depends on case-specific circumstances.

Table 1: Non-participants affected by PES, source: Pagiola et al. (2005)

former accepting payments below opportunity costs and the latter “not [even being] willing to take part in the research, clearly being opposed to the PES scheme” (p.448, *ibid*), a finding which could possibly be explained through different motivations towards the environment (people inherently environmentally friendly or not). Nevertheless, participation factors give a valuable indication of what factors are shaping PES perceptions and which factors are crucial for further uptake. Therefore, one useful approach would be to elicit the views of neighbours on these already as decisive identified factors, analysing i) if and ii) in which ways these variables are affected through PES establishment in the nearby neighbourhood. Furthermore, we can check if the magnitude of these variables significantly vary (diminish/increase) with the time people being located close to PES sites, which could be taken as an indicator for temporal effects. Studies showed that positive perceptions and attitudes towards certain practises tended to promote participation within conservation programmes⁹, thus positive reactions of people to these neighbouring PES sites could generally be beneficial.

Landowners who wish to participate in the programme have to provide the following a) Application form to the regional MINAE office; b) Proof of identity or statutes of an organisation; c) Proof that they hold a legal title to the land. If applicant only have possession rights then other official requirements are necessary: proof of sale, three independent witnesses, description of the property and its limits, proof that there are no conflicts over the property, etc. All of these have to be publicly authorised by an official lawyer (*notario público*); d) Proof that they have paid local taxes; e) An official cadastral map of the property; f) Verification of the size of the area by a professional topographer; g) (Copy of) a cartographic map on a scale 1:50.000 to indicate location of the area; h) Legal authentication of representative; i) For sustainable forestry activities, a Forest Management Plan drafted by a professional forestry engineer and approved by the National Conservation Areas System (SINAC). Reforestation can only be financed after additional official approval by the Ministry of Agriculture; j) Priority areas for approving projects are selected every year through a decree. Source: Porras et al. (2006).

⁹See for example [Sheikh et al., 2003, Sidibe, 2005, Emden et al., 2008, Wei et al., 2009].

Brotherton’s approach Generally, two approaches to categorise factors affecting the decision to participate in environmental conservation schemes have been developed. Wilson (1997) draws on Brotherton’s (1989, 1991) classification into ‘scheme factors’ and ‘farmer factors’ (see Table 2), expanding his categories by adding variables such as ‘information environment’ [Thacher et al., 1996, Adesina and Chianu, 2002], ‘attitudes towards the environment’ [Mcdowell and Sparks, 1989, Morris and Potter, 1995] and ‘dynamics within the farm district’ [Wilson, 1992], stating that these are “neglected factors in the literature, possibly due to its ‘intangible’ nature” [Wilson, 1997, p.86]. However, his findings were very modest. Concerning the information environment and impact of available sources for information provision on participation, no results were reached. He later acknowledged that the disappointing result might “possibly suggest a weakness of the methodological approach adopted in this study” (ibid, p.87), thus he does not regard his added variables as unimportant. Indeed, Thacher et al. (1997), Adesina et al. (2000), Adesina and Chianu (2002) and Zbinden and Lee (2005) all demonstrated that access to information is positively related to uptake of conservation activities, Rigby et al. (2001) showed that uptake increased if a farmer had received information primarily from other farmers (interpersonal communication), Moss (1994) quantified this effect stating that 40 percent of farmers applied to an Environmental Service Area (ESA) scheme as soon as it was brought to their attention, a technical trip by IIED (International Institute for Environment and Development) to Costa Rica’s PES concluded as a main policy lesson that “information is key to spread participation” (Porrás et al., 2006, p.45), Arriagada et al. (2009) state

Scheme factors:

- voluntary nature
- payments
- scheme duration/length of interruption between renewal of schemes
- scheme logistics
 - information provided by ADAS
 - follow-up and monitoring
- severity of change in farm management required by scheme/flexibility of scheme

Farmer factors

- farmer characteristics
 - age
 - education
 - dependency on farm for income
 - length of residency
 - successor factor
- farm characteristics
 - farm size
 - amount of non-intensively used farmland
 - tenure
- information environment
- dynamics within the farm district
 - rate of neighbour participation
 - follow-the-leader mentality
 - spread of innovation
- (● attitude to the environment)

Table 2: Participation factors, source: Wilson (1997)

	Percent of respondents
Lack of information	66
Payment too low	9
Distrust system	2
Too complicated	15
Cannot pay for application	2

Table 3: Reasons for not enrolling land in PES, source: Arriagada et al. (2009)

that many of interviewed non-participants do not participate simply due to a lack of information about the programme and, vice versa, Van der Horst (2011) attributes low uptake of an ecosystem service provision scheme to negative local publicity, further emphasising the “high impact of localised information provision” (ibid, p.674). One interesting area of research is thus to take up these ‘neglected factors’ and analyse in more detail the information environment in the field of PES in Costa Rica, checking for instance if people are familiar with the PES programme, if they possess knowledge about it, further addressing issues related to access to information through the assessment of the different channels through which people hear and receive information about PES. Furthermore, local dynamics can be investigated by directly asking study participants if they have spoken with neighbours about the scheme, if they are aware that a property with PES is located next to their place of residence, or if and how they were influenced through the establishment of the PES site close-by. That questions regarding the information environment are highly important is further illustrated by Table 3, where ‘lack of information’ dominates the list naming reasons for non-participation (cf. [Arriagada et al., 2009]). This is followed by the view that the system is ‘too complicated’, they ‘distrust’ its functioning, application fees are viewed as too high or payments as being ‘too low’. Some points mentioned here will further be taken up in the study, for instance if people regard these programmes as useful or not or if they are of the opinion that through these programmes, the government and its agencies are now better able to enforce environmental laws.

3.4 Motivational theories

Arriagada et al. (2009), with reference to Pagiola et al. (2005), develop Brotherton’s approach further (see Figure 7), maintaining the division between scheme and farmer factors (here termed ‘household characteristics’) but grouping participation factors into three successive categories: Factors that affect eligibility to participate, factors that affect their desire to participate, and factors that affect their ability to participate. Whereas the first category depends on the programme’s targeting and thus cannot be influenced, desire points directly towards motivations.

Motivational theories, especially with reference to PES, can generally be built upon two

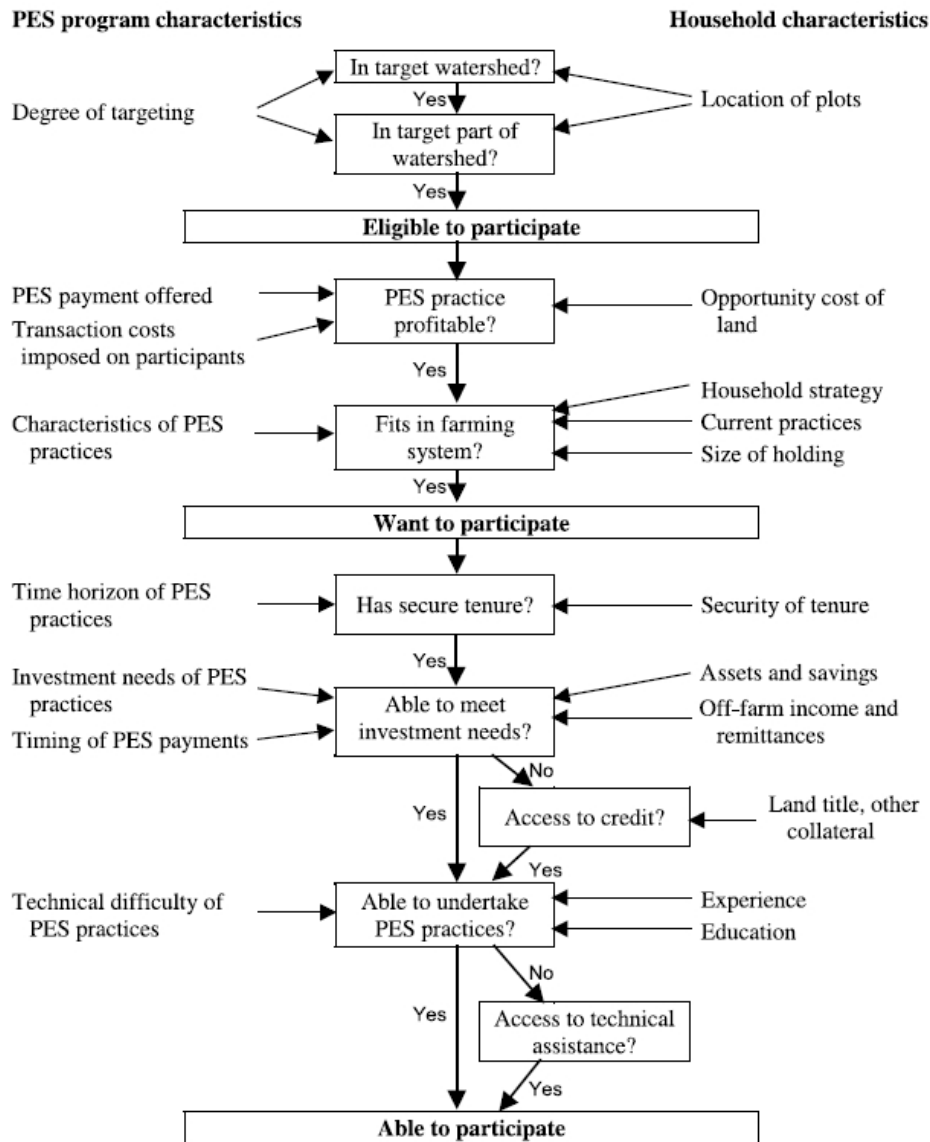


Figure 7: Factors influencing participation and non-particip., source: Pagiola et al. (2005)

stances. Standard economic theory regards individuals as self-contained with idiosyncratic pay-off functions, where effort is negatively linked to marginal utility [Fehr and Falk, 2002a]. A desired behaviour can be stimulated by offering contingent rewards, serving as ‘positive reinforcers’ by changing an individual’s utility calculus. Intrinsic motivation to carry out certain tasks which require effort (i.e. implying ‘costs’) and do not offer any reward can hardly be explained. Translating that to our case means that an individual’s desire to participate in a PES scheme can only be understood if and only if the prospect of this participation offers strictly more utility than abstaining from it. Strictly, as an equal utility level implies indifference, and this term is incompatible with desire.

Kosoy et. al (2007) demonstrate that economic explanations often fall short when attempting to justify phenomena within the field of PES. Analysing three PES schemes in

watersheds in Central America, they conclude that opportunity costs are strictly larger for enrolled landowners than the actual amounts received from the PES programme, thus contradicting not only neoclassical axioms but also the ‘economic foundation’ of PES itself. A theory which is able to explain such effects is described by the literature on social psychology, where on the one side intrinsic motivations can serve as an incentive to act and where, on the other side, rewards can impair performance and motivations, thus turning intended positive reinforcers into negative ones. Furthermore, ‘intangibles’ such as perceptions over distributional issues (e.g. fairness) or over ‘the right thing to do’ can trigger positive as well as negative motivational changes even if a person is just in the position of an observer/third person and thus not the direct target of an utility maximisation process [Benabou and Tirole, 2003].

Self-determination theory Trying to understand these puzzles makes it imperative to look more closely at motivational theories. This is a complex matter. The following paragraph will shortly describe basic considerations put forward in the literature - considerations which are necessary to build the basis to better understand the theory some analysed effects in this study rest upon, such as crowding-theory. Therefore, the next abstract should be understood as a road-paver.

The literature generally distinguishes between intrinsic and extrinsic motivations, where the afore mentioned stance-divide reappears (economic vs. social psychology literature). Deci (1971, p.105) defines that “one is said to be intrinsically motivated to perform an activity when one receives no apparent reward except the activity itself” (see also [Deci, 1975]), thus derived satisfaction suffices to act even in the absence of economic incentives [Frey and Oberholzer-Gee, 1997]. By contrast, extrinsic motivation is purely instrumental with incentives coming from ‘outside’ of an individual [Frey and Jegen, 2001, Villacorta et al., 2003], thus it can be regarded as means to achieve a certain end. Fehr and Falk (2002) count for example social approval [Rege and Telle, 2001] or reciprocity [Falk et al., 1999] in this category, emphasising that intrinsic motivation has to be task-specific/targeted and constituting an end in itself. Both motivational types have often been equated with ‘self-determination’ to describe intrinsic motivation, and ‘controlling’ or ‘autonomy enhancing events’ to describe extrinsic motivation, until Deci and Ryan (1985, 1991, 2000) formulated the Self Determination Theory (SDT), arguing that even though self-determination is per definition explained through intrinsic motivation, extrinsic motivation can also clearly be self-determined, meaning autonomously enforced behaviour as illustrated by the social approval/reciprocity example. “We argue that extrinsically motivated action can vary in its degree of self-determination, thus having either a relatively internal or a relatively external perceived locus of causality. Accordingly, any intentional action can be described using the perceived locus of causality continuum and thus can be

said to be more or less self-determined” [Deci and Ryan, 1991, p.250], where the continuum is described by six in self-determination decreasing motivational subtypes¹⁰.

Referring to SDT appears convenient as Pelletier et al. (1998) developed the Motivation Towards the Environment Scale (MTES) to be able to measure self-determination in the field of the environment. The scale proved satisfactory levels of reliability and validity (see *ibid*) and consists of 24 seven-point Likert-scale items, with four items each to reproduce exactly the categories of the SDT. In the research proposal, it was planned to include the MTES as the sample could have been easily described in terms of their motivation towards the environment. However, the idea had to be dropped after pre-testing the questionnaire (see 5.5, paragraph ‘Pre-test modifications’).

3.5 Crowding-out

Referring back to intrinsic motivation, a further issue studied in the social science literature concerns ‘crowding-out’ effects [Deci et al., 1999, Frey and Jegen, 2001], meaning that externally introduced rewards (mostly pecuniary) may erode/crowd out task-specific intrinsic motivation. Since PES work through monetary rewards, this effect represents an object of interest. One of the first studies on this effect go back to Titmuss (1970), who observed that paying for blood actually reduced total supply as the introduction of a price incentive undermined social behaviour, a result confirmed by Upton (1973) three years later. Many studies followed empirically validating the existence of such crowding-out effects¹¹, with Frey and Oberholzer-Gee (1997) finding for example that the acceptance rate for the construction of a nuclear waste repository close-by dropped from 50.8 percent to 24.6 percent when compensation was offered compared to when no reward was offered. The underlying reasons for the occurrence of this effect are either explained through Self-Perception Theory (SPT) [Bem, 1967, Bem, 1972] or Cognitive Evaluation Theory (CET) [Deci and Ryan, 1980, Deci and Ryan, 1985, Goudas et al., 1995], where the latter “assumes that people have a psychological need for self-determination” [Fehr and Falk, 2002b, p.37]. CET assumes that the level of self-determination depends on whether an event is perceived as ‘controlling’ (contingent rewards, evaluation, surveillance, deadlines etc.) or ‘autonomy enhancing’ (positive feedback, choice etc.), claiming that these effects either weaken or strengthen self-determination. As PES are contingent on compliance/delivery of services, one should expect crowding-out effects under CET, measured for example through correlation between task-specific motivations and self-reported negative motivational effects due to the introduction of a PES scheme close by.

¹⁰The categories are: Intrinsic motivation, integration, identification, introjection, external regulation, amotivation.

¹¹Cf. [Freeman, 1997, Ostmann, 1998, Gneezy and Rustichini, 2000a, Gneezy and Rustichini, 2000b, Frey and Jegen, 2001].

However, this study focuses on neighbourhood effects, i.e. interviewed participants do not receive any form of reward or payments, thus the present study does not follow the standard definition of crowding-out. This is important to keep in mind, as I use this more as an entry point and then translate the standard definition to a different scenario. Nevertheless, we might expect similar results as crowding-out relies partly on a psychological process named Impaired Self-Esteem (ISE). ISE is caused when “an intervention from outside carries the notion that the actor’s motivation is not acknowledged, his or her intrinsic motivation is effectively rejected. The person affected feels that his or her involvement and competence is not appreciated which debases its value...As a result of impaired self-esteem, individuals reduce effort” [Frey and Jegen, 2001]. With the neighbour being paid and oneself not, it appears reasonable to assume that such an effect of ‘own efforts not being acknowledged’ could still be triggered. In addition, study participants can be asked directly if their motivation to conserve the environment has increased or decreased as a result of whether they perceive that their attempts are appreciated or not.

3.6 Commodification of nature

Going back to the study undertaken by Kosoy et. al (2007) where payments were lower than opportunity costs in all three examined study sites, the literature also offers a second route. In an experimental study conducted in rural Colombia, Cardenas et al. (2000) examine the effects of externally imposed rules and regulations on behaviour and its implication for environmental quality. They find that with a government-imposed regulation, individuals are worse-off than without this top-down enforced action as they exhibit less ‘other regarding behaviour’, thus making more self-interested choices than group-oriented ones, with the result being lower environmental quality. Thus, the intended welfare improving effects were not just absent, they even worsened the situation. As a conclusion, the authors state that individuals “tend to strike a balance between self and group interests” (ibid, p.1719), and that the policy somewhat facilitated a switch towards Nash-equilibrium.

With the Institutions-as-Rationality-Contexts (IRC) hypothesis, Vatn (2009, 2010) provides a theory for explaining these effects. As already inherent in its name, IRC rests upon the assumption of plural rationalities, one social and one individualistic. Institutions, comprised of societal norms and rules, are viewed as solving the coordination problem of an individual of which rational to apply to a certain situation, thus signalling if group interests and cooperation is the name of the game or if purely egoistic motives should be pursued. A change in the logic of a situation through institutions can either be triggered through pecuniary incentives or, as Kosoy et al. (2007) explain, “through imposing a single language of valuation” (ibid, p.1232). Analysing PES, they criticise the

commodification process¹² of environmental services, which 1) disregards the complexity of national ecosystems, 2) imposes one single exchange-value and 3) hides ('masks') any social relations between 'producers' and 'users' of the services. Being able to analyse issues related to the notion of nature's commodification in the present research, it will be examined if views on nature's commodification are introduced through neighbourhood effects of PES, meaning that if people living close to PES sites regard environmental services now under a more 'economic lens', i.e. as source to derive financial gains from. Furthermore, it can be assessed whether views are correlated with motivational changes due to PES introduction.

3.7 Fairness concerns

One additional factor that affects motivation is fairness, with examples coming mostly out of the organisational literature [Colquitt et al., 2001, Hartmann, 2012]. To conceptualise fairness in the environmental field, it is useful to draw on Environmental Justice Theory (EJT), which generally separated between distributive on the one and procedural justice on the other hand [Ikeme, 2003, Walker, 2010]. Fairness is frequently interchangeably used with distributive justice [Johansson-Stenman and Konow, 2011], with the latter being equalised with 'equity' [Svarstad et al., 2011, Corbera et al., 2007], thus Equity Theory (ET) seems appropriate to examine fairness concerns. The basic proposition of ET is that individuals review their respective inputs and outputs and check them with others. In case unfairness or inequity is perceived, an individual will try to rebalance through different actions. According to Carrell and Dittrich (1978, p.205), "two methods of inequity resolution have received strong support. First, individuals in situations of underpayment may alter inputs to restore equity. Second, individuals may withdraw from an inequitable situation either temporarily or permanently", characterised through for example absenteeism or quitting. Empirical evidence to support ET comes mainly from research on organisational structures and labour supply, where underpaid workers decrease their inputs (cf. [Patchen, 1961, Homans, 1966] for early studies) or where managers of a firm report that the practise of firing a 'lazy worker' serves above all the purpose to establish internal equity, preventing other workers from reviewing and adjusting their input/output ratios due to perceived unfairness [Bewley, 1999]. Clements et al. (2010) demonstrate that this effect is also relevant in the environmental PES field. They compare three biodiversity conservation programmes in Cambodia, declaring that people in one village in a bird's nest protection programme were, even though receiving relatively high payments, not sufficiently motivated as payments were perceived as benefiting only a few individuals, thus the system was regarded as unfair. That unfairness can result in negative emotions is further shown by Folger et. al (2001) and DeCremeer et al. (2005).

¹²Commodification should be understood here as the transformation of goods and services into objects meant for trading.

Theoretically differentiating equity, Pascual (2010) reminds us that equity can have different underlying fairness criteria. Equity based on merit for example implies application of accountability principles associated with payments based on compensation for forgone benefits or actual provision of services, whereas equity based on a ‘needs rule’ implies having an eye on how well recipients are constituted, with payments following for example a ‘maxi-min’¹³ criterion. Referring explicitly to the Costa Rican PES programme run by Fonafifo¹⁴, they identify an egalitarian fairness criterion, as payments are not differentiated between number of trees on a protected territory or types of trees for carbon sequestration, but distributed equally across the entire country [Wünscher et al., 2008]. The field of fairness would appear to be an interesting topic for further research. One possible way to analyse equity/fairness effects would be to investigate if any fairness concerns are introduced with PES establishment in the neighbourhood or if people generally think that the disbursement of PES payments to subscribed landowners is a just practise. Furthermore, the correlation between fairness concerns and self-reported negative motivational effects concerning the environment due to introduction of a PES scheme close-by can be checked, which could be taken as an indicator for a negative effect.

¹³Defined as: “Payments aim to maximise the net benefit to the poorest landholders, even at a cost of efficiency loss. Payments are differentiated according to the income of providers” [Pascual et al., 2010, p.1240].

¹⁴Fonafifo (Fondo Nacional de Financiamiento Forestal) is part of the Ministry for Environment and Energy (Minae, Ministerio del Ambiente y Energía) and responsible for financial administration and for the programme’s payments to landowners.

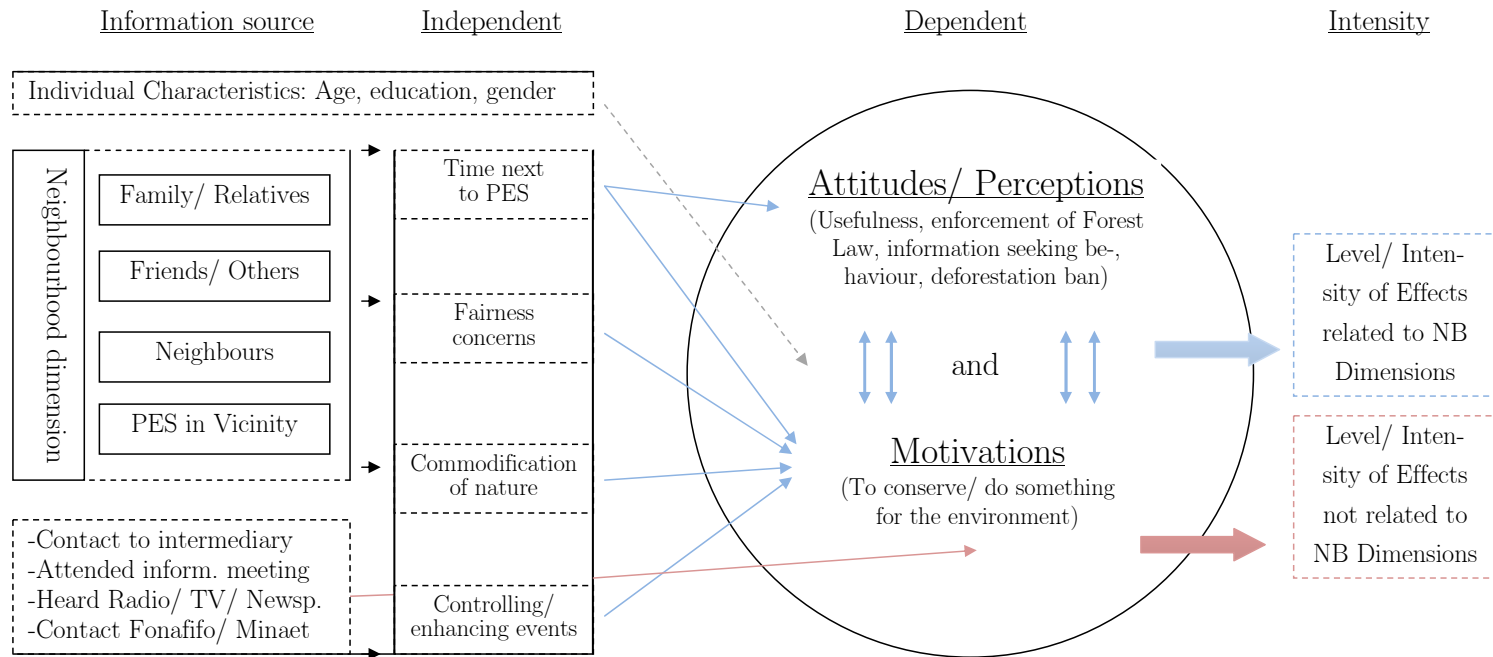
4 The Model

Based on the literature review and the various effects discussed in the previous chapter, a model has been developed to illustrate the proposed effect-channels. This chapter has the objective to introduce and explain the model and its different components.

As with every model, the schema put forward (see Schema 1) represents a simplification trying to capture real-world phenomena - phenomena which have been elaborated in the literature review. It should be noted that the model tries to capture and explain effects which are more related to the second part of the research question, as this part looks at relationships between variables and their directions of influence whereas the first part investigates more generally if neighbourhood effects can be identified and what perceptions people hold over certain parts of PES or the environment. To the left side of the model, one finds the information source used, together with the independent components. Information about PES can either flow directly from known sources out of the neighbourhood dimension, for example from geographical proximity (geographical neighbours, knowledge of PES in vicinity) and from inter-personal proximity (family, relatives, friends, other known people), or from sources which lie outside of this dimension, for example from contact to intermediaries, the attendance of an informational meeting about PES, from radio, TV or newspapers, from direct contact to Fonafifo, Minae or other government institutions etc.. The information source used represents just the channel through which a certain information was obtained. The identification of this channel is needed to analyse if an effect was triggered i) by the neighbourhood dimension, which then could be a possible indicator for neighbourhood effects, or ii) if other information sources acted as triggers for certain effects. In the latter case, these effects could not be related to the neighbourhood dimension. This implication is captured by the connection of the first with the last column of the model, titled 'intensity'.

Before explaining the independent side and the effect-channels, we find the dependent components encircled in the third column. They include attitudes and perceptions over the usefulness of PES, over the capacity of the government to enforce the Forest Law, over the deforestation ban imposed by the Forest Law and over chances for illegal logging on private Fincas on the one side as well as motivations to do something for the environment on the other. Attitudes, perceptions and motivations influence each other, therefore they are represented together. I am well aware that this representation is, in an economic or mathematical sense, questionable as dependent components per definition cannot have an effect on other dependent components. Nevertheless, the relationship is undeniable. When testing hypotheses, however, only one way of causality will be assumed and tested - namely the one proposed in the literature. Remembering the literature on fairness, one such hypothesis worth testing is if fairness concerns with reference to the neighbour who

receives PES, are negatively correlated with self-reported negative motivational effects concerning the environment due to introduction of a PES scheme close-by. Regarding the literature on the commodification process of the natural environment, the model will check if the proposed introduction of 'one single monetary exchange-value' for environmental services has lowered the motivation to do something for it. Concerning the theory of crowding-out, it will be analysed if, due to the neighbour receiving payments and oneself not, an individual feels that their own efforts are not being acknowledged (impaired self-esteem) and therefore reduces their motivation to do something for the environment. A condition which is labelled controlling/autonomy enhancing in the model. Finally, it will be analysed if the time period for which a person finds itself located next to a PES site has an influence on the strength of attitudes, perceptions and motivations. Besides the effects analysed, individual characteristics such as age, the education level or gender might also have an influence on the dependent components and are therefore illustrated in the model. However, these individual characteristics will only be dealt with at the margin, as the focus of this study is placed on the afore mentioned effects.



Schema 1: Model Specification

5 Methodology and data collection

The aim of the following chapter is to give a detailed understanding of the methodology and the data collection method used in this study. After the definition and explanation of some key terms and concepts, broad space will be given to the sampling process, as sampling criteria and thus site and household selection highly influenced the characteristics of the obtained sample, carrying the risk of biases. This section will be followed by a description of how effects were measured. Finally, the questionnaire will be introduced together with a description of modifications that had to be undertaken after pre-testing - modifications which were quite numerous. The chapter closes with a short abstract on ethical considerations.

The study follows a case study design, pursuing a quantitative approach supplemented by semi-structured questions and qualitative interviews with key forest experts in the field. Structured quantitative questionnaires with reliance on mainly pre-coded closed questions provided a way to reach standardisation of not only questions outlined but also of answers recorded, allowing to apply statistical assessments methods (using PASW/SPSS). As little is known about the phenomenon of interest, the research design was of exploratory nature.

5.1 Definition of neighbourhood

As this study is concerned with neighbourhood effects, it is imperative to define what is meant by this term. The Oxford English Dictionary lists three definitions i) “friendly relations between neighbours; neighbourly feeling or conduct”, ii) “nearness” and iii) “the vicinity, or near situation, of something” [Simpson and Weiner, 1989, p.308]. The Webster’s New Universal Unabridged Dictionary lists on first position “friendly relations, as of neighbours; neighbourliness” [Webster and McKechnie, 1983, p.1203]. The first definitions given by both dictionaries already indicate that neighbourhood can be understood in a broader sense than just being physically located next to someone/something. ‘Neighbourly feelings’ or ‘friendly relations, as of neighbours’ are also encompassed. The literature review already outlined different effect-channels corresponding to the type of neighbourhood definition assumed. For instance, in geographical neighbourhood definitions, distance is decisive [Robalino and Pfaff, 2011]; using political divisions, the whole unit is key (country, state, district etc.) [Grubb et al., 2002]; in market definitions, dependencies are crucial [Brock and Durlauf, 2001]; using a network definition, social selection criteria (belief, political conviction etc.) might be deciding [Parker and Van Alstyne, 2005].

The present study will pick up the different notions inherent in the term by using a narrow definition of geographical neighbourhood, i.e. distance on the one hand and a broader definition of neighbourhood dimension encompassing ‘neighbourly feelings’ and

‘friendly relations, as of neighbours’ on the other. The former, narrow definition of geographical neighbourhood will be used for household sampling, using the distance to a certain PES site as a selection criterion to determine if a household is still considered to be a geographical neighbour or if the household is located already outside the defined geographical boundaries and thus cannot be considered to be a geographical neighbour. The idea to use a geographical definition for household selection was derived out of the literature on substitution and slippage effects, which constantly draw buffer zones around implementation areas to check whether deforestation ‘leaks’ to nearby places. Alix-Garcia et al. (2010) use a one and a five kilometre buffer zone in a Mexican case study to check for leaked deforestation, Kinnaird et al. (2003) and Curran et al. (2004) draw a buffer of 10 kilometres in studies of deforestation in Indonesia, and Sánchez-Azofeifa et al. (2002, 2003) use a one kilometre buffer zone in two studies on deforestation in Costa Rica.

Before going to the field, it has been planned (research proposal) to draw two spatial zones (SZ) around a PES site where interviews were going to be conducted, the first one (SZ1) being located from zero to one kilometre around a PES site ($0m \leq SZ1 \leq 1000m$) and the second one (SZ2) from one to three kilometres ($1001m \leq SZ2 \leq 3000m$). However, this approach interfered with site selection criteria when data on PES areas by Fonafifo were obtained, thus the idea of using two spatial zones around each PES site had to be dropped (see 5.3.1, ‘Sampling criteria for site selection’ and 5.3.6, ‘Consequences of sampling criteria’). After a discussion with Catie researchers on the right translation of ‘neighbourhood’ in Spanish (possibilities included ‘vecindad’, ‘vecindario’, ‘barrio’ and ‘comunidad’), a local Costa Rican Catie researcher, who has lived all her life within the country and is thus familiar with the local environment, stated that a 500m definition of geographical neighbourhood would probably mirror best the understanding of most interviewees. According to her view, a broader definition might turn out to be problematic. Therefore, the geographical neighbourhood in this study is defined as one spatial zone only, including all households living in the distance from zero up to 500m around a PES site.

Besides this narrow definition for the household selection process, a broader definition of neighbourhood dimension will be employed in the analysis of effects. Remembering the definitions outlined above, it appears straightforward to assume that ‘neighbourly feelings or conduct’ or ‘relations as of neighbours’ can be found among family members or friends due to ties, bonds, feelings etc.. Therefore, this study will count effects being triggered through contact to family members, relatives, friends, neighbours or due to knowledge of a PES site in the vicinity as being representative of this neighbourhood dimension, standing apart from effects caused by other sources, such as the attendance of an informational meeting about PES or information gained via TV or radio. Without doubt, to assume

that family members/friends are per definition ‘close’ or have ‘neighbourly feelings’ for each other is a simplification whose validity can be contested. Nevertheless, studies have shown that Latin Americans, together with Asians, seem to possess “a collectivistic orientation that emphasizes family members’ responsibilities and obligations to one another” [Fuligni et al., 1999, 1030] which is stronger compared to Europeans (see *ibid* for more sources), thus the assumption appears reasonable. For a graphical representation of the effects treated as coming out of the neighbourhood dimension and effects being located outside of this dimension, see Figure 4 (chapter 4, ‘The Model’).

5.2 Likert-scales

Besides the concept of neighbourhood, this study utilised Likert-scales, a tool or technique allowing to assess attitudes developed by Rensis Likert (1932). Likert-scales [Spector, 1992, Cohen et al., 2007, Bryman, 2008] can be described as “a set of items, composed of approximately an equal number of favourable and unfavourable statements concerning the attitude object” [McIver and Carmines, 1981, p.22], which is given to a group of subjects. Each subject is then asked to indicate their degree of agreement or disagreement with the confronted statement on an equidistant set of responses, comprised mainly of five (e.g. strongly agree, agree, undecided, disagree, strongly disagree) or seven points (strongly agree, agree, slightly agree, undecided, slightly disagree, disagree, strongly disagree). Some authors have stressed the importance to use multi-item measures for defining and measuring a certain concept instead of single measures, claiming that complex issues can hardly be captured by rating of one single statement. Furthermore, the demand has been put forward to use reverse wording, i.e. opposite stances (positively and negatively formulated statements) to minimise response sets and to address the issue of acquiescence - the tendency to agree with all leading to biased results [Bryman, 2008].

For the present study, 105 items (including reverse-worded ones) have been constructed measuring twelve concepts on a 7-point scale. To select the most feasible items, two researchers at Catie as well as two researchers located in Norway were consulted to rank and comment on the statements according to their usefulness. Out of the initial pool, 19 items were retained and inserted into the pre-test questionnaire. In addition, twelve items out of the Motivations Towards the Environment Scale (MTES) to measure self-determination in the field of the environment (see 3.4, ‘Motivational theories’) as well as three items out of a pre-defined personal conservation behaviour scale to measure how far people conserve and protect resources in everyday live were included. Note that after the pre-test phase, the questionnaire has again been modified (see 5.5 and ‘Pre-test modifications’).

Justifying parametric analysis of Likert-scales and items Regarding the analysis of Likert-scales and items, a considerable amount of thought has been put into the question

of whether data generated using individual Likert items should be treated on an ordinal or interval scale. Strictly speaking, equidistance between the possible answers to an item is difficult to assume, thus implying an ordinal scale, and as Kuzon (1996) remarks, using parametric analysis on ordinal data is one of ‘seven deadly sins’ of statistical analysis, with a second sin dealing with normality, stating that parametric measures can only be applied to samples drawn from a normally distributed population. However, in the case of Likert items, even sceptical writers acknowledge that interval scale might be justifiable, but demanding that this assumption ‘should be considered at the design stage and must be addressed by authors when they discuss their chosen methodology’ [Jamieson, 2004, p.1218]. Recently, Norman (2010) tried to put an end to the controversy, using evidence dating back to 1931 (cf. [Pearson, 1931], also [Boneau, 1960]) to show that parametric analysis can be conducted with confidence on Likert data. He points towards robustness, stating that results are stable even when assumptions are violated as the central limit theorem shows that even “for sample sizes greater than 5 or 10 per group, the means are approximately normally distributed regardless of the original distribution” [Norman, 2010, p.628], concluding that “ANOVA and other tests of central tendency are highly robust to things like skewness and non-normality” (ibid). Thus, parametric tests can be used on Likert data without the fear of coming to the wrong conclusion.

5.3 Sampling

The data collection method consisted of 98 in-person survey questionnaires divided into sub-samples. Furthermore, semi-structured qualitative interviews with forest experts in the field of PES in Costa Rica were conducted, as forest experts by definition have large knowledge about the various aspects of PES, thus their insights and convictions gained throughout their years represented an important source of consultation. The following subsection will firstly explain the sampling criteria for site selection and then, secondly, the sampling process which led to the identification of survey participants (household sampling).

5.3.1 Sampling criteria for site selection

The sampling criteria for the selection process of this study’s research location were established before going to the field and encompassed six points.

- a) First PES area ever established at site
- b) PES area still receiving payments
- c) Difference in years of PES contract establishment
- d) PES sites are under protection contracts
- e) Number of houses located around a PES contract > 30

f) Local similarities of PES locations

The first criterion was set up to guarantee that the respective PES schemes around which interviews were going to be conducted represent the first PES ever established at the research site. The main consideration leading to the formulation of this criterion was that in case an interviewee attributed an effect to the establishment of a PES site in the nearby vicinity (zero to 500m), a clear isolation and attribution of this effect to a single PES scheme wanted to be assured. Assuming that at the same research site various PES schemes had existed in the past (e.g. eight or thirteen years before), it was thought that it might become even more difficult for interviewees to remember and attribute a certain change to one of the PES schemes that existed at the site. By choosing a ‘clean’ location, i.e. a location where just one PES scheme ever existed, the task for the interviewee to differentiate between the schemes was thought to be eliminated, thus making it easier and demanding less from participants. However, it has to be kept in mind that this geographically determined trigger of a neighbourhood effect represents just one possible trigger out of eight. Others include information received from family/relatives, friends, the attendance of an informational meeting regarding PES, information received from radio, television or newspapers etc.. Nevertheless, the establishment of a PES site in the distance of zero to 500m of interviewees’ place of residence was thought to be an important act for obtaining information regarding PES, thus this criterion has thought to be justifiable.

The following criteria b, c and d all describe requirements with reference to the characteristics of selected PES sites. Besides still receiving payments and thus with the contract not having ceased (criterion b), contracts should vary in their time of being established in order to analyse temporal effects (criterion c), i.e. if neighbourhood effects for example increase with the time of being located next to a PES site (see 1.4, ‘Research Questions and Hypothesis’). In the research proposal, it was planned to select a first PES scheme (C1) which had already been in existence for more than three and a half years but less than four and a half years ($3.5y \leq C1 \leq 4.5y$) and a second PES scheme (C2) which has been established for longer than six months but less than one year ($6m \leq C2 \leq 1y$). However, these temporal exigencies had to be altered upon arrival in Costa Rica due to data limitations (see 5.3.3, ‘Obtaining Fonafifo data’). Remembering that protection contracts account for roughly 81 percent of total hectares protected in Sarapiquí (see 2.3, ‘Sarapiquí’), criterion d secured the selection of one of these contracts.

Criteria e and f characterise the broader landscape in which a PES scheme should be embedded. Being able to randomly sample around 30 households in the vicinity of zero to 500 meters around a PES site, a sufficiently large population was required (criterion e).

Finally, criterion f tried to control for local similarities by signifying that out of the pool of eligible PES research locations identified, the ones with similar local characteristics should be selected. Robalino and Pfaff (2012) for example list the distance to main roads or the distance to city centres among such characteristics. As these two factors can easily be assessed using satellite imagery, they formed the only factors considered for criterion f.

In the whole, the criteria for site selection turned out to be highly restrictive. Criterion e, for instance, ruled out rural areas. The implications of the restrictivity will be discussed in sub-paragraph 5.3.5 ‘Sample sites’ and 5.3.6 ‘Consequences of sampling criteria’.

5.3.2 Arriagada’s data points

For site selection, I was asked by David N. Barton, senior research scientist at the Norwegian Institute for Nature Research (NINA), to analyse PES data points provided by Rodrigo Arriagada. Each one of his 137 data points indicated a point on a map of either a PES participant or a non-participant - a point where he conducted an interview for his doctoral thesis. To combine data sets, it would have been useful to select PES sites from Arriagada’s data points. Therefore, the coordinates provided were projected into the coordinate system WGS1984 using ArcGIS and imported into Google Earth (GE) to evaluate, through satellite imagery, if any of the points sufficed the site selection criteria. For assessment, the 87 data points of non-participants were omitted as only active participants’ PES areas would serve as research sites. Out of the remaining 50 data points of PES participants, a further 20 were excluded as they were located in the neighbouring province Siquierres and thus not in Heredia and the Sarapiquí canton.

Figure 8 illustrates the results. Yellow dots (star-signed) indicate that the resolution of the satellite image was not high enough to identify houses necessary for household selection (criterion e). As financial resources were limited and a visit to the site was not possible, I tried to obtain better satellite imagery by consulting a research group of PhD students and professors based at the University of Idaho/United States and Catie. After some discussions, I was granted access to their images. However, the resolution was once again not high enough for household identification. In the central/southern Sarapiquí region, the images obtained turned out to be even worse than the ones provided by GE. As a consequence, the yellow dots could not be used further.

For blue dots (diamond-signed), high resolution imagery was available but after analysing dot by dot, hardly any houses were detected, thus it would not had been possible to sample sufficient households in a 500m spatial zone around these areas. Cross-checking this finding, information on population spots out of the Costa Rican Atlas (2008) were

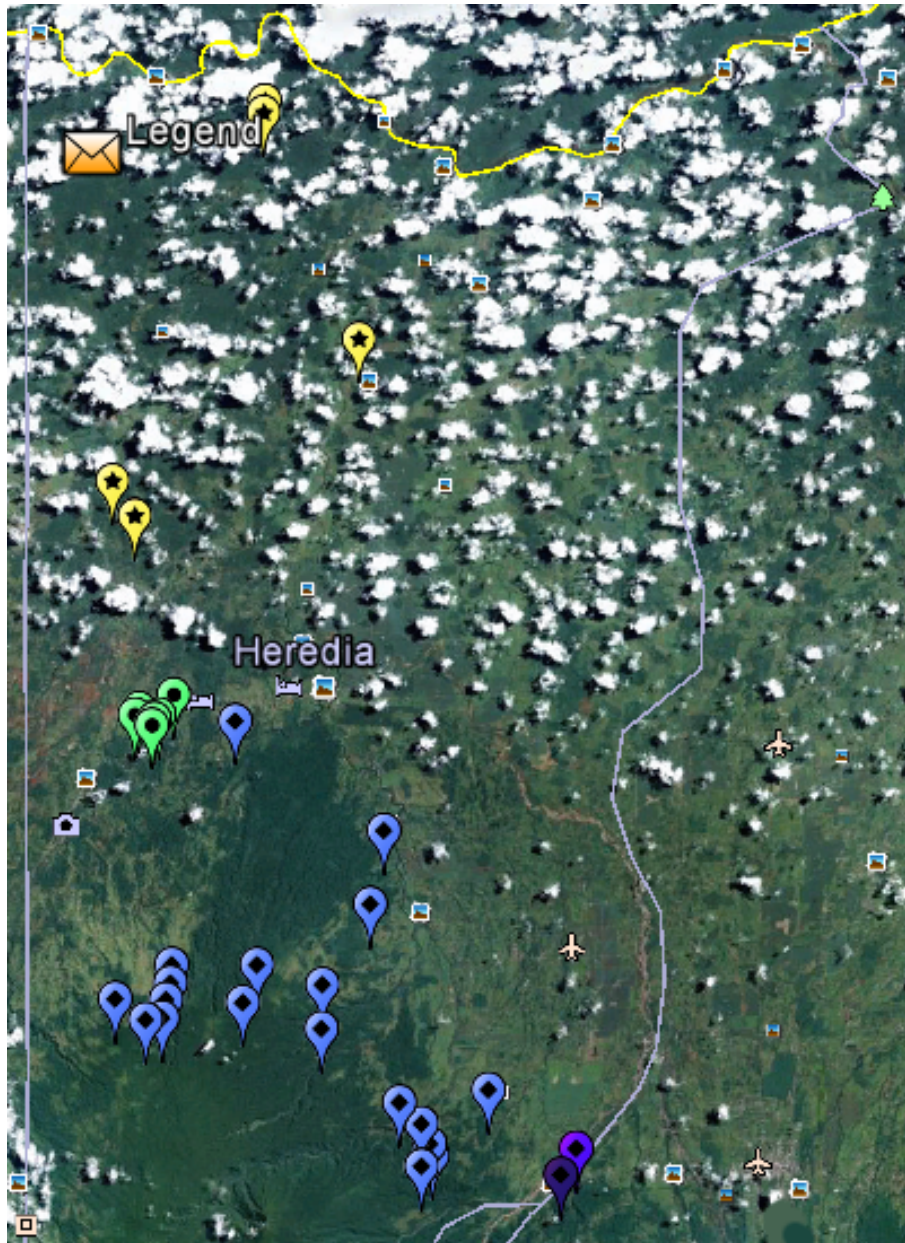


Figure 8: Map of Sarapiquí with Arriagada's data points

used and projected into ArcGIS. These data points (see Figure 9, red points) were combined with Arriagada's data points (blue points) and plotted into the same coordinate system (CRTM 90), with the result confirming that most of Arriagada's PES participants are located outside population spots.

After yellow and blue dots turned out to be not useful, green dots (circle-signed) were analysed. At first glance, they appeared to be located in more urban, populated areas, which is confirmed by the created Figure 9. To check for criteria a, namely that the PES is unique in the area, data (shape-files) provided by Fonafifo on PES areas from 2003 up to 2011 were used, projected into the coordinate system WGS1984 to fit GE and mounted. The result is shown in Figure 10, where orange areas indicate PES contracts established

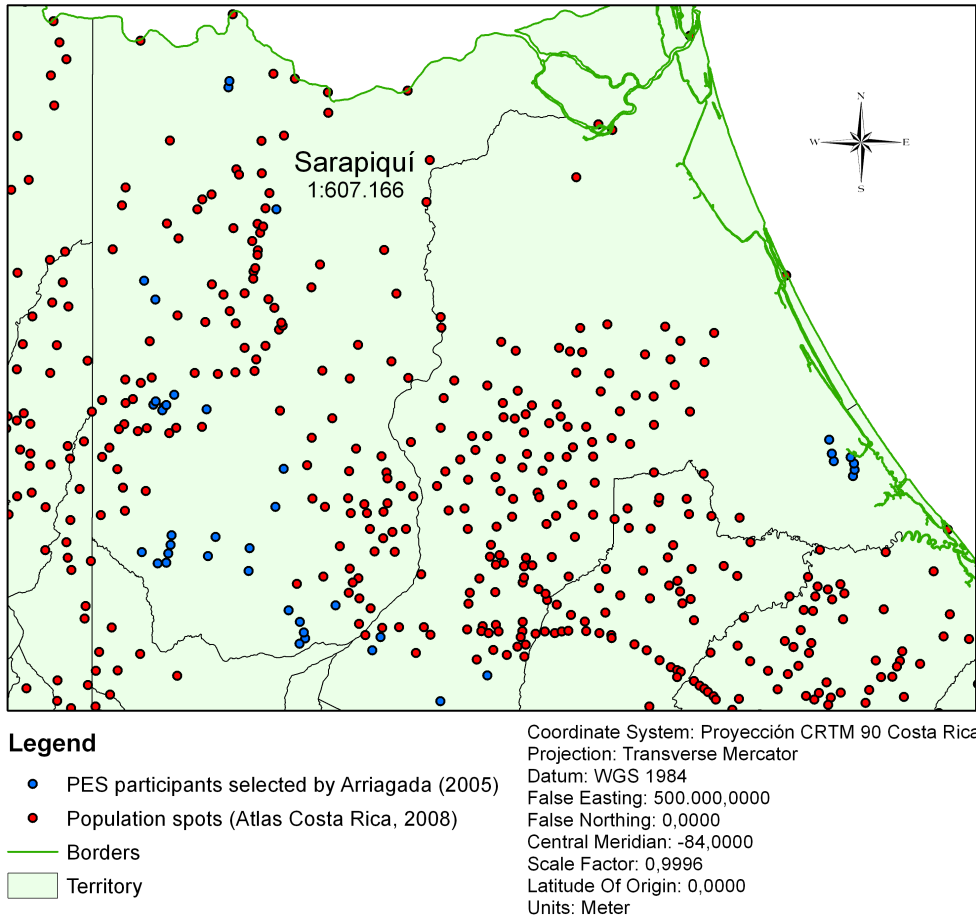


Figure 9: Population spots (Costa Rican Atlas 2008) and PES participants selected by Arriagada, own representation using ArcGIS

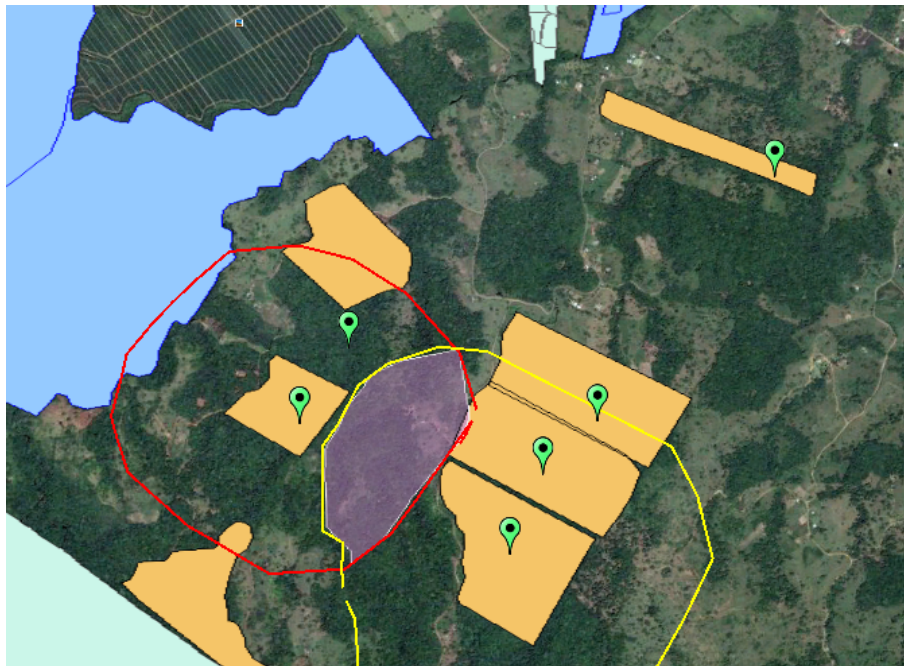


Figure 10: Arriagada's data points and Fonafifo's PES data

between 2003 and 2007¹⁵, light green areas contracts established in 2008 and blue areas contracts out of the year 2011. For illustrational purposes, the 500m spatial zone (distance around PES scheme in which interviews were going to be conducted. One zone marked red, one yellow.) was drawn around two PES sites corresponding to two data points given by Arriagada. The image shows why none of the green dots could be used: With the spatial zone drawn around a PES site, it was not possible to obtain a ‘clean’ research location, i.e. an area where there has never existed a PES area before to clearly attribute an effect to one single PES scheme. In the illustrated case, one such spatial overlap is represented by the pink polygon. Therefore, it was decided not to use Arriagada’s data further, and to pursue a different approach for the selection of research sites.

5.3.3 Obtaining Fonafifo data

To obtain more data on PES contracts in the Sarapiquí region and to gain local approval and support for the study, three meetings with Fonafifo were set up, two in San Jose (main office) and one in Sarapiquí (regional office, one of eight in the country). Fonafifo (Fondo Nacional de Financiamiento Forestal - National Forestry Financing Fund) is part of the Ministry for Environment and Energy (Minae, Ministerio del Ambiente y Energía) and was brought into existence through the Forest Law passed in 1996. The semi-autonomous agency is responsible for financial administration (above all disbursement of payments), revision and approval of PES applications, and thus represents the main authority in the Costa Rican PES programme. Prior to the meetings, a Spanish-written short version of the research proposal was prepared and handed-over. Through a meeting with Fonafifo’s monitoring department, I was told that the most recent PES shape-files¹⁶ available date from the year 2010. Therefore, criterion c (difference in years of PES contract establishment) had to be altered from the initially envisioned time intervals ($3.5y \leq C1 \leq 4.5y$ and $6m \leq C2 \leq 1y$). However, after three months in the country, shape-files for 2011 were released so that besides contracts sufficing $3.5y \leq C1 \leq 4.5y$, newer ones out of the year 2010 and 2011 could be used to re-establish a reasonable time distance between PES sites.

5.3.4 Site selection with Fonafifo’s data

The files provided by Fonafifo included data on PES contracts in the Sarapiquí canton out of the year 2003 until 2007, 2008, 2009, 2010 and 2011¹⁷. As different coordinate systems

¹⁵Data on PES contracts established between 2003 and 2007 were received in one file, thus it could not be differentiated in more detail according to single years.

¹⁶Shape-files are, as the name already indicates, files in a format called *.shp (shape). In the present case, they contain information on the geographical extension of a Finca with PES. Projected on a map, these shape-files mark the exact boundaries of a Finca which has received PES payments. Note that geographical zones indicate the boundaries of the whole Finca an enrolled person owns and not just the parts which actually are under PES protection. Thus, in many cases, the zones illustrated through the shape-files are larger than the area enrolled in PES.

¹⁷As mentioned under 5.3.3 ‘Obtaining Fonafifo data’, 2011 data were obtained after three months in the field.

were used, all data was projected into WGS1984 using ArcGIS and loaded into GE to obtain a better picture where PES sites previously had been established. As described in chapter two, Sarapiquí is heavily targeted by PES, thus when all PES contracts from 2003 until 2011 were loaded, the resulting map was cluttered with contracts. For the selection

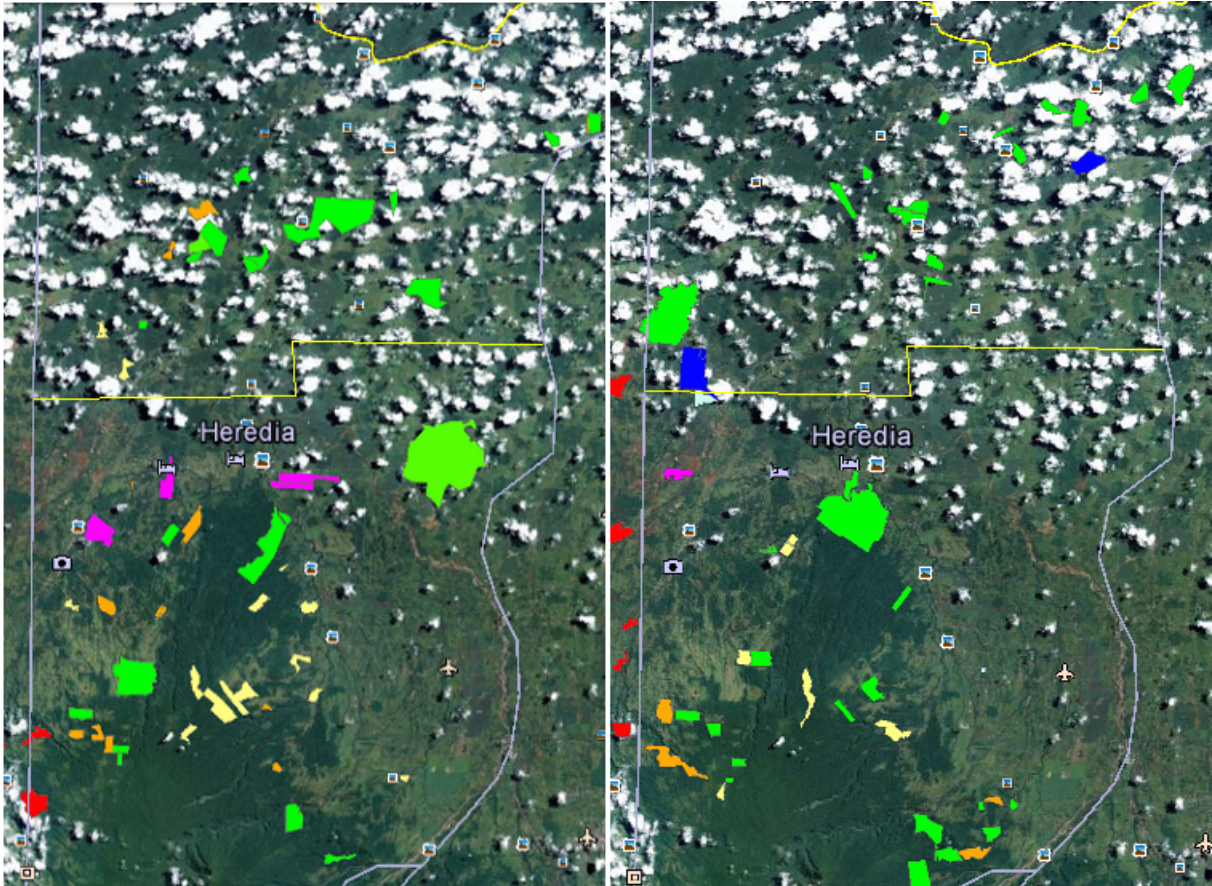


Figure 11: PES protection contracts, 2008 (left) and 2010 (right)

process, PES protection contracts granted admission to the programme in 2008 were analysed at first. Contracts had a duration of five years, thus with four and a half years of being established, they were close to termination¹⁸. Each PES area was analysed one by one for suitability and fulfilment of established criteria. The picture to the left of Figure 11 illustrates results for the 2008 contracts, the part to the right shows results for protection contracts out of 2010. As visible at first sight, PES areas have been categorised according to certain attributes.

- Green: Follow-up contract (not able to isolate).
- Orange: Not able to isolate, have been other PES areas around in the last ten years.
- Light yellow: Not enough houses around for sampling.
- Blue: Resolution of satellite image not high enough.
- Pink: Eligible area.
- Red: Area outside Sarapiquí.

¹⁸Note that the contract duration time has been altered. Whereas decree No. 36516-MINAE (Ministerio del Ambiente y Energia) published in 2011 defines a contract duration period of five years for the forest protection modality (\$320US per hectare for the whole period, equalling \$64US per year/ hectare),

Green areas indicate that even though PES areas have gained approval in 2008, they represent follow-up contracts, meaning that they have received payments at an earlier stage. Therefore, these areas were deemed infeasible as they violated criterion a (see 5.3.1, ‘First PES area ever established at site’). Again, criterion was formulated as it was thought that it might be more difficult for interviewees to remember and attribute a certain change/effect to one specific PES area in case various PES areas had already existed in the past at the same spot. By choosing a ‘clean’ location, i.e. a location where just one PES scheme ever existed, the task for the interviewee to differentiate between the schemes was thought to be eliminated, thus making it easier and demanding less for participants.

Similar considerations led to the exclusion of orange areas. When projecting PES contracts from 2003 until 2007 (for 2008 areas, left image) or from 2003 until 2009 (for 2010 areas, right image) in GE, areas were coloured orange because in one of the years in the past, there have been other PES contracts exactly around these orange areas established in 2008 or 2010 respectively. Therefore, it would had been impossible to get a ‘clean’ PES area in the sense that there had never existed another PES before. For visualisation of this effect, Figure 10 can be consulted again. There, the pink area (spatial overlap) illustrates a similar effect, even though in the present case, it has been checked if such a spatial overlap had ever existed, even with PES contracts that have existed in the past and have ceased already.

Yellow areas indicate that the PES contract analysed did not suffice site selection criterion e, namely that a sufficiently large population can be found around the contract area (number of houses > 30) to sample households.

Blue PES areas, only existent in the right 2010 picture, indicate that the resolution of the satellite image available was not high enough to work with (e.g. to check if enough households were available for sampling), thus they were also regarded as not useful, together with red PES areas which were located outside Sarapiquí and thus outside the research location of this study.

Finally, pink areas represent contracts which fulfil the requirements postulated under 5.3.1 ‘Sampling criteria for site selection’ and were thus deemed useful as research location. Among PES areas enrolled in 2008, three such areas where found. Among the 2010 accepted ones, only one such area could be identified. With respect to criterion f (local similarities of PES locations), two eligible areas out of the year 2008 were selected (named A1-07/08 and A2-08) as well as the eligible area out of 2010 (named A-10/11). In the

decrece No. 36935-MINAE published in 2012 speaks of a contract duration period of ten years (\$640US per hectare for the whole period, equalling \$64US per year/ hectare).

following, the PES sites around which interviews were conducted will be described in more detail.

5.3.5 Sample sites

In total, three areas were selected, labelled A1-07/08, A2-08 and A3-10/11. A1-07/08 is located right outside to the south-east of the city Puerto Viejo de Sarapiquí, the canton's capital. The western boundary of the Finca runs directly alongside the national highway four, and following this route for approximately 1.8 kilometres leads to the entrance of town, thus A1-07/08 is located in an urban area close to a city centre with good road connection. Figure 12 illustrates the Finca where the PES contract area is located on, indicated by the yellow enclosed area. The red line shows the spatial zone which is drawn 500 meters around the Finca - the space between the yellow and the red line thus represents the area where interview candidates were sampled from. Finally, blue lines indicate spatial zones (500m) of other PES areas that had existed or still exist (e.g. the light green area which was established in 2008 to the bottom right) near the chosen research site. The pink polygons in Figure 12 indicate where these spatial zones interfered with the spatial zone of A1-07/08. These overlapping areas were not considered eligible and thus were excluded from household selection, as it would not have been possible to obtain a 'clean' household selection site within these spatial overlaps, i.e. a site where there has never existed a PES area before to clearly attribute an effect to one single PES scheme (see 5.3.1, 'Sampling criteria for site selection', criterion a).

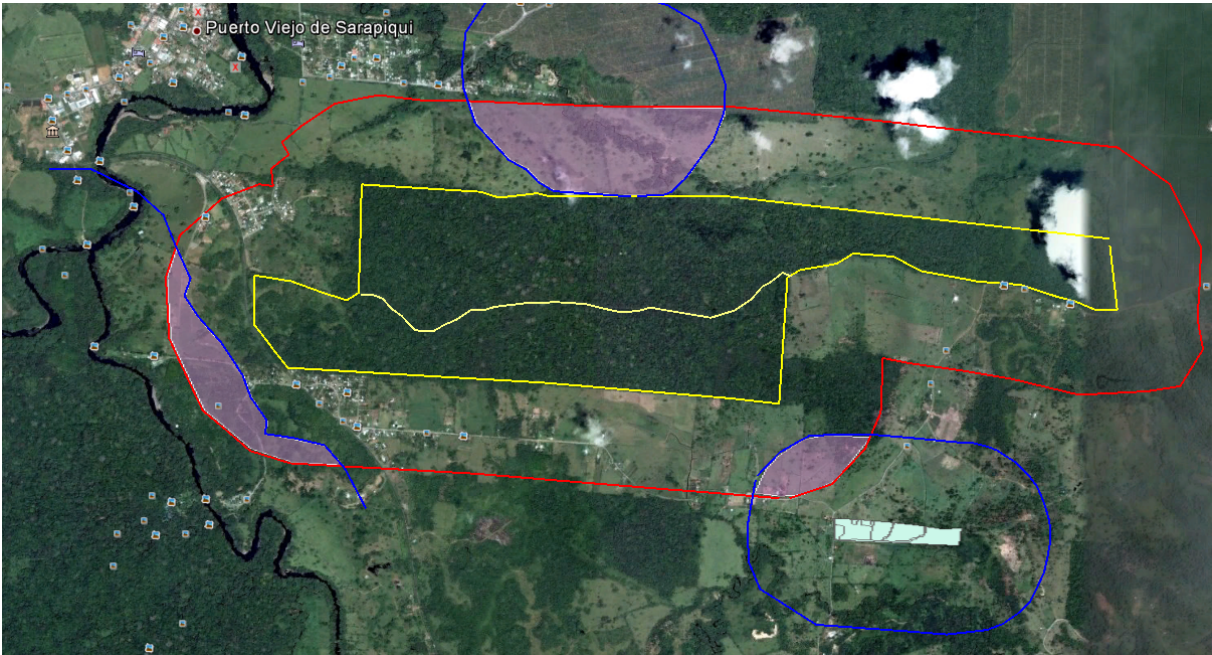


Figure 12: First PES area selected (A1-07/08, yellow), together with spatial zone (red), geographical map

The yellow enclosed Finca with the PES contract area lying within is subscribed to the beneficiary ‘Industrias Agropecuarias Asociadas S.A.’, domiciled in San Jose. The Finca actually has received two separate PES contracts, one in 2007 (SA-01-22-0132-2007¹⁹) and one in 2008 (SA-01-22-0022-2008), indicated through the light yellow line running through the Finca. The lower part of the Finca, for instance, is documented in Fonafifo’s archives as illustrated in Figure 13. The map shows that in this lower part of the Finca,

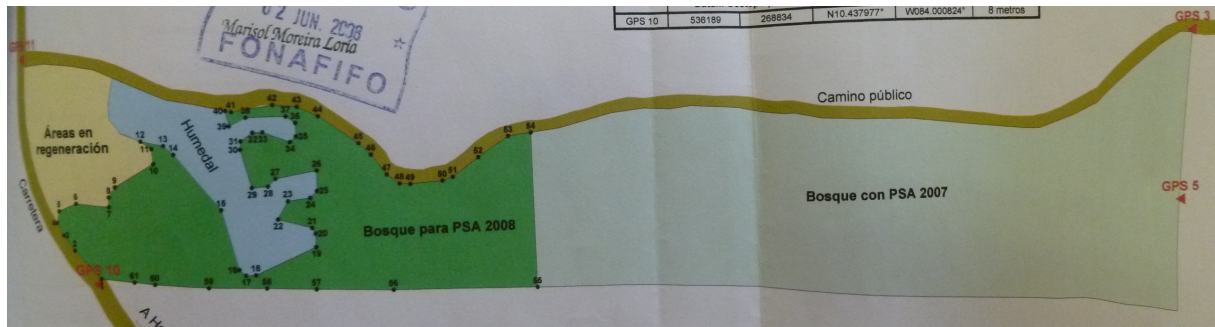


Figure 13: Technical map, lower part of A1-08, Fonafifo’s archives

85.2ha of forest (light green area to the right, labelled ‘Bosque con PSA 2007’) have been protected in 2007, whereas 32.6ha of forest (dark green area to the left, labelled ‘Bosque para PSA 2008’) were enrolled in 2008. Together with the upper part of the Finca, the contracts from both years protected an area of 332.6ha of forest in total.

The second research site A2-08 is located in the district of La Virgen, lying to the north-east of the village of the same name La Virgen. The Finca with the PES contract area within has no direct road passing by at its borders, but the main road running through the centre of La Virgen is located just around 420m to the south-east. As visible from the geographical map in Figure 14 (image shown to the right), A2-08 is located directly at the entrance of the town La Virgen, thus the area is in general highly urban. As in Figure 12, the yellow encircled area indicates the Finca where land for PES is contracted on, the red line visualises the 500m spatial zone drawn around A2-08 and blue lines show spatial zones (500m) of other PES areas that had existed or still exist near the chosen research site, with pink polygons illustrating spatial overlaps.

The PES contract was established in 2008 (SA-01-22-0010-2008) for an area of 292ha, encompassing almost the entire Finca as visible from the technical map in Figure 14 (dark green area in the image shown to the left titled ‘Bosque para PSA 2008’). A2-08 is subscribed to the beneficiary ‘Reserva Biologica La Tirimbina LTDA.’, an “educational, scientific and ecotourism destination” [TB, 2012]. The Tirimbina Rainforest Center, which uses the protected area for various purposes such as guided tours through the forest, bird watching or research interests, is located at the western border of the protected site with

¹⁹Number under which Fonafifo handles the contract.

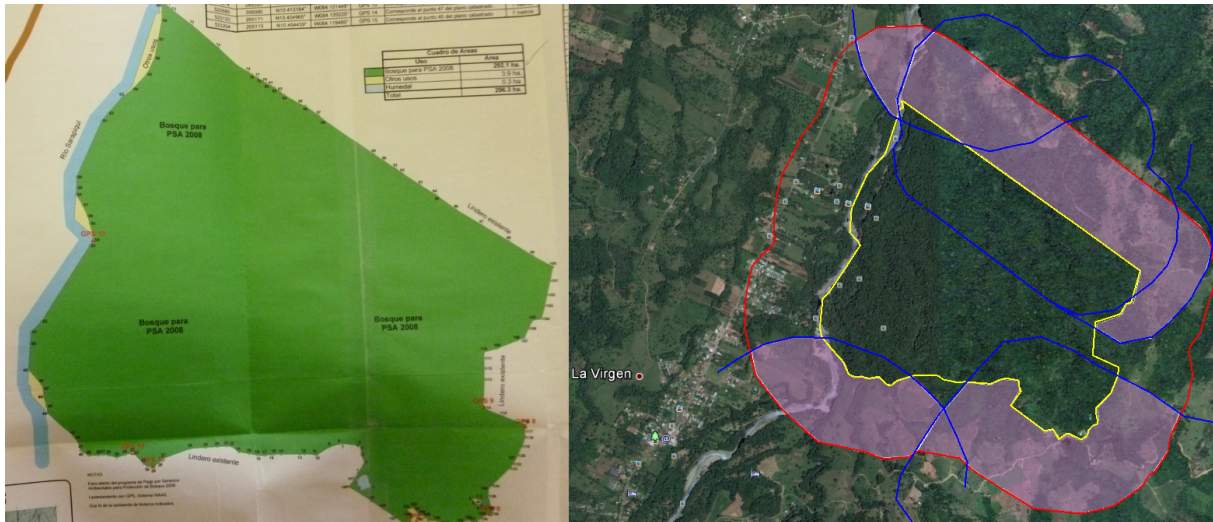


Figure 14: Second PES area selected (A2-08), technical (left) and geographical map (right)

direct access. As many researchers and especially tourists continuously arrive at the Tirimbina Rainforest Center, it is assumed that at least the organisation as owner of the PES contract is quite well-known in the area compared to ‘Industrias Agropecuarias Asociadas S.A.’ (A1-07/08, to which the first research site is subscribed to).

The third and final research site A3-10/11 is also located in the district of La Virgen, lying approximately six kilometres to the north of La Virgen’s city centre. Compared to the other two research sites, this third area is less densely populated and the road passing the Finca on its western border (this is where almost all households were located) is smaller and not paved, thus the area in general is less traffic-intensive in comparison to the other two research sites. However, the main road connecting Puerto Viejo de Sarapiquí with La Virgen passes just to the southern end of A3-10/11, and the town of Chilamate is around two and a half kilometres away. Therefore, the area can still be described as more urban than rural.

Figure 15 illustrates A3-10/11 geographically: The yellow encircled area marks the boundaries of the Finca where the PES contract area is located on, the red line indicates the spatial zone (500m) drawn around the Finca, blue lines show the spatial zone (500m) of other PES areas that had existed or still exist nearby with pink polygons demonstrating spatial overlaps. The Finca is subscribed to the beneficiary ‘Collin Street Bakery Inc.’, with the representative living outside of Sarapiquí in the Alajuela province. As A1-07/08, the Finca actually has received two contracts, one in 2010 and one in 2011, which is indicated by the light yellow line running through the yellow enclosed area in Figure 16. The area established in 2010 (SA-01-222-0057-2010) is represented by the smaller part lying to the south of the Finca, protecting 25ha. The upper part of the Finca started to receive payments in 2011 (SA-01-22-0055-2011) for a total of 205.6ha for forest protection.

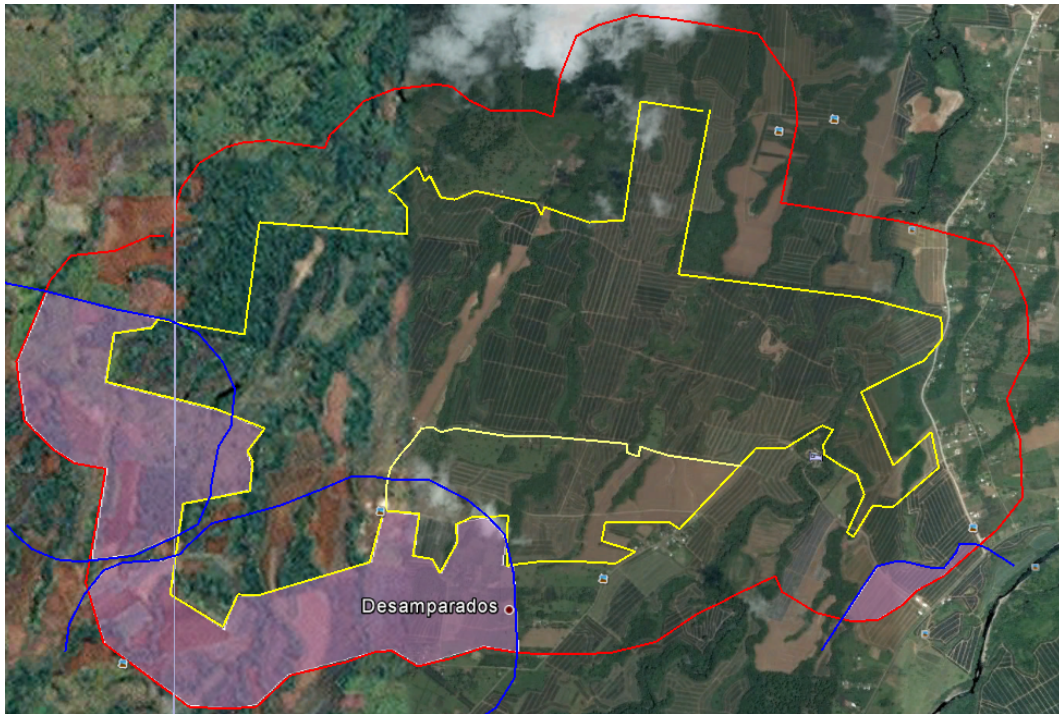


Figure 15: Third PES area selected (A3-10/11), geographical map

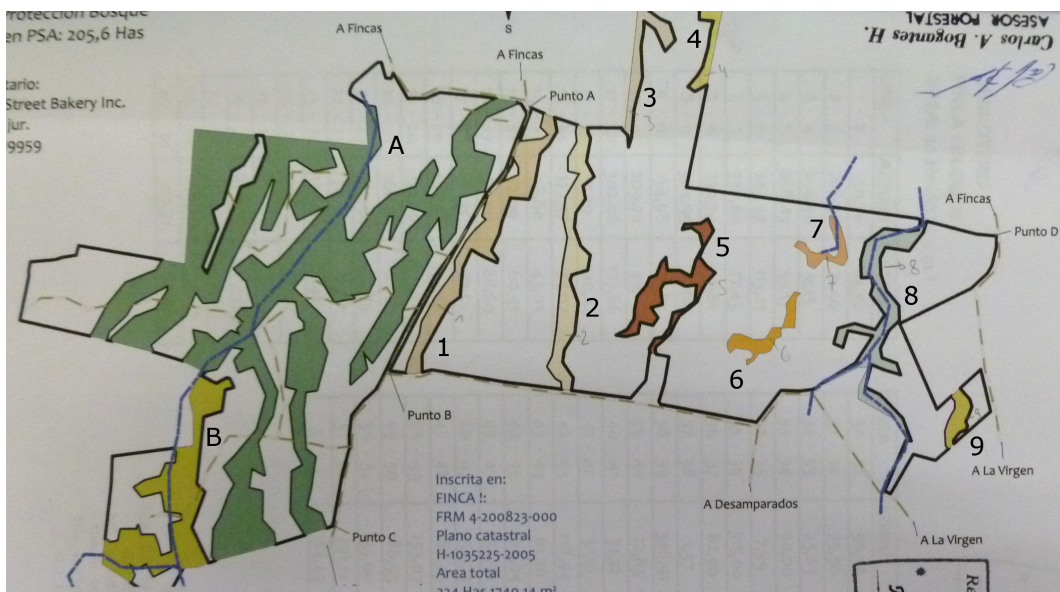


Figure 16: Third PES area selected (A3-10/11), technical map

The technical map of the bigger upper part established in 2011 is illustrated by Figure 16, where a clear characteristic of this PES contract area becomes visible: Compared to A1-07/08 and A2-08, this third contract area consists of eleven PES blocks which are scattered within the Finca. Block A (125ha) and block B (20ha), lying to the south of the Finca, protect 70 percent of the total PES area. The remaining 30 percent are subdivided into nine areas, protecting 13ha (area marked '1'), 10ha (2), 4ha (3), 3ha (4), 7ha (5), 3ha (6), 2ha (7), 12ha (8) and 2ha (9) respectively. The space lying between the different

PES blocks is, above all, used for pineapple cultivation.

5.3.6 Consequences of sampling criteria

Having described the three research sites, it is imperative to reconsider the process of how these areas were deemed eligible and thus how these were selected. The sampling criteria for the selection process were established before going to the field and encompassed six points, namely a) first PES area ever established at site, b) PES area still receiving payments, c) difference in years of PES contract establishment, d) PES sites are under protection contracts, e) number of houses located around PES contract greater than 30 and f) local similarities of PES locations. As shown by Figure 11, these criteria turned out to be highly restrictive as only four sites in total fulfilled the ‘entry requirements’ (criteria a to f). Criterion a for instance ruled out follow-up PES contracts which accounted for the majority of enrolled contracts in 2008 and 2010 (see Figure 11, green areas), whereas criterion e basically eliminated rural areas. The choices I made at the outset thus determined to a large extent the outcome. Bryman (2008) identifies three possible sources that can bias a sample: i) The usage of a non-probability or non-random sampling method, ii) a deficient sampling frame and iii) non-response. The first source causes some elements (here: PES sites) to be more likely to be selected, e.g. through criteria of exclusion, thus the assumption to derive valid inferences from findings through strong external validity and generalising them beyond the specific context in which the study was conducted (representativeness) cannot be held. Through the pre-defined sampling criteria for site selection, a “distortion in the representativeness of the sample” (ibid, p.168) is clearly visible, leading the site selection process to be a non-probability sample. As only four PES sites were considered eligible, the view of the “omnipresence of variability”, as Peters (2011, p.53) terms it, and which should be addressed through an adequate sampling design, is somewhat denied in this study. Furthermore, criterion f defined that local similarities should exist between PES sites, which further led the sample to appear more homogeneous, with research sites being located in urban areas and close to city centres with good road connections. The criterion was formulated as the sample size of three spots (A1, A2, A3) was relatively small and it was thought that, with reference to Robalino and Pfaff (2012), the selection of similar research sites would present a simple way to control for local similarities. However, this approach might be more prone to the problem of correlated unobservables, i.e. the existence of some group specific component that varies across groups, as with research sites featuring similar characteristics, chances for the identification of such ‘group specific components’ (e.g. rural/urban) are minimal.

Before giving a brief justification and arguing context-specific why a non-probability sampling for site selection was chosen, it appears worthwhile to formulate an argument on a more technical level. By choosing a case-study design, a decision was made to investigate

the complexity and particular nature of a single case (cf. Bryman 2008). Thus, the decision for this specific research design implied already that external validity (generalisability of findings) considerations would be weak right from the outset. Clearly, weakened external validity does by no means justifies its abolishment altogether. Therefore, case-specific arguments have to be made:

- The first point concerns the availability of satellite imagery. Looking back at Figure 11, the area above the reversed yellow ‘z’-line running horizontally across the map indicates where the resolution of the satellite images were not sufficiently high to identify if enough households for household selection would have been located around a PES site. As explained under 5.3.2 ‘Arriagada’s data points’, I tried to obtain better images via a research group based at the University of Idaho and Catie, but also their images did not provide an adequate resolution. Therefore, these areas had to be excluded.
- Nevertheless, all shape-files with the geographical information of PES sites were available and provided by Fonafifo, thus assuming abundant financial resources, a different method could have been to set up a complete sampling frame, i.e. a “listing of all units in the population [here: PES sites] from which the sample will be selected” [Bryman, 2008, p.169], randomly select three areas and then visit each site for eligibility-assessment by car. The necessity for satellite imagery would have been obsolete. In case an area would not be deemed eligible, other sites would have been randomly selected from the sampling frame and visited. This, however, was not possible due to financial constraints which simply did not allow a cost-intensive site identification process. Consequently, financial constraints mark the second point.
- Related to financial issues is the third point, namely the geographical definition of neighbourhood which was set at 500m. Assuming that I would have kept the distances indicated in the research proposal ($0m \leq SZ1 \leq 1000m$ and $1001m \leq SZ2 \leq 3000m$), it would had been possible to select more sites in a rural setting as the likelihood to encounter sufficient households would have increased with greater spatial zones. Certainly, the potential for spatial overlaps (pink areas in Figure 14 or Figure 15) with other PES areas that had existed or still exist in the area would augment likewise, complicating the task of defining which areas would be eligible for household selection. However, one of the main problems with this approach would have been that I would have needed some sort of transportation to get from one interview point to the next, whereas with the 500m definition of the spatial zone, the distance could easily be walked. Without a license for instance, it proved difficult to even acquire a motorcycle to get around. Besides these imponderables, pursuing this approach would have meant to ignore the advice given by a Costa Rican Catie researcher

and expert that a geographical definition of neighbourhood of 500m would probably mirror best the understanding of most interviewees. Thus this idea was dropped.

- A fourth point centers around the question of attribution and especially criterion a. As already explained under 5.3.1 ‘Sampling criteria for site selection’, the criterion was set up to guarantee that the respective PES schemes around which interviews were going to be conducted represent the first PES ever established at the research site. A different strategy would have been to set up a complete sampling frame (note the problems with this approach as stated under point one and two), randomly select three PES sites and then check which areas had existed or still exist in the spatial distance of 500m around the selected site. With the list of ceased and valid contracts at hand, interviewees could have directly been asked which PES sites they know and which site was responsible for gaining knowledge about PES and triggered a certain effect. However, in discussions at Catie, my suspicion was confirmed that it might be difficult for interviewees to differentiate between PES schemes that had existed or still exist nearby, thus it was decided to stay with a ‘clean’ research area and clarify through the questionnaire if interviewees had knowledge about other PES schemes (nearby or further away). Generally, the rigidity and restrictiveness of criterion a due to the amount of PES contracts in Sarapiquí was underestimated (see part 2 ‘Case-study site’ for a detailed description). Undertaking the same study in a province which has been targeted less by PES would have reduced the dominance of criterion a. However, as Fonafifo explicitly recommended this province and the canton of Sarapiquí when confronted with the research proposal, the location was treated as given.

5.3.7 Target population and household sampling

It is evident that with the selection of research sites, characteristics of the population living within these areas were determined. In contrast to site selection which was done in a non-random fashion due to the encountered obstacles described above, household sampling was conducted randomly as it proved more straightforward. Being able to select households through desk-identification, an online tool provided by Geo Midpoint was used. Geo Midpoint (www.geomidpoint.com) provide freely accessible GIS tools, such as a midpoint calculator, a bearing and distance calculator or a random point creator which generates random points over a surface of the earth restricted to any circular or rectangular shaped area limited by latitude (northern and southern limit) and longitude (western and eastern limit) coordinates. The tool can generate a maximum of 2000 random points defined through coordinates, which can then be projected onto Google Maps.

To randomly sample houses, the coordinates of a rectangular area²⁰ enclosing a selected

²⁰“Note: This is not a true rectangle because latitude and longitude lines are curved and longitude lines

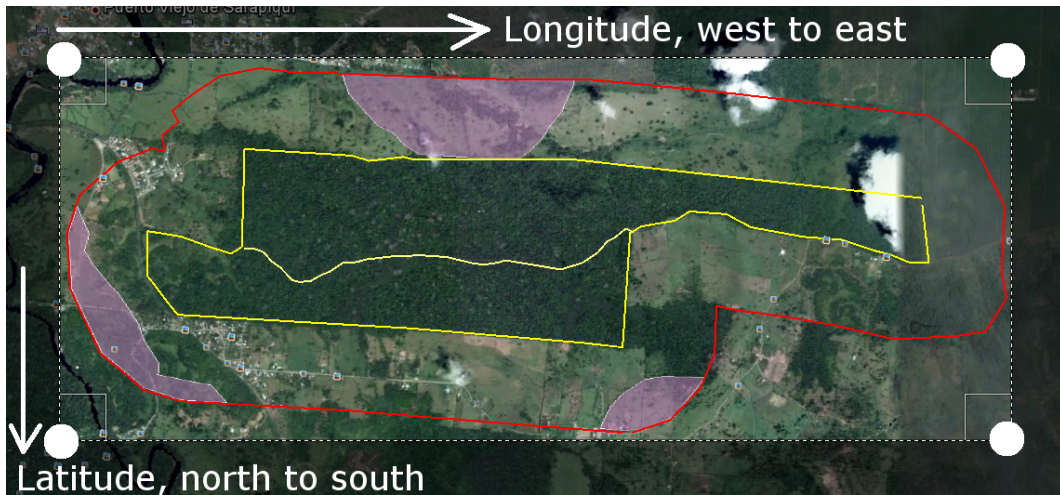


Figure 17: Household sampling procedure, example

PES site (A1-07/08, A2-08 or A3-10/11) with its spatial zone were taken and inserted into Geo Midpoint’s random point generator (coordinates had to be converted from degree, decimal minutes to decimal degrees). Figure 17 illustrates the rectangle, where longitudinal coordinates were taken from the upper left and the upper right corner and latitudinal coordinates from the upper left and the lower left corner (white dots). Then, 2000 random points were projected onto the area which was displayed in Google Maps. In the following, it was analysed where a created random point (red pin with black dot inside, see Figure 18 or Figure 19) hit a house in the rectangle. Examples from selected houses of PES site A1-07/08 are illustrated through a red circle in Figure 18, examples from A2-08 in Figure 19. In case not enough houses were hit with the generated 2000 random points, a second round was conducted. Having all houses with its associated coordinates identified, coordinates were at first transferred to Google Earth to display them together with selected PES sites, and then uploaded onto a Garmin GPS device to track each house while being at the research location.

In total, 100 observation points (roofs) have been identified using this approach, 33 in A1-07/08, 34 in A2-08 and 33 in A3-10/11. As it was not possible to check whether a roof identified via satellite images represented an inhabited house, five observation points had to be replaced upon arrival at the research location. One point turned out to be a school, a second one as a storage building, two were lying within the ‘Tirimбина Rainforest Center’ and one point could not be approached due to watching dogs. For houses where nobody was encountered, a strategy pursued by Arriagada et al. (2010) was followed, namely that in case I failed to find a person after three attempts, the house located directly to the left (west) or opposite was selected as replacement²¹.

converge at the poles, however it is often a convenient way to define a region on the earth’s surface and it does provide a way to generate true random points on a spherical earth” [GeoMid, 2012].

²¹In their study, the direction of the replacement is not indicated, only that a neighbour was selected.



Figure 18: Household sampling A1-07/08, observation point 3, 4 and 5



Figure 19: Household sampling A2-08, observation point 4, 5, 6, 7 and 8

In 15 cases, this approach had to be pursued. The total number of valid interviews amounted to 98, thus the rate of non-response is given with 15.3 percent. Regarding the ‘door policy’, I tried to interview only persons who have attained full age (mayoría de edad), including every Costa Rican above the age of 18. However, as it would have appeared rude to directly ask a potential participant for their age in case I was not sure if the person opening the door was already of age or not, the decision whether to interview the person or to ask for their parents was made right at the doorstep. Figure 27 illustrates the age distribution on the sample, showing that the youngest participant was 18 years old.

Besides household selection for the quantitative survey questionnaire, semi-structured qualitative interviews were conducted with forest and PES experts working in the canton of Sarapiquí. Experts by definition have huge knowledge about the various aspects of PES, thus their insights and convictions gained throughout their years represented an important source to consult. Interviewees included the National Forestry Financing Fund’s (Fonafifo) regional office in Sarapiquí, the Ministry for Environment and Energy’s (Minae) office in Sarapiquí, and the Foundation for the Development of the Central Volcanic Mountain Range’s (Fundación para el Desarrollo de la Cordillera Volcánica Central, Fundecor) regional office in Sarapiquí. Whereas the first two represent governmental institutions, Fundecor is a Costa Rican NGO funded in 1989 with the aim to protect forests and to sustainably combine conservation and commercial timber interests. The organisation serves as a so called intermediary, i.e. Fundecor handles most of the administrative procedures surrounding a PES application, supporting and finally submitting all necessary documents to Fonafifo. For their support, they charge an intermediation percentage fee of

around 15 percent of disbursed payments. The importance of this organisation cannot be overestimated: According to Fonafifo's regional office, around 85 percent of all received contracts are generally submitted by Fundecor (personal communication, conservative estimation).

Cost-intensity The sampling process for household selection has been carried out through desk-identification, as staying at the research centre Catie was inexpensive compared to accommodation in Sarapiquí. Therefore, it was decided to travel to the research location in Sarapiquí only after all major preparations had been completed and observation point coordinates had been uploaded onto the GPS device to commence interviewing more or less timely upon arrival. Furthermore, being situated at Catie was convenient due to the facilities provided such as an office room accessible 24h or a speedy internet connection. Transportation from Catie to Puerto Viejo de Sarapiquí took about 6 hours (public buses), hence travelling between the two places wanted to be kept minimal.

Nevertheless, other less time consuming methods could have been employed. One such method would have been to travel to each one of the three PES sites (A1-07/08, A2-08, A3-10/11), assign a number to each house that was found within the eligible spatial zone of zero to 500m around the respective PES site and then randomly select numbers from the produced list. The distance could easily be walked, so the process could have been completed within three to four days. Comparing this approach with the one pursued, I am of the opinion that the actual sampling process using Geo Midpoint's random point generator did not take more time as visiting site by site personally. Certainly, the selection of roofs which did not represent an inhabited household could have been avoided through direct assessment. In the present case, this concerned just five out of 100 observation points and is thus, in my view, no criteria for favouring a certain method. However, imagining a rural setting where households engage in farm activities and barns, storage buildings etc. are located close to houses, this consideration might become important as the potential to select non-inhabited 'roofs' would be substantially higher. The main reason leading the pursued approach to be more time consuming was the duration of coming up with an innovative idea of how to randomly sample households without being at the research site and finding a GIS tool such as the random point generator which can be used together with Google Earth.

5.4 Measurement definitions

The following subsection will describe the different approaches of how effects and the potential existence of neighbourhood effects will be measured in the present study. The main questions assessing neighbourhood effects were phrased as statements to which responses could either be given on a Likert-scale or, in few cases, with 'Agree' and 'Disagree'. The

latter case basically represents a simplification of a Likert-scale, limiting possibilities to just two options. The reason for this reduction in options can be explained by expressed concerns from a Costa Rican researcher working at Catie that having seven or five possible options available (ranging from totally agree to totally disagree) to answer to an already complex statement might impose difficulties upon interviewees. Thus, where a statement was considered demanding, possible options were reduced so that interviewees had to just indicate if they tend to agree or disagree with a given statement. Surely, in terms of statistical analysis, the decision included drawbacks as the reduction in options from five to two made parametric assessment methods impossible.

Addressing the first part of the research question²², statements were either framed in the form of implying a specific ‘change’ (in the following termed ‘change’ statement) or in the form of stating a ‘general’ opinion (in the following termed ‘general’ opinion statement).

1. Information Seeking Behaviour		Degree of (dis)agreement
a. Due to...	1) contact with persons of my family/ relatives who know about PES, 2) contact with friends/ other people who know about PES, 3) contact with neighbours who know about PES, 4) the existence of a property with PES close-by, 5) contact I had with intermediaries, 6) my participation in an informational meeting about PES, 7) hearing about PES in the Radio/ TV/ Newspaper, 8) contact I had with Fonafifo/ Minaaet,	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
<hr/> ...I became more interested in the topic of PES.		

Figure 20: Likert-scale item for a ‘change’ statement, example

An example of a ‘change’ statement is given by Figure 20. Note that during the course of an entire interview, all ‘change’ statements attributed an effect (here: ‘I became more interested in the topic of PES’) only to one source, either to one belonging to the neighbourhood dimension (in Figure 20, this corresponds to number 1, 2, 3 or 4) or to a source lying outside of this dimension (number 5, 6, 7 or 8). The information source to which all the respective effects were attributed to, i.e. if in all change statements number 1, number 2, number 3 etc. was used, was determined through the following question posed at the beginning of the questionnaire: ‘In general, what is the first and the second strongest source out of which you received information about PES?’ (see Figure 21). The source that an interviewee indicated here as the strongest, defined if all change statements attributed an effect to family/ relatives (no. 1), friends/other people a person knows (no. 2), neighbours (no. 3) etc..

²²The first part of the research question investigates the general knowledge about PES, if neighbourhood effects can generally be identified and what perceptions people living close to a PES contract hold over certain parts of PES or the environment in general.

- 4 a. In general, what is the first and the second strongest source out of which you received information about PES? (Please indicate the first and the second strongest source)**
- Family/ relatives who 1) never had 2) had/have... PES.
 - Friends/ other people who 1) never had 2) had/have... PES.
 - Neighbours who 1) never had 2) had/have... PES.
 - Intermediaries (Fundecor etc.)
 - Participation in informational meeting
 - Radio/TV/ Newspapers
 - Fonafifo/ Minaet
 - Other: _____

Figure 21: Sources of PES information, used for the determination of ‘change’ statements

It is worth mentioning that when the research proposal has been drawn up, I wanted to consider one source only, namely source number four in Figure 20 (‘due to the existence of a property with PES close-by..?’). With various effects being attributed to this sole event (existence of a PES property close-by), it would had been possible to quantify if this event triggered certain effects or not (more interested in the PES topic, more motivated to do something for the environment etc.). However, in case the mentioned effects were triggered due to other events (family/friends talked about it, TV/radio transmitted information etc.), the research would not have been able to capture this as interviewees had only been asked to say how far the existence of a PES property close-by influenced them and not other events. Therefore, it was decided to consider a broader range of effects.

To take the strongest source from which an interviewee received information about PES and using this source for the change statements appeared reasonable, as this source per definition shaped knowledge about PES. Overall, there was a risk and an opportunity involved in allowing different sources: With a total number of around 80 interviews and assuming that each one of the eight sources would be named with equal frequency, every source would be described by ten observations only, limiting statistical assessment methods. Contrarily, it might be possible to quantify through Likert-ratings which source triggered the strongest effect and which source might be of minor importance, allowing to produce a ranking which gives an indication of the strength of the various sources on PES issues.

Overall, it is clear that with all ‘change’ statements, a high willingness of participants to rethink and re-frame certain motivations/attitudes was demanded to finally being able to attribute these to a specific source, quantifying how far a respective information source was responsible for triggering a certain effect or for holding a certain opinion. Nevertheless, with the explicit reference to the specific source at the beginning of each item, it is assumed that participants were well able to perform this task. By now, it should get clear that these ‘change’ statements provided in itself an indication for neighbourhood effects.

Regarding ‘general’ opinion statements, participants were asked to state their views on for example the overall PES scheme, such as its usefulness or their overall motivation towards the environment. In these statements, no explicit reference to a certain information source was made, thus they only provide insights into attitudes. ‘I regard PES as an effective instrument to preserve forests and enhance biodiversity richness’ serves as an example. Through subsequently inserting open questions, attitudes could further be investigated in a more unstructured way, with participants being encouraged to freely express their own opinion on neighbourhood effects, thus providing another source to interpret quantitative findings.

Addressing the second part of the research question²³, ‘correlations’ and ‘difference’ measurements were used. The rationale for ‘correlations’ was derived out of the theory, checking if causality as suggested by certain theories in the literature can be found in the data. The effect of fairness concerns, of views on nature’s commodification and of controlling/autonomy enhancing effects (meaning that own efforts are not being acknowledged to measure crowding-out) on an individual’s motivation were planned to be examined using correlation coefficients.

Regarding ‘differences’, the hypothesis wanted to be tested that mean values of ‘change’ statements as well as of ‘general’ opinion statements identified through the first part of the research question increase the longer a household finds itself located next to a PES site. Therefore, and as explained under 5.3.1 (‘Sampling criteria for site selection’), PES sites which differ in years of contract establishment were selected. These temporal effects were planned to be tracked by checking the significance of the difference between the means of sub-samples. For the analysis, non-parametric as well as parametric tests built the basis.

5.5 The questionnaire

To design the questionnaire for this study, I orientated myself to the structure of a questionnaire produced by Signe Rugtveit, M.Sc. student at the University of Life Sciences (UMB) in Norway who conducted her research in 2011 at Catie in Costa Rica. She, in turn, drew on two surveys undertaken in Costa Rica in 2005, thus questions were already adapted and formulated according to the local idiom. Her research was concerned with landowners only and generally pursued different objectives. Therefore, only few questions regarding socio-economic aspects were adopted (age, education level, income etc.) as

²³The second part of the research question investigates how identified neighbourhood effects can be explained, looking at relationships between variables on the one side and certain theories and their proposed effect-channels on the other.

these variables were not tailored to the specific research context. Nevertheless, the overall structure supported in gaining a clear view on how to organise questions.

The questionnaire for this study consisted of three parts. The first part dealt with general information about PES, such as if an interviewee had ever heard of the PES programme, how many PES receivers a person knew, out of which sources an interviewee had received information about PES, if a person knew that a PES site was located in the nearby vicinity (0 to 500m around), if an interviewee had ever applied for a PES contract and questions of a more hypothetical nature, such as what an interviewee thought would happen in case a PES receiver cut trees in their Finca or in case the programme would not have existed. Several questions posed at the beginning of this part were not directly relevant for answering a specific research question, they rather checked preconditions for the whole questionnaire to work. Furthermore, control questions screening for instance participants own definition of geographical neighbourhood were inserted, as well as a section on landowners who had applied and/or received PES payments, in case former applicants or contract receivers were encountered during interviews.

The second part had the objective to measure attitudes via the developed Likert-scales. As described under 5.2, this part consisted, before pre-testing the questionnaire, of 34 items, some newly formulated and selected out of a pool of potential items and some taken from pre-defined scales, rounded up with open questions. In total, 13 concepts wanted to be measured with numerous questions being formulated in the way that a clear attribution of an effect was possible ('change' statement, see Figure 20 above). This second part built the basis for the analysis of the various theories and effects outlined in the literature review, for instance of crowding theory, and was thus of major importance. Note that this second part was altered quite substantially after pre-testing of the questionnaire

The third and last part of the questionnaire enquired about socio-economic variables, such as gender, age, education level, income etc.. These information served as a basis to describe the obtained sample in its socio-economic characteristics.

To guarantee that questions were phrased according to local language characteristics, a native Spanish-speaker checked the whole questionnaire for errors/inconsistencies in a first step. Then, a local Costa Rican researcher at Catie double-checked and re-phrased where necessary. In general, interviewees were explicitly be told that no judgements will be made about their responses, avoiding to become overly friendly with candidates to address the social desirability bias [Bryman, 2008].

Pre-test modifications To pre-test the questionnaire, five pilots were conducted in the spatial zone of A1-07/08 (see yellow pins, Figure 22). The pre-test phase proved to be highly instrumental in further tailoring the questionnaire to the local environment, as several obstacles were identified:

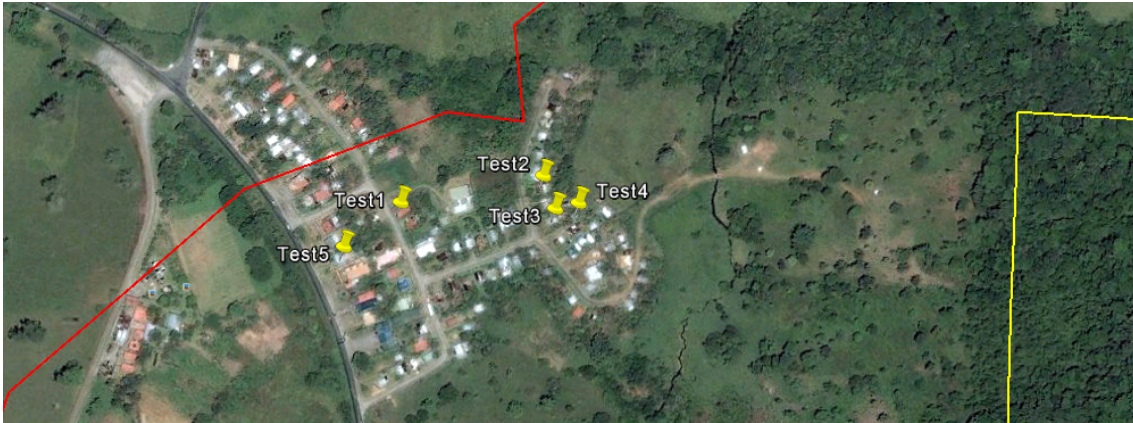


Figure 22: Observation points for pre-test of questionnaire

- PES knowledge

When asked ‘Have you ever heard about the Payments for Environmental Services (PES) programme?’, a question upon which the realisability of the questionnaire depended, four out of five interviewees responded with ‘No’, jeopardising the whole process. As I did not want to end the interview right at the spot, I tested some other questions which came to my mind and it turned out that when asked ‘Do you know if there exists a programme here in Costa Rica in which the government and its institutions pay persons who protect forest or reforest on their private Finca?’, almost all test persons knew that programmes of this sort existed. Therefore, more questions on the knowledge of the PES scheme itself were included.

- PES site

The majority of interviewees answered to the following question ‘Do you know if there is a property in the distance of maximum 500m from here which currently has a PES contract?’ with ‘No’. I personally was somewhat surprised as these properties were located close-by, so I was interested in whether interviewees thought that they would be aware of the existence of a PES scheme on a property in the distance of maximum 500m from the present location in case it existed. Therefore, this question was inserted aswell.

- Likert-scales

The major configurations concerned the developed Likert-scales, as several problems emerged during interviews. As a first point, it appeared to me that a differentiation

according to a seven-point scale²⁴ was perceived as too complex/nuanced. Therefore, it was decided to reduce possibilities to a five-point scale²⁵, further illustrating options via a show-card which depicted thumbs to better understand the meaning of available options (see Figure 23).

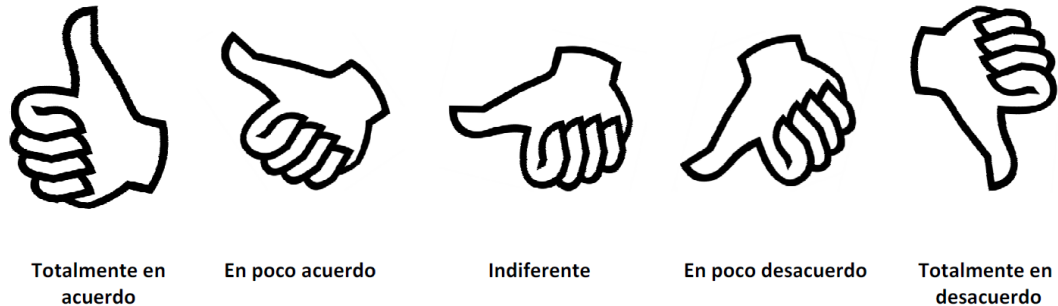


Figure 23: Show-card for five-point Likert-scales

A second point concerned reverse wording of Likert items. As explained in 5.2 ('Likert-scales'), a claim has been made in the literature to use reverse wording, i.e. to use opposite stances (positively and negatively formulated statements) to minimise response sets and to address the issue of acquiescence - the tendency to agree with which leads results to be biased [Bryman, 2008]. Some negatively formulated statements had to be read again as interviewees did not understand them right away, thus it seemed that these statements were difficult to grasp in comparison to positively formulated ones. As a tendency to agree with all could not be discovered, it was decided to drop the idea of reverse wording. A third point circled around the usage of the Motivations Towards the Environment Scale (MTES), with which the motivation to do something for the environment should be measured in 12 items. However, the long list of items proved exhausting and as the questionnaire had to be slimmed in general (see next point), the MTES was excluded.

To be somehow able to measure a person's motivation to take action for the environment, a question was used as replacement asking a person to self-rate their motivation in a number ranging from zero to ten. I am well aware that this replacement is not ideal as it is prone to social desirability bias, i.e. "a distortion of data that is caused by respondents' attempt to construct an account that conforms to a socially acceptable model of belief or behaviour" [Bryman, 2008, p.699], but given the circumstances, it was thought to be acceptable. Point four concerned the overall extent of the questionnaire which had to be reduced to stay manageable within 30-40 minutes. Besides cuts in part one and part three, concepts to be measured in part two were reduced from thirteen to ten. Furthermore, also due to point two

²⁴Strongly agree, agree, slightly agree, undecided, slightly disagree, disagree, strongly disagree

²⁵Totally agree, agree, undecided, disagree, totally disagree

and three, Likert-items were cut down from the initially 34 to eight. To maintain a high level of meticulousness, more open questions were inserted following a Likert statement.

In congruence with the first questionnaire, all alterations were double-checked by a native speaker and a local Costa Rican researcher employed at Catie. In general, the pre-test phase turned out to be highly useful to modify and improve the catalogue of questions.

5.6 Ethical considerations

Interviewees were informed about the purpose and possible uses of the research, thus relevant information was given and participation only occurred after free prior informed consent. My stance was best represented by ‘empathic neutrality’, meaning “an empathic stance in working with study respondents seeks[ing] vicarious understanding without judgement (neutrality) by showing openness, sensitivity, respect, awareness, and responsiveness” [USC, 2012].

6 Results and discussion

The following chapter pursues the objective to highlight and discuss results. In a first step, the obtained sample will be described in more detail and, where feasible, compared to overall Costa Rican population statistics to gain an impression of the socio-economic composition of the sample, checking in which ways it might be biased as the site selection was carried out in a non-random fashion. Next, results describing general sample characteristics regarding PES will be presented. These results do not answer the outlined research questions, they serve more the purpose to convey to the reader how familiar interview participants generally were in terms of the PES programme. This subsection will be followed by a paragraph evaluating questions belonging to part one of the research question before, in a fourth and final step, the second part of formulated research question and its hypotheses will be assessed and tested. Generally, obtained data has been encrypted to prevent unauthorised access, using the open source software ‘TrueCrypt’.

The obtained sample resulting out of the household selection process is illustrated by Figure 24 (for A1-07/08), Figure 25 (for A2-08) and Figure 26 (for A3-10/11). The total number of interviews amounted to 98, with a rate of non-response of 15.3 percent (replacement of 15 households due to unavailability after three attempts, cf. [Arriagada et al., 2010]). 17 interviewees were not aware that a PES programme or a programme in which the government and its institutions pay landowners for forest protection or reforestation on their private Fincas exist (see Appendix II, question 1a and 1c), thus these persons had to be excluded as an interview could not be realised. Households belonging to this category

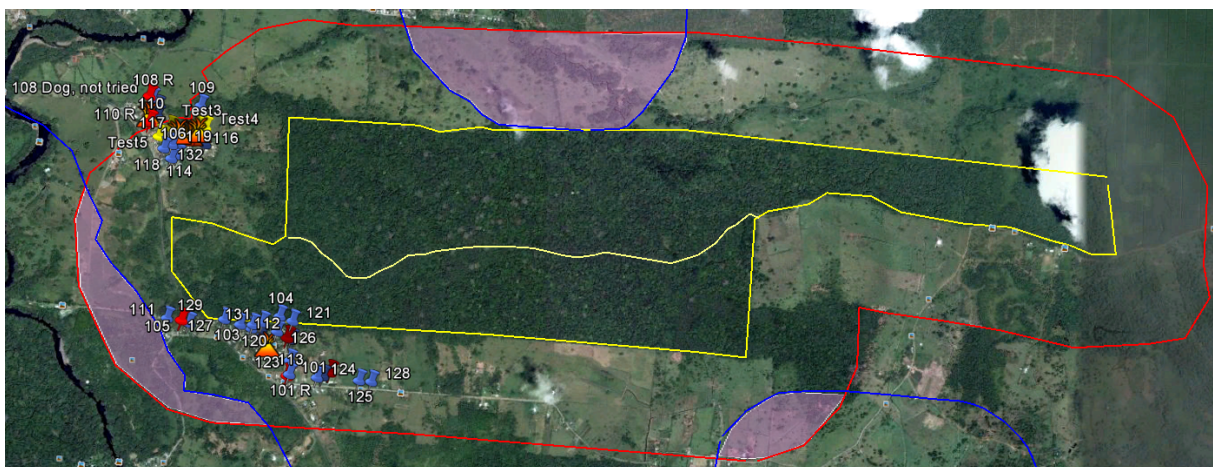


Figure 24: A1-07/08 with all household observation points

are indicated through a yellow vulcano in the afore mentioned Figures, leaving 81 valid interviews, shown by blue pins. Nevertheless, socio-economic data has been collected from all 98 potential interviewees, thus the group indicating that they were not aware of any programmes such as PES can briefly be compared to eligible participants. For this

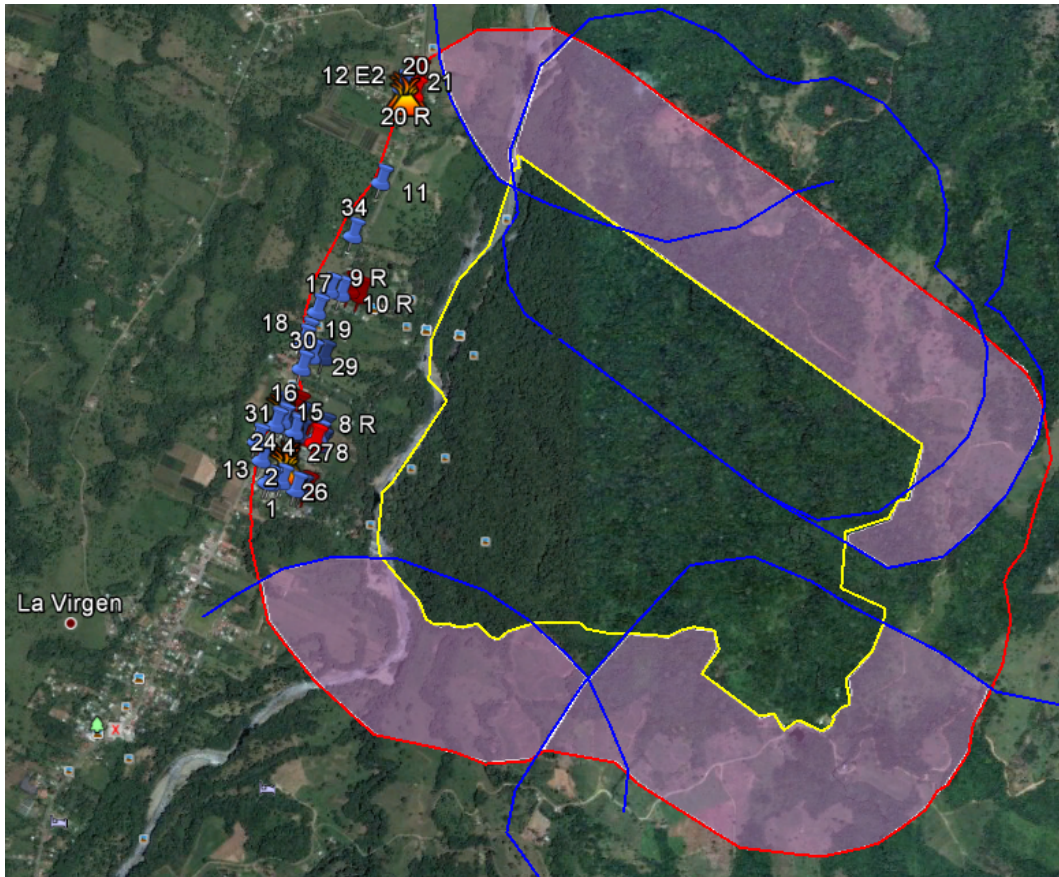


Figure 25: A2-08 with all household observation points

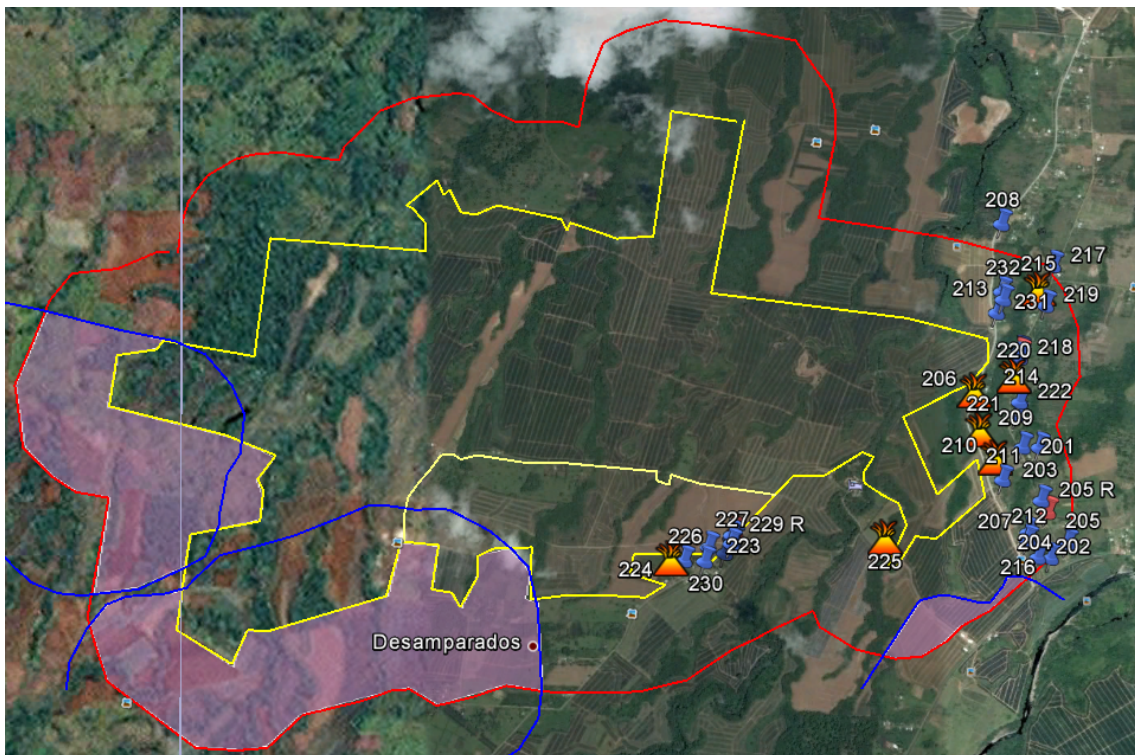


Figure 26: A3-10/11 with all household observation points

purpose, age, the attained education level as well as the household’s consumption level appear of interest. With reference to the first two variables, the null-hypothesis stating that means of the age as well of the attained education level are equal for both groups cannot be rejected at a five percent significance level (see Table 31 and 32 in Appendix I for more details). However, when comparing consumption levels, the null-hypothesis that respondents who know about the existence of programmes such as PES are characterised through higher average means with reference to consumption levels can be rejected (one-tailed test, $t_{stat}(df:95)= 2.693$, $t_{crit}= 2.628$, $\alpha = 0.005^{**}$). The 95 percent confidence interval suggests in this case that with a probability of 95 percent, interviewees who did not know about the PES programme were between 0.22 and 1.47 consumption categories lower than people who knew about it. As the test was significant at $p=0.005$, also the 99 percent confidence interval could have been constructed.

6.1 Socio-economic sample characteristics

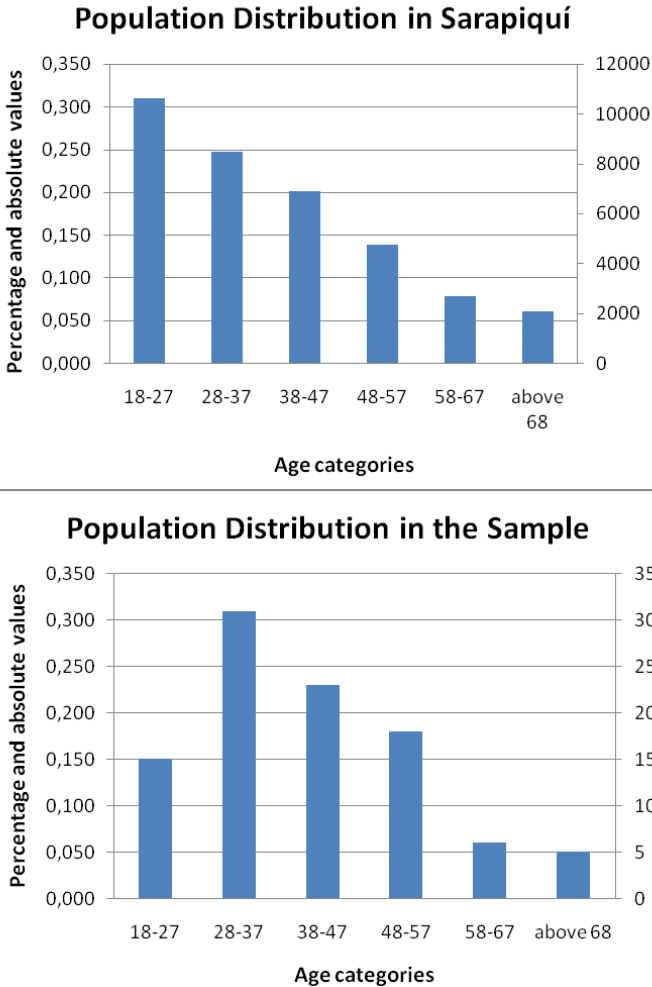


Figure 27: Population in Sarapiquí and in the sample

Remembering section 5.3.6 ‘Consequences of sampling criteria’ and that site-selection was carried out in a non-random fashion, it might be worthwhile to check the socio-economic composition of the obtained sample to gain further insights in which ways it might be biased. Figure 27 for instance shows the age distribution classified into age categories of inhabitants of the Sarapiquí region according to 2011 Census data (upper part) and the age distribution of the sample, in percentage (primary y-axis) as well as in absolute values (secondary y-axis). Except for the first age category 18 to 27, the declining trend seems to be captured by the study. Assuming that older people on average have lived for a longer time period in a certain place and this is correlated with

general knowledge of the close-by region, one implication of the under-representation of the youngest age category in this study could be that study results are upward biased, i.e. that more people indicate that they have heard about the PES programme than what would be gained by having a closer representation of Sarapiquí’s population in the sample.

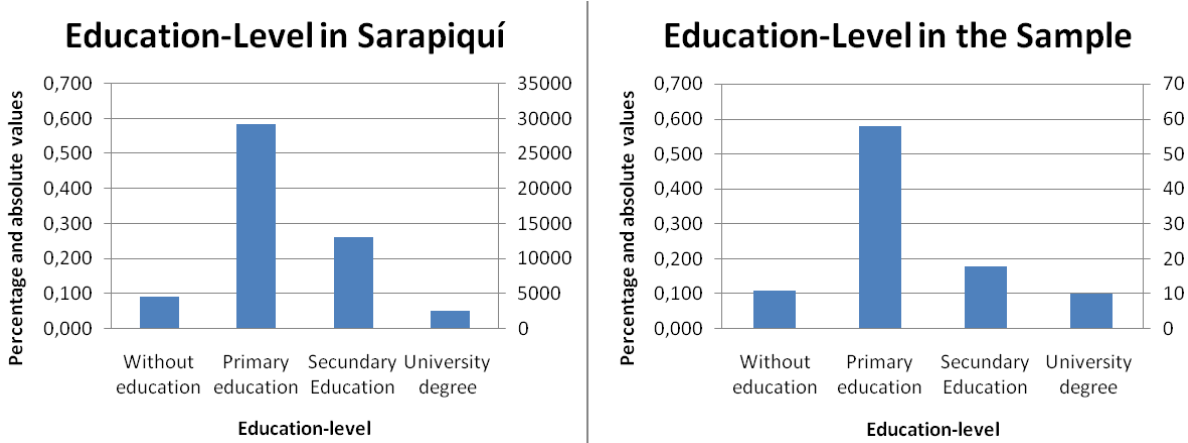


Figure 28: Attained education levels in Sarapiquí and in the sample

A second socio-economic characteristic worth assessing seems to be the attained education level to check if sampled respondents are generally better or worse educated than average citizens living in Sarapiquí, again drawing on 2011 Census data. Judging Figure 28 at first sight, it appears reasonable to acknowledge that the overall education distribution in Sarapiquí is quite well mirrored by the sample. Citizens without formal education make up roughly 10 percent, primary education have received almost 60 percent of the population. With respect to the latter two categories, i) citizens holding a university degree are somewhat over-represented in the sample than in the actual population and ii) citizens having attained secondary education are somewhat underrepresented. Nevertheless, the tendency is well captured.

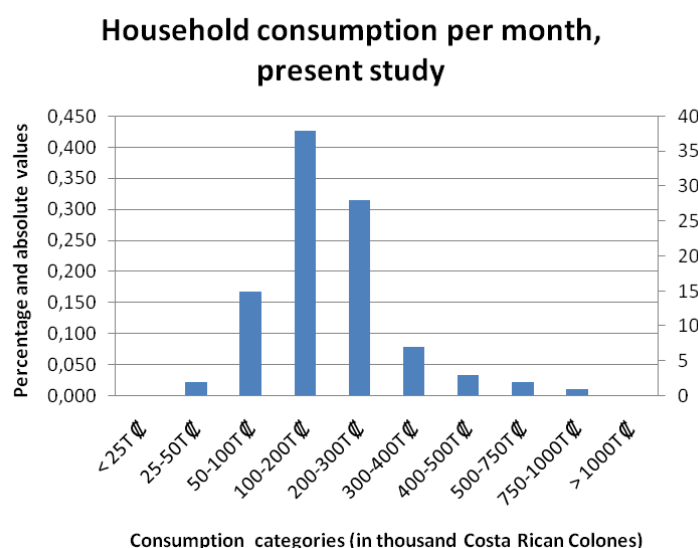
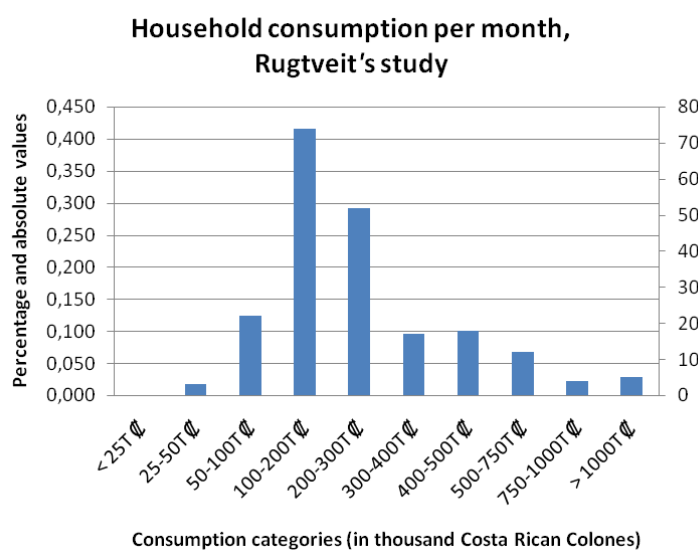


Figure 29: Consumption levels, Rugtveit and sample

the fourth with 703,500 and the fifth with 1,582,810. As the question investigating consumption levels was taken over from a study conducted by Signe Rugtveit in Costa Rica (see 5.5, 'The questionnaire') in 2011, a comparison can be made to her results. Her research was concerned with landowners only, possessing on average a farm of 58ha which might carry implications in itself for income and/or consumption levels. Furthermore, the study was conducted in the canton of Hojancha in the Guanacaste province, lying to the west of the country. Nevertheless, as data on the same variable are available, the opportunity to compare results and to catch a glimpse upon the sample should not be missed. Figure 29 shows both distributions. It becomes clear that sampled households in this study are described through lower consumption levels, even though the most frequently cited consumption categories appear to be similar: In both studies, around 42 percent of respondents indicated that they spend around 100,000 to 200,000 thousand Costa Rican

Another interesting variable to investigate concerns income or consumption levels. In the questionnaire, interviewees have been asked to express total household consumption per month, including all expenses of household members for food, clothing, school fees, medicines, combustibles, insurances etc. in an approximate number corresponding to one of ten categories. As the 2011 Census provides data on income per household only, no direct comparison can be made as consumption expenses might be higher or lower than income depending on individual saving or loan patterns. For the whole region 'Huetar Norte' (the smallest unit in the 2011 Census for this variable), the total average household income is given with roughly 640,000 Colones. The first quintile is described with 141,400, the second with 314,100, the third with 454,800,

Colones on consumption, and roughly 30 percent named the category standing for 200,000 to 300,000 thousand. However, the null-hypothesis stating that means are equal for both groups can be rejected at a five percent significance level (2-tailed test, $t(df:194.3^{26}) = -2.236$, $p = 0.026^*$, $\alpha = 0.05$).

Description	Observations	Total	Percentage
Has plot of land or Finca (agricultural/ livestock usage) in Sarapiquí	1979	16158	0,122
Has plot of land or Finca (agricultural/ livestock usage) in Heredia	7535	125647	0,060
Has plot of land or Finca in the Sample	9	97	0,093

Table 4: Land-owners in Heredia, Sarapiquí (both Census 2011) and in the sample

A final characteristic worth checking to further describe the socio-economic composition of the sample concerns the amount of landowners in the sample. The 2011 Census enquires about the existence of a plot of land or a Finca for agricultural and livestock uses only ('Tiene parcela o finca agropecuaria'), and it is not clear how far ownership of land without such activities is considered in the definition. PES participants for example are not allowed to undertake any land-use changes on their Fincas while receiving payments. Thus, the comparison with numbers generated out of the study sample where interviewees were just asked if they have a plot of land or a Finca in general has to be treated with caution. Table 4 shows that in Sarapiquí, the percentage of respondents indicating that they own a Finca as defined by the Census is, with 12.2 percent, more than double the provincial average of 6 percent. The sample result of 9.3 percent lies well within.

6.2 General sample characteristics regarding PES

Having described the sample in socio-economic terms, a characterisation of general characteristics of the sample regarding PES is the aim of the following, conveying to the reader how familiar interview participants generally were with reference to the PES programme.

The leftmost graph of Figure 30 illustrates responses to the opening question of the questionnaire. Here, roughly 18 percent responded with 'Yes' when asked if they had ever heard about the PES programme, thus they were immediately deemed eligible for conducting interviews. Further 63 interviewees who did not know about the existence of such a programme knew that in Costa Rica, programmes have been set up in which the government and its institutions pay individual persons who protect forest or reforest on their private Finca, which is synonymous to PES. Therefore, these persons were also

²⁶No integer due to Levene's test for equality of variances. Here, equality can be rejected at a five percent significance level ($F=5.097$, $p=0.025$, $\alpha = 0.05$).

deemed eligible, leading to 81 valid interviews. The rightmost graph in Figure 30 depicts this result, further showing that with 17 interviewees, the questionnaire could not be realised. Note that also people who indicated that they knew the PES programme were asked the question heading the rightmost graph, as inconsistencies could be discovered here. The graph to the middle shows that Fonafifo, the administering agency, is generally

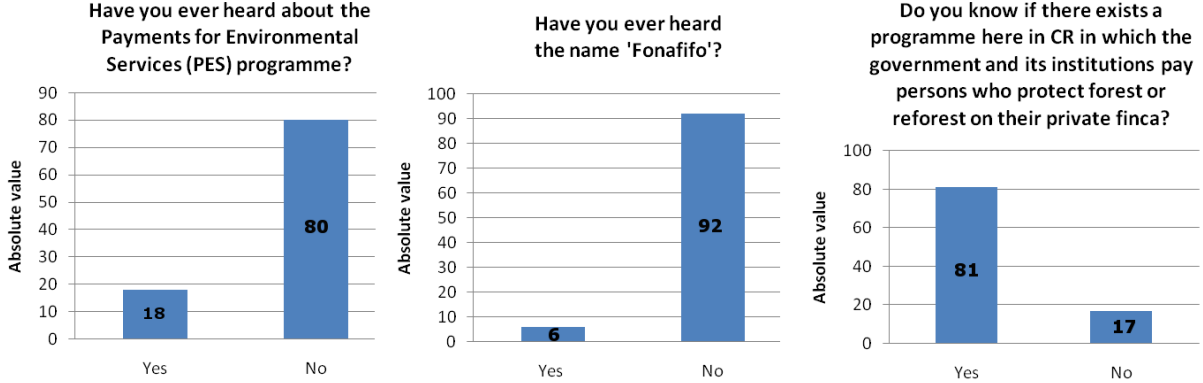


Figure 30: Questionnaire preconditions

not well known among study participants, even among people who have heard about the PES programme. While being in the field, forest experts have been enquired about their expectations regarding participant’s responses (people living in the Sarapiquí canton) over the existence of programmes in which the government and its institutions pay persons who protect forest or reforest on their private farm. Fernando Salaz Sarkis, head of Minae’s regional office as well Eduardo Solórzano, head of Fonafifo’s regional office in Sarapiquí, responded in a similar fashion by stating that according to their knowledge, the vast majority (la ‘gran mayoría’) should be aware of it. Whereas the former puts emphasis on his view by verbally reaffirming his opinion twice (quote: “Si la gente si sabe, si lo conocen...”, ‘Yes, people do know it, yes they possess knowledge of it’), the latter quantifies his guess, stating that around 80 percent of respondents would answer with ‘Yes’ when confronted with the afore described question. Looking again at the rightmost graph in Figure 30, we can calculate the sample rate which is given with 82 percent, thus the estimate put forward by Eduardo Solórzano matches the study result extremely well.

Note that after the opening questions, I explicitly told eligible participants to refer from now on to programmes in which the government and its institutions pay persons who protect forest or reforest on their private farm as Payments for Environmental Service programmes. Therefore, this terminology was used throughout the questionnaire.

Before turning towards the assessment of outlined research questions, it appears interesting to describe the sample in terms of eligibility criteria for PES application. Participants have not been pre-screened if they met demanded criteria or not, as this study desired

to analyse the existence of effects triggered on the overall population - effects which are not necessarily limited to eligible forest owners only. Out of the pool of 81 interviews, just two persons stated that they had ever applied for PES. However, one person did not remember much of the process as they applied around the year 2000 and the Finca had to be sold years ago due to financial constraints facing the family. Table 5 demonstrates that even though just two households ever applied for PES, the number of households deeming themselves eligible for PES application is given with five (note the difference to Table 4 where the number of landowners in the sample is given with nine. Eligibility is here defined as owning a Finca/ a plot of land of a minimum size of two hectares with a standing forest on it). This finding already illustrates that the vast majority of interview participants were simply not eligible for PES participation, a finding which is described in more detail by Table 6. Here, 88.9 percent of total participants or 92.3 percent of total valid observations for this variable (as three

		Frequency	Percent
Valid	No	74	91,4
	Yes	5	6,2
	Do not know	2	2,5
	Total	81	100,0

Table 5: Eligibility for PES

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	I don't think that I would be eligible for PES (not enough land/ no Finca)	72	88,9	92,3	92,3
	I don't know how to apply/ very complicated	2	2,5	2,6	94,8
	The programme does not appear very useful	1	1,2	1,3	96,1
	Do not need remuneration/ Own motivation to keep	1	1,2	1,3	97,4
	Other	1	1,2	1,3	98,7
	Close to a gully	1	1,2	1,3	100,0
	Gesamt	78	96,3	100,0	
Missing	99	3	3,7		
Total		81	100,0		

Table 6: Reasons why never applied for PES

participants did not want to indicate anything, thus they were coded 'missing') expressed that they did not have enough land/no Finca when asked why they never applied for PES, thus they were per definition excluded from the programme. Furthermore, two interviewees named a too complicated application process as main reason for not applying, such as "lots of paperwork" ('mucha papelera') and "the government demands really a lot...many formulars and documents" ('el gobierno pide muchíssimo...muchos formularios y papeles'). Other reasons, which were just named once, included the impression that the

programme did not appear very useful or the perception that no remuneration is needed as the own motivation sufficed for forest protection. In addition, one participant stated that he has to share the Finca with a relative, and that decisions regarding land use have to be taken in conjunction. Whereas he supported the idea of PES, his relative opposed it, thus the status-quo of the Finca could not be changed.

6.3 Results RQ part I

The subsection which follows will investigate every question belonging to part one of the research question in more detail, assessing knowledge about PES, if neighbourhood effects can generally be identified and what perceptions people living close to a PES contract hold over certain parts of PES or the environment in general. To that end, various tables, graphs and charts will be used to illustrate results.

- *How many people who receive/have received PES payments interviewees generally know?*

It has been shown in section 6.2 ‘General sample characteristics regarding PES’ that the majority (sample rate: 82 percent) of sampled participants were aware that PES programmes or programmes in which the government and its institutions pay persons who protect forest or reforest on their private farm exist in Costa Rica, a result which stands in line with expectations expressed by forest experts. A subsequent question concerns the amount of people interviewees knew who still receive or have received PES payments, thus where a direct reference point would be given. Figure 31 gives a first indication, grouping known people into categories such as if they belong to family/ relatives, to the circle of friends, to the neighbourhood or if they are just ‘Others known’ (also ‘distant acquaintances’ for the Spanish ‘conocidos’), further divided by their geographical location. Note that every participant was asked to indicate the number of persons she knew out of each category, thus multiple answers were permitted. The biggest group is represented by ‘distant acquaintances’ coming mainly out of the Sarapiquí canton itself, followed by family members/relatives and friends. Looking at the two latter groups, it can be said that the geographical proximity defined by the canton’s boundaries appear of minor importance, as in both groups the knowledge of people who have/had a PES contract living inside and outside of Sarapiquí is more equally distributed compared to ‘Others known’. The finding that four people knew neighbours who have/had a PES contract but live outside of Sarapiquí is explained by the fact that these persons lived themselves in a different locality before moving to Sarapiquí.

Table 7 gives a more detailed description of obtained responses. Here, vertical summation of one category leads to 81, thus responses of all interviewees are recorded according to the amount of people known out of the various categories. In comparison to Figure 31,

How many people interviewees know who have/ had a PES contract, sorted by categories

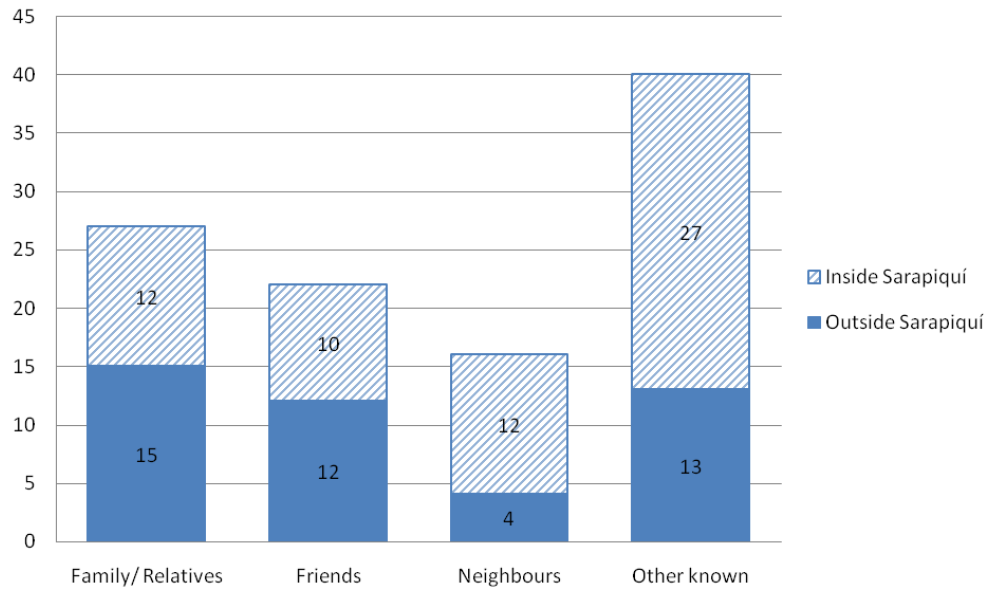


Figure 31: Knowing people who have/had a PES contract, sorted by categories

this table shows that in every category, except for ‘Other known inside Sarapiquí’, almost three-fourths of respondents indicated that they knew not a single person (#0 = zero persons known) belonging to one of the respective groups. In case an interviewee did know a person in one out of the eight categories, she is quite likely to know just one as the values for two, three, four or five persons known (#2, #3, #4, #5) are relatively small.

	Family/Relatives inside Sarap.	Family/Relatives outside Sarap.	Friends inside Sarap.	Friends outside Sarap.	Neighbours inside Sarap.	Neighbours outside Sarap.	Other known inside Sarap.	Other known outside Sarap.
#0	62	71	69	73	68	70	55	60
#1	15	8	7	6	12	10	18	16
#2	1	2	2	2	0	1	4	4
#3	2	0	2	0	0	0	2	1
#4	1	0	0	0	1	0	2	0
#5	0	0	1	0	0	0	0	0

Table 7: Knowing people who have/had a PES contract, detailed

Being enabled to make a point with reference to the amount of people interviewees generally knew who have/had received a PES contract, i.e. not depending on one out of the eight categories, we have to consult Figure 32. Here, we see that 26 participants did not know a single person who has ever received a PES contract, 30 participants knew one, 9 were aware of two, 8 of three, 7 of four and 1 of five. As 26 interviewees had

not a single person who has ever received PES among their circle of known people, it appeared interesting to illustrate from where these persons heard for the first time about the existence of PES. Therefore, these sources are represented here as-well. The Figure illustrates that approximately 70 percent of respondents knew i) not a single person or ii) one person only, and that for both groups publicly available information sources such as radio, television or newspapers played the most important role for their first contact to PES. For respondents who knew two or more PES contract receivers, this source seemed to decrease in importance. Moreover, the fact that around one-third of participants did not know a single person who has/had ever received a PES contract but were still aware that PES programmes or programmes in which the government and its institutions pay persons who protect forest or reforest on their private farm exist, implies that a direct contact point is not necessary for a first information provision.

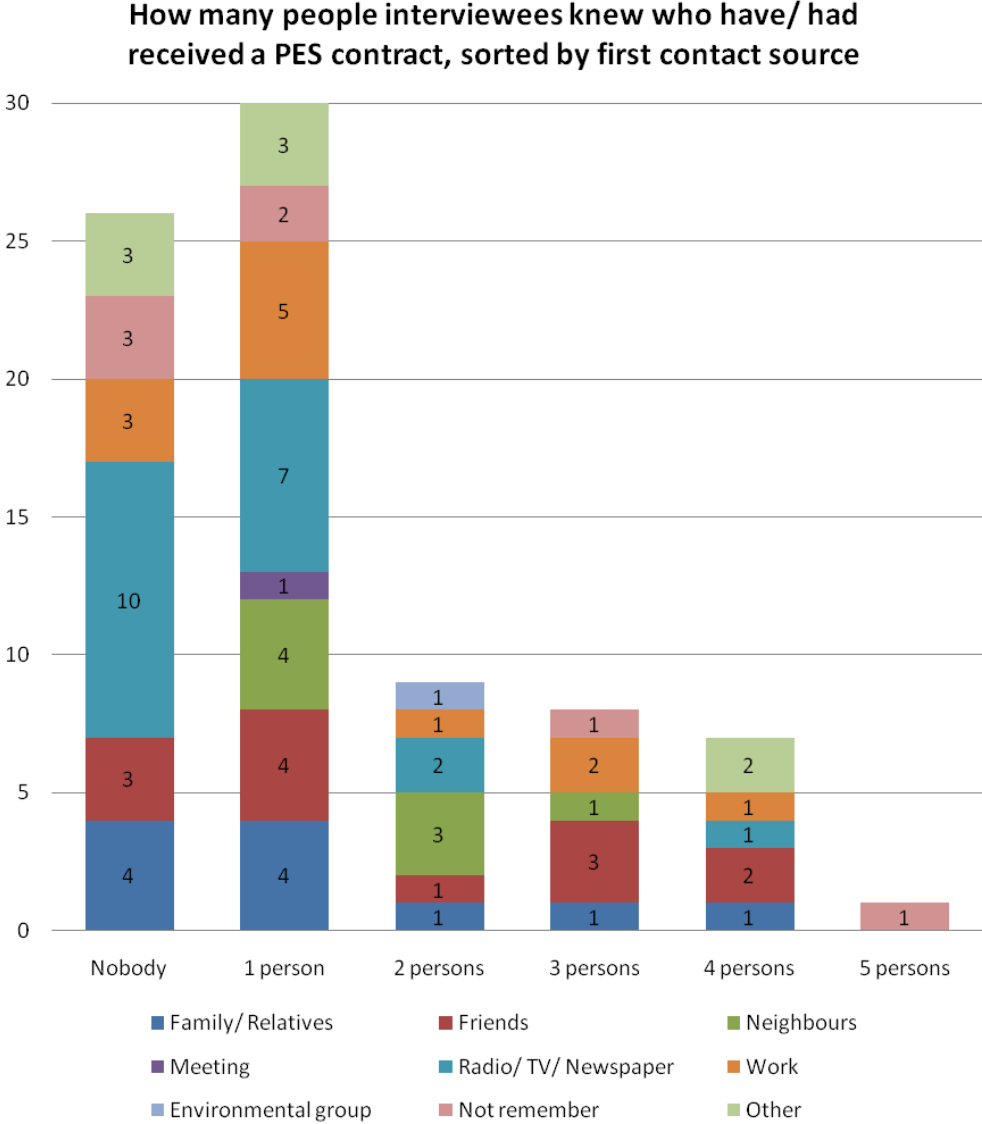


Figure 32: Knowing people who have/had a PES contract, sorted by first contact source

- *What are the main channels through which people hear and receive their information about PES?*

Answering through which channels participants heard and received their information about PES, responses to two questions posted in the questionnaire will be highlighted. At first, the channel through which interviewees heard for the first time about PES will be described. Then, an analysis of the strongest information source regarding PES information will follow, as similarity between both channels cannot be assumed.

2012-2009	2008-2005	2004-2001	2000-1996	do not remember
20	23	16	17	5

Table 8: Year in which heard for the first time about PES

Table 8 and Figure 33 demonstrate in which year and from whom participants heard for the first time about the existence of PES. The Figure is composed of twelve categories, indicating a wide range of sources. The chart already differentiates according to sources belonging to the neighbourhood dimension, represented through pieces set apart on the rightern side, and sources lying outside of this dimension. As immediately visible, radio/TV and newspaper represent the most frequently cited first contact point with 25 percent, followed by information received through friendships with 16 percent (summation of friends who never had a PES contract and friends who have or have had a PES contract), information received through the workplace with 15 percent and information received from family members or relatives with 14 percent (summation). What appears interesting is that the neighbourhood defined as geographical distance plays a minor role only with 9 percent (summation), and that electronic transmission of information together with information received from the workplace are, combined, more important as a first contact source for information dissemination regarding PES (40 percent vs. 39 percent) than the three summated sources belonging to the neighbourhood dimension (family/relatives, friends, neighbours). However, at this stage interviewees were asked from whom they heard for the first time about the PES programme only.

By contrast, Figure 34 enquired about the strongest source out of which an interviewee received information regarding PES. The chart is organised in a similar fashion as Figure 33 to facilitate comparison, with sources belonging to the neighbourhood dimension again being set apart. Comparing both charts, two aspects grow apparent at first sight: First, when asked concerning the strongest source for information provision, two categories describing from whom a person heard for the first time about PES became obsolete, namely ‘Environmental group’ and ‘Do not remember’, thus Figure 34 is composed of less categories (for Figure 33, n=81, for Figure 34, n=79). Second, sources grouped together

From whom did you hear for the first time about the PES programme?

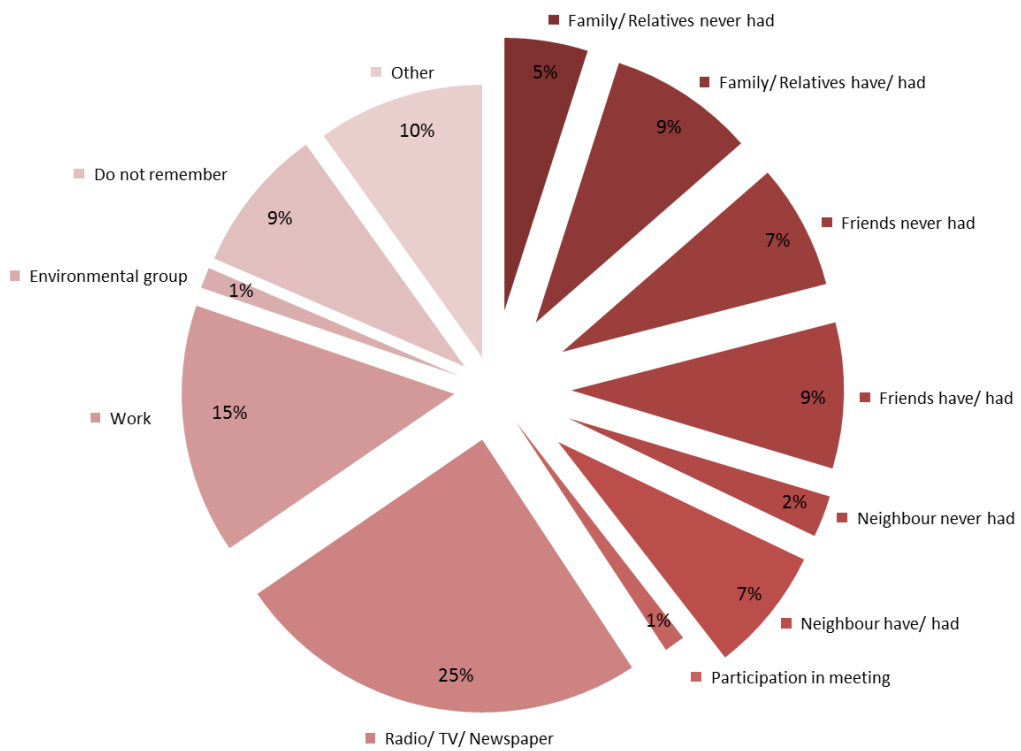


Figure 33: First time heard about PES, sorted by categories

What was the strongest source out of which you received information about PES?

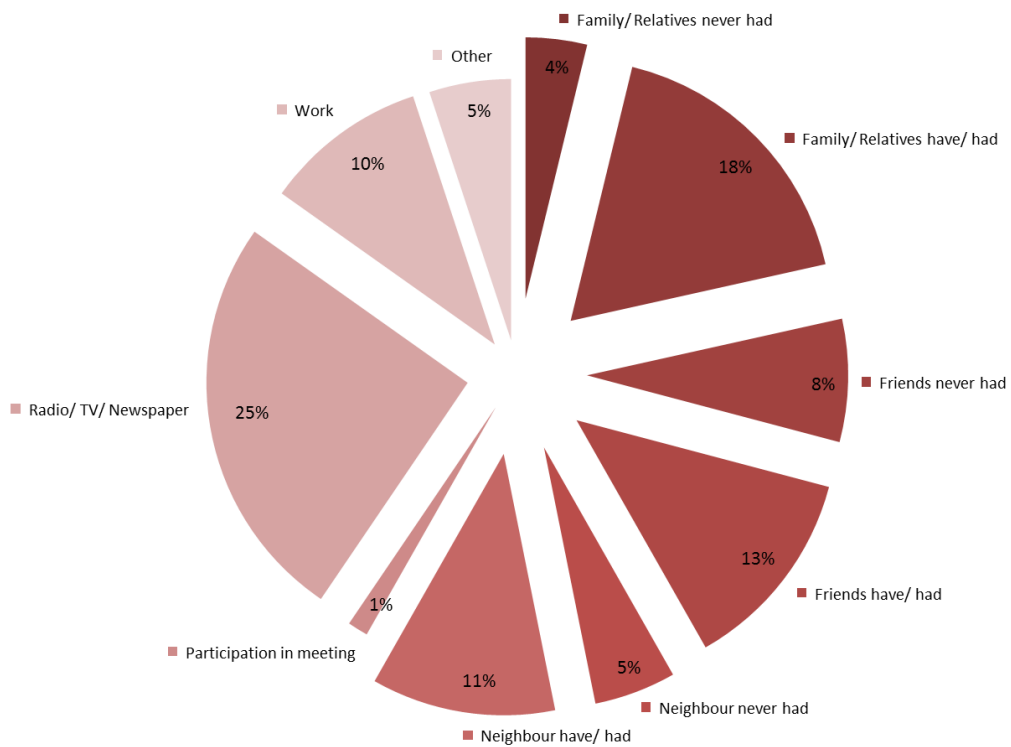


Figure 34: Strongest source for PES information I, sorted by categories

under the term neighbourhood dimension account for a greater part of the pie chart than before, namely 59 percent compared to 39 percent earlier. The increase in importance of more than 50 percent indicates that family/relatives, friends as well as neighbours are important sources for information transmission and that they, even when a different first contact point to the PES topic has been made, can complement and deepen knowledge. This is particularly relevant in case interviewees knew persons who still receive or had received a PES contract in the past, as the most significant increase in percentage points is registered in these three categories: For family/relatives, this increase amounts to 100 percent (9 percent to 18 percent); for friends to 45 percent (9 percent to 13 percent); and for neighbours to 57 percent (7 percent to 11 percent). Overall, information received through radio, TV or newspapers still represent the main channel through which participants receive information about PES, again with 25 percent. That the importance of publicly available information has not not ceased nor increased might be explained by the fact that 26 participants in the questionnaire did not know a single person who ever had a PES contract, thus an increase in favour of the neighbourhood dimension is ruled out. When asked if a local or national level radio, TV or newspaper was responsible for the knowledge transfer, all respondents (100 percent) stated it has been a national level one.

Furthermore, participants indicating a source belonging to the neighbourhood dimension have been asked more openly why they received information about PES from their respective surroundings, i.e. why for instance a family member or a friend spoke about the topic and if they can imagine a reason why these particular persons have influenced their knowledge of PES and others not. Table 9 lists answers, which could generally be grouped into four categories. The majority of persons indicating a source belonging to

	Family/ Relatives	Friends	Neighbours
Just a comment/ Just heard it	12 (70.6%)	17 (94.4%)	9 (81.8%)
Explained properly	2 (11.8%)	1 (5.6%)	1 (9.1%)
Explained (relevance for own Finca)	2 (11.8%)	0	1 (9.1%)
Explained (for potential Finca in future)	1 (5.8%)	0	0
	17 (100%)	18 (100%)	11 (100%)

Table 9: Reasons for speaking about PES, sorted

the neighbourhood dimension stated that family/relatives, friends or neighbours made just a comment about PES or that they just heard about it briefly (70.6 percent, 94.4 percent and 81.8 percent respectively), thus a proper explanation of the various aspects surrounding PES does not seem to have taken place. A slight difference is noticeable when participants heard from family members or relatives, as here roughly 30 percent indicated that they received a proper explanation - two because it might had been of relevance for

a Finca which they owned, one as she was thinking about acquiring a Finca in future and two just for the pleasure of knowing.

- *Are interviewees aware that a PES contract exists in the distance of maximum of 500m from their homes?*
- *Have interviewees who know PES ever spoken about the programme with their neighbours living at a distance of maximum of 500m?*

Both research questions stated above concern effects related to the geographical neighbourhood definition which was set at 500m in the study, thus they will be dealt with together. Remembering subsection 5.1 ‘Definition of neighbourhood’, a 500m dimension has been chosen due to the explicit recommendation by a local Catie researcher, stating that this dimension would probably mirror best the understanding of geographical neighbourhood of most interviewees. Table 10 displays that 69 interviewees, or 86.3 percent of the valid percentage, did not know if there exist a property in the distance of maximum of 500m from their place of residence which currently has a PES contract. This number somewhat surprised me as I thought it to be much lower. As outlined in the above mentioned ‘Definition of neighbourhood’, I was planning to actually use a much broader geographical definition of neighbourhood when drawing up the research proposal, namely a first spatial zone up to 1km and a second one encircling up to 3km. After discussions

Do you know if there exists a property in the distance of maximum 500m from here which currently has a PES contract?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	69	85,2	86,3	86,3
	Yes	9	11,1	11,3	97,5
	Unsure	2	2,5	2,5	100,0
	Total	80	98,8	100,0	
Missing	99	1	1,2		
Total		81	100,0		

Table 10: Knowledge of PES in the vicinity

at Catie and the decision to significantly narrow down the geographical extent, I was expecting that the majority of interviewees were aware of the existence of a Finca with PES close-by, as all participants knew about the general existence of such programmes (see Figure 30, ‘Questionnaire preconditions’). In addition, a geographical distance of 500m to a PES property marked the outer boundary of the sampling area - many households were located at a closer range even, for instance 100m, 200m or 300m away. Furthermore, out of the nine responses indicating that they indeed knew of the existence, four were clearly not the one still receiving payments, thus the amount of people who actually were aware of the PES is around five.

Have you ever spoken with people who live in the distance of maximum 500m from here about PES?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	78	96,3	96,3	96,3
	Yes	3	3,7	3,7	100,0
	Total	81	100,0	100,0	

Table 11: Information-sharing within the vicinity

phical proximity can hardly be made. This finding appears consistent with a comment made by Mr. González Chaverri, forest expert at Fundecor: “I would like to tell you that in Costa Rica, farmers are very individualistic, they are...[pause]... they do not share a lot with neighbours what they are doing on their Fincas. I noticed that there is a culture for doing things on your own rather than sharing them with the others ” (‘Quiere decirle que en Costa Rica, los finceros son muy individualistas, son muy...[pausa]...de no compartir mucho con otros vecinos sobre lo que hacen en su finca. Yo he sentido que hay mucha cultura de hacer las cosas por su cuenta, y no tanto compartirlas con los demás’). Fortunately, geographical neighbourhood has just been one possible source for the attribution of neighbourhood effects, with information received from family member, friends etc. representing other sources²⁷. Nevertheless, the finding was surprising. With reference to the methodology employed in this study, the fact that an argument for the existence of geographically determined spill-overs can hardly be made has severe consequences. In retrospect, it can be said that the pre-set sampling criteria for site selection (see subsection 5.3.1), especially criterion a (‘first PES area ever established at site’) which substantially complicated the sampling process, did not turn out to be useful as neighbours were simply not aware that a PES scheme existed in their geographical neighbourhood. Thus, the restrictivity imposed by this criterion could have been circumnavigated with this insight, shortening the amount of time needed for the preparation of this study.

Both research questions used a 500m definition of geographical neighbourhood, thus a second thought over the usefulness of this measure seems desirable. The 500m level has been pre-set, as it was thought to correspond with participants’ idiosyncratic perception of geographical neighbourhood. Figure 35 shows if the extent has been over- or underestimated by illustrating participants’ personal definitions of geographical neighbourhood, with results being further subdivided into groups according to interviewees’ responses if they i) knew, ii) did not know or iii) were unsure about the existence of a property which

²⁷At one stage during the process of formulating the research proposal, it was planned to attribute all effects to geographical proximity. Likert statements would all then read as ‘Due to the existence of a PES area in the distance of maximum 500m for here,...(insert: effect intended to measure)’. With the majority of neighbours not being aware a the PES property close-by, this research would have been impossible to conduct.

This finding, together with results shown by Table 11, namely that 96.3 percent of participants have never spoken about PES with persons living in the distance of maximum of 500m, indicates that an argument for the existence of spill-overs due to geogra-

currently has a PES contract in the distance of maximum 500m (n=74). Generally, we see that the 500m definition is, with eleven mentions, the most frequently cited one, followed by a definition of 1000m with 10 mentions. The median ($Q_2= 600m$) indicates that our 500m definition represents roughly the level where the sample is split into two halves.

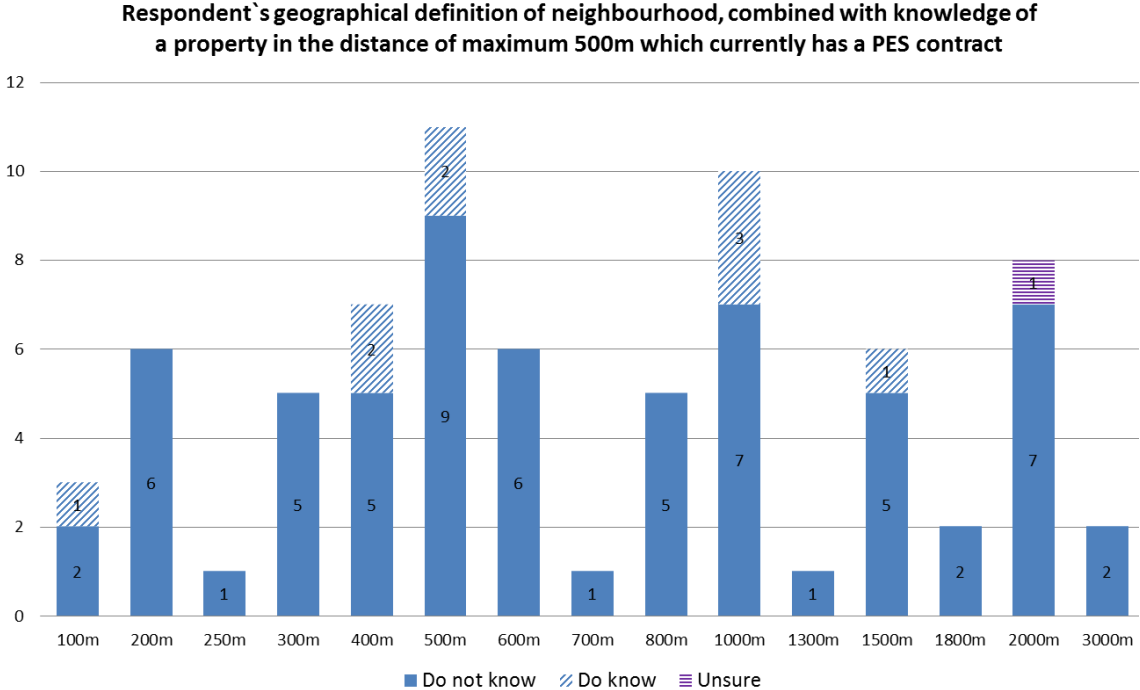


Figure 35: Participant's definition of neighbourhood, sorted by categories

Regarding overestimation, it has to be said that for some respondents, the definition of geographical neighbourhood put forward in the questionnaire might have been too large. The first quartile is given with $Q_1= 400m$, thus 25 percent of respondents conceptualised geographical neighbourhood narrower. However, and as already stated, 500m marked the outer boundary of the sampling area, thus in many cases households were located closer to the PES site, thus this point of concern can partly be countered.

An alternative would have been to set a 1000m definition, but with the sample mean of $\bar{O}= 888m$, the extent of the geographical neighbourhood as conceptualised by participants would have been overestimated. In my view, overestimation entails more risks than underestimation as in the latter case respondents indicating a value above the pre-set value still regard the pre-set level as lying within their definition, thus this level is still encompassed in their perception of geographical neighbourhood. In the former case, this would not be the case.

Looking again at Figure 35, it becomes apparent that most of the interviewees who indicated that they know of the existence of a PES property which currently has a PES contract, named a geographical neighbourhood definition in the range of 100m to 1000m, thus tending to favour smaller definitions of geographical neighbourhood. The box-plot in Figure 36 confirms this result. However, as the rightern bar contains nine observations only, this finding might not be conclusive.

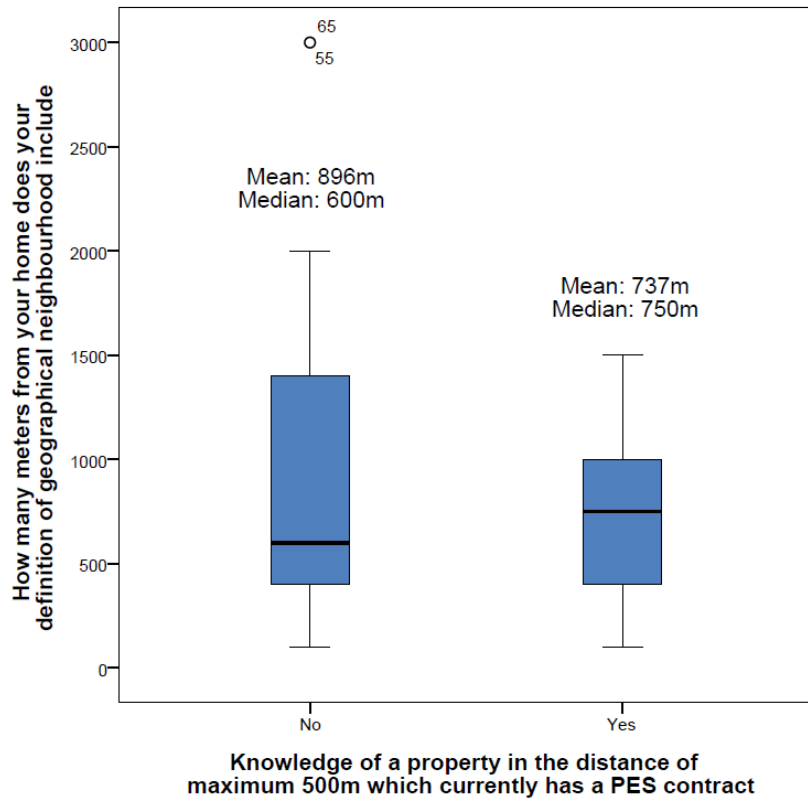


Figure 36: Neighbourhood definition and PES knowledge

Since we have seen that the majority (n=69) of interviewees were not aware of the existence of a property which currently has a PES contract close-by, a last area of interest concerns respondents' own perception over their 'information-radius'. Surprisingly, out of all 69 respondents, 58 were convinced that they would know in case a property/a Finca which receives government payments for reforestation or forest protection at the moment exist in the distance of zero to 500m from their place of residence, thus substantially overestimating their capacity to receive this sort of information. The most frequently na-

If there exists a property/ a Finca in the distance of zero to 500m from here, so more or less nearby, which receives government payments for reforestation or forest protection at the moment, would you know?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes- because its so close/ know area	38	46,9	55,1	55,1
	Yes- through friendships in area	5	6,2	7,2	62,3
	Yes- people talk	15	18,5	21,7	84,1
	No	11	13,6	15,9	100,0
	Total	69	85,2	100,0	
Missing	99	12	14,8		
Total		81	100,0		

Table 12: Reasons for knowledge of PES in the vicinity

med reason concerned proximity: 55 percent stated that simply because they ‘know the area’, they would be aware of the existence of such a property/Finca. This is followed by the impression that ‘people talk’ (21 percent), thus the information would surely had spread. 11 respondents (16 percent) expressed that they would not know it.

- *In which of the following areas are we able to identify the existence of neighbourhood effects? Which of these areas demonstrate being significantly impacted by the introduction of a PES scheme close-by? Which areas demonstrate the least impact?*

1. *Changes in information seeking behaviour*
2. *Changes in views over nature’s commodification and changes in motivations towards environmental goals*
3. *Changes in views concerning the enforcement of the Forest Law*

In the following, each one of the enumerated points above will analysed separately. ‘Changes’ in all three areas of enquiry were measured using ‘change-statements’ (see 5.4, ‘Measurement definitions’), i.e. Likert statements in which a clear attribution of an effect (e.g. changes in information seeking behaviour) to a specific source (e.g. ‘due to contact with persons of my family/relatives...’, ‘due to contact with friends...’, ‘due to contact with neighbours...’ etc.) was possible. Note that for one interviewee, all effects intended to measure were attributed to one source only, namely to the one she indicated as being the strongest for information provision regarding PES (see Appendix II, question No. 4). For the four persons where no pre-set category corresponded to their strongest information source and who thus indicated ‘Others’, the second strongest source was used which in all four cases could be grouped into one of the defined categories²⁸. This was done for the sake of convenience, as four additional entries for a specific information source with just one observation each would have made the tables exhaustively long.

- *Changes in information seeking behaviour*

Table 13 displays results for changes in the information seeking behaviour of interviewees, i.e. if respondents felt more interested in the topic of PES when they received information about it from one of the respective sources. It becomes apparent that 68 out of 79 respondents totally disagreed with the statement, and that this type of response is the dominant one regardless of the respective information source. That means are all distributed between one and two, translating into the range of ‘totally disagree’ to ‘disagree’, indicates that none of the sources was, on average, able to induce participants to pursue more information regarding PES. Separating means for sources belonging to the

²⁸In the questionnaire, interviewees have been asked to indicate the first as well as the second strongest source out of which they received information regarding PES.

Strongest source responsible for PES knowledge * Information seeking behaviour

		I became more interested in the topic of PES				Total	Mean
		1 (totally disagree)	2 (disagree)	4 (agree)	5 (totally agree)		
Strongest source responsible for PES knowledge	Family/ Relatives never had	3	0	0	0	3	1
	Family/ Relatives have/ had	12	0	1	1	14	1,50
	Friends never had	8	0	0	0	8	1
	Friends have/ had	8	1	0	1	10	1,50
Due to.....	Neighbour never had	3	0	0	1	4	2
	Neighbour have/ had	7	1	0	1	9	1,55
	Participation in meeting	2	0	0	0	2	1
	Radio/ TV/ Newspaper	18	1	0	1	20	1,25
	Work	7	0	1	1	9	1,77
Total		68	3	2	6	79	

Table 13: Information seeking behaviour, sorted by knowledge sources

neighbourhood dimension (n= 48) and sources lying outside of this dimension (n= 31), the null-hypothesis that both means are equal cannot be rejected at a five percent significance level (2-tailed test, $t(df:77) = 0.189$, $p = 0.851$, $\alpha = 0.05$, see Table 14 ‘All Areas’).

Taking a closer look at the three different research sites A1-07/08, A2-08 and A3-11/12 separately, Table 14 lists means and p-values testing the hypothesis that means of the information seeking behaviour triggered due to information received from the neighbourhood dimension are equal to the means of the information seeking behaviour triggered due to information received from sources lying outside this dimension, at a five percent significance level. Here, results in each one of the three research sites confirm the result obtained in the aggregate picture, since the null-hypothesis cannot be rejected in none of the three areas. These results suggest that effects triggered due to information received from sources belonging to the neighbourhood dimension are, on average and at a five percent significance level, not different from effects being triggered due to sources lying outside the neighbourhood dimension, thus casting heavy doubt upon the relevance of the distinction made.

		All Areas		A1-07/08		A2-08		A3-10/11	
		\emptyset	p	\emptyset	p	\emptyset	p	\emptyset	p
More interested in the PES topic	Inside NB Dimension	1.44	.85	2.20	.50	1.25	.13	1.22	.78
	Outside NB Dimension	1.39		1.75		1.00		1.13	

Table 14: t-Test statistics, information seeking behaviour and dimensions

Several interviewees indicated that they did not feel motivated to gain more information regarding PES simply because they did not own land, thus the topic was regarded as irrelevant. Therefore, it appeared sensible to separate respondents according to their own perception regarding their eligibility for PES. Table 15 demonstrates results. With a mean of 2.4, the group of land owners who regarded themselves as eligible rank top, also compared to means listed in Table 13. However, as five observations only belong to this category and as the mean is still distributed between ‘disagree’ and ‘indifference’ (response category two and three), positive effects defined as means falling into the range of category three to five, indicating that some respondents indeed felt more motivated to gain further information regarding PES, seem absent.

		I became more interested in the topic of PES				Total	Mean
		1 (totally disagree)	2 (disagree)	4 (agree)	5 (totally agree)		
Participants' own perception regarding their eligibility for PES	No land/ Finca, not eligible	61	3	1	5	70	1,37
	Land/ Finca, regard themselves not eligible	2	0	0	0	2	1,00
	Land/ Finca, regard themselves eligible	3	0	1	1	5	2,40
	Land/ Finca, unsure if eligible or not	2	0	0	0	2	1,00
Total		68	3	2	6	79	

Table 15: Information seeking behaviour, sorted by PES eligibility

Overall, the existence of positive neighbourhood effects with reference to information seeking behaviour has to be denied. At first sight, findings appear to stand somewhat in contrast to study results outlined in the literature review. The majority of studies cited in chapter three emphasised the overwhelmingly importance of access to information for uptake of environmental activities. However, most of the studies outlined derived their findings by focusing on potential PES providers, i.e. individuals/households who fulfil basic PES application requirements, such as ownership of land for instance. In the present study, interviewees who regard themselves as eligible for PES application also exhibit, with 2.4, the highest value, indicating that for this group access to information is indeed of greater importance than for other groups. However, and as stated, a value of 2.4 still stands for disagreement or indifference, thus the receipt of information did not stimulate an information seeking effect, even though the small size of observations belonging to this category impede a final judgement.

Furthermore, t-Test statistics have shown that responses given in case an effect was triggered due to information sources which have been grouped under the term ‘neighbourhood dimension’ and responses given in case an effect was triggered to sources which could not be counted as coming out of this dimension did not, on average, seem to differ (at $\alpha =$

5 percent), thus the distinction made does not offer any insights. Note that a reversely coded informational effect has not been analysed, for instance if a negative informational effects was triggered since still-overs can generally work in both directions. However, in case of information seeking behaviour, this seems unlikely.

- *Changes in views over nature's commodification and changes in motivations towards environmental goals*

In a first step, it will be examined if views on nature's commodification are introduced in the geographical neighbourhood to a PES area, meaning that if people living close to PES sites regard environmental services now under a more 'economic lens', i.e. as a source to derive financial gains from. Remembering subsection 3.6 'Commodification of nature' outlined in the literature review, the possibility for the introduction of such a view has been documented, especially through "imposing a single language of valuation" [Kosoy et al., 2007, p. 1232]. In a second step, changes in motivations towards environmental goals will be dealt with, which will be necessary to analyse crowding-out effects.

To analyse changes in views over nature's commodification, three 'Yes' or 'No' statements as well as one open question were included in the questionnaire. The first two statements investigated if new economic evaluation tendencies with reference to nature and forests were introduced, such as if PES information received from one of the respective information sources led interviewees to think that nature and forests have a price now which is more or less defined or if the statement read as "before, I thought that it is not possible to quantify the value of nature and forests, but now, due to...[respective information source]... I think that it is well possible to quantify it" was true or false. A positive response to both questions was taken as a precondition for the analysis of commodification effects (see tick-marks in Figure 37, after 'price' for the first and after 'quantify value' for the second statement). Overall, 18 respondents fell into this category. The third statement was formulated as "I still view the environment and forests as a whole ecosystem and not as a particular service, the...[respective information source]... had no effect at all on this view (way of thinking)".

Figure 37 illustrates that, with the first bar on the bottom, one interviewee answered in this specific way, giving no answer ('99' was coded as 'missing value') to the fourth and final question which enquired about participants' view if programmes such as PES contribute to regard nature and forests as a commercial good ('mercancía'). The second bar counted from the bottom in Figure 37 shows the most frequent response given regarding notions of nature's and forests' commodification. Ten participants stated here that it is 'True' that due to information received regarding PES, they now regarded nature and forests as having a more or less defined prices and that it now became possible to

quantify the value of both. However, this introduction of economic evaluation methods did not lead interviewees to think that the environment and forests can now be seen as particular services, changing the view of both belonging to a whole ecosystem towards a point of view where each aspect of the environment can be separated and stand apart from each other, each aspect as a full-fledged service. Furthermore, these respondents were not of the opinion that programmes such as PES contribute to regard nature and forests as a commercial good. On the one hand, this could be interpreted as a puzzle since the possibility to assign a value to something, thus putting a price tag on it, is a

Commodification of Nature and Forests

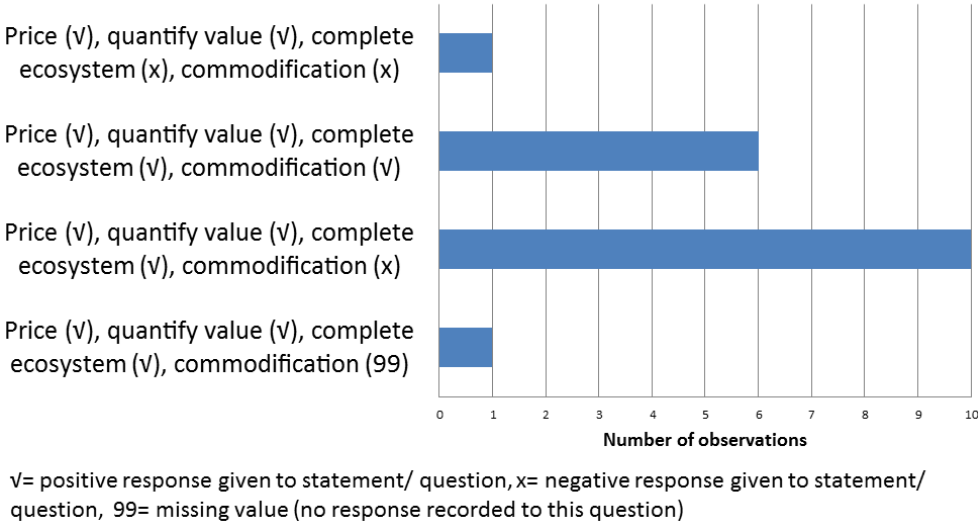


Figure 37: Views regarding nature’s and forests’ commodification

decisive characteristic of a tangible economic good. On the other hand, this result might indicate that even though a process of commodification of nature and forests is introduced through the establishment of PES programmes, these forces are not strong enough to disrupt the perception of a holistic picture of nature which simply cannot be parcelled and treated as a commercial good. In the latter case, it would be a subject for further research to determine the condition/threshold where such a complete shift towards a commercial view on nature and forests would become possible. Similar considerations might be able to explain findings represented in the second bar to the top of Figure 37. Six respondents, fulfilling the two basic pre-conditions (‘price’ and ‘quantify value’), indicated here that even though they are of the opinion that programmes such as PES contribute to regard nature and forests as a commercial good, they hold a holistic ecosystem view in which different parts can not be singled out as a specific service. However, these six respondents rated ‘True’ that programmes such as PES contribute to perceive nature and forests as some sort of commodity.

Assigning the eighteen observations represented in Figure 37 to the various information sources which were responsible for the change in view, Table 16 highlights that respondents who participated in an informational meeting regarding PES (with 100 percent) and who received information from neighbours who never had a PES contract (with 50 percent) were, on a percentage basis, the most likely group indicating views on nature’s and forests’ commodification²⁹. However, with two observations only in the former category and four observations only in the latter, results appear weak.

Strongest source responsible for PES knowledge * Commodification of nature and forests

		More or less defined price & able to quantify value of nature of forests		
		Pre-conditions not fulfilled	Pre-conditions fulfilled	Total
Strongest source responsible for PES knowledge	Family/ Relatives never had	2	1 (33%)	3
	Family/ Relatives have/ had	13	1 (7%)	14
	Friends never had	5	3 (37%)	8
	Friends have/ had	10	0	10
	Neighbour never had	2	2 (50%)	4
	Neighbour have/ had	9	0	9
	Participation in meeting	0	2 (100%)	2
	Radio/ TV/ Newspaper	14	6 (30%)	20
	Work	6	3 (33%)	9
Total		61	18 (22%)	79

Table 16: Commodification of nature and forests, sorted by knowledge sources

Grouping information sources according to the two defined respective dimensions (inside vs. outside of neighbourhood dimension), the degree of association between the two binary variables can be analysed using the Phi (Φ) coefficient. Phi statistics represent the only valid method for assessment as both variables are dichotomous in type, i.e. they “contain data that have only two categories” [Bryman, 2008, p.321]. Table 17 shows the description of the test, for which a Phi value of $\Phi = -0.24$ is generated, implying that the likelihood that commodification effects were triggered was somewhat greater in case information was received from sources lying outside of the neighbourhood dimension compared to when information was received from sources belonging to the neighbourhood dimension.

Screening Table 16 for further insights and looking at sources related to the neighbourhood dimension only, it appears that in case an interviewee named a person who never had a PES contract as strongest information source, the likelihood that this interviewee

²⁹Note that Table 16 separates only for the fulfilment of the two basic pre-conditions as defined earlier, namely that interviewees think that nature and forests have a price now which is more or less defined and that the value of both can now be quantified whereas this task could not be carried out before.

Dimension of information source* Commodification of nature and forests

		More or less defined price & able to quantify value of nature and forests		
		Pre-conditions not fulfilled	Pre-conditions fulfilled	Total
Dimension	Outside of NBH dimension	20	11	31
	Inside of NBH dimension	41	7	48
Total		61	18	79

Table 17: Commodification of nature and forests, sorted by information dimension

indicated tendencies related to the commodification of nature and forests, defined through validating ‘True’ the first two statements forming the pre-condition, seemed increased. In case information came from the family/relatives who have or had a PES contract, only 1 person (7 percent) stated that nature and forests have a more or less defined price now and that it is now possible to quantify its value. If information came from friends or neighbours who have or had a PES contract, not a single person held that view. To check for bivariate correlation within the neighbourhood dimension, comparing interviewees who received their primary information from persons who have/had a PES contract themselves and interviewees who heard about PES from persons who never had a PES contract with reference to the fulfilment of the two pre-conditions, the Phi (Φ) statistics can be used again. The description of the test as well as the degree of association between the two binary variables are given in Table 18 and Table 19.

Information source used within neighbourhood dimension* Commodification of nature and forests

		More or less defined price & able to quantify value of nature and forests		
		Pre-conditions not fulfilled	Pre-conditions fulfilled	Total
Information received from persons out of the neighbourhood dimension who...	Never had PES	9	6	15
	Have/ had PES	32	1	33
Total		41	7	48

Table 18: Description of the Φ -Test

Symmetric Measures		
		Value
Nominal by Nominal	Phi	-,486
	Cramer's V	,486
N of Valid Cases		48

Table 19: Φ -Test statistic

The Phi value of $\Phi = -0.486$ indicates a good negative pattern of association, implying that respondents who’s primary information source is described by persons who never had a PES contract themselves are more likely to express views related to the commodification of nature and forests than in case an interviewee received information regarding PES from

persons who already had a PES contract. Explaining this finding is not possible out of the collected data. However, a first guess can be formulated: Out of the 32 respondents shown in Table 18, six (20 percent) stated that, when asked the more open question if they are of the opinion that programmes such as PES contribute to regard nature and forests as a commercial good, they did not hold this view because the payment levels of these programmes were considered low. The reason of financial compensation being perceived as too low was never mentioned in case interviewees named persons who never had a PES contract as strongest source for PES information provision. Thus, a guess would be that both groups conveyed information to the respective interviewee differently, with persons who had a PES contract themselves emphasising the low payment level for the ecosystem service they provide, which could possibly lead to a reduced likelihood of interviewees seeing these programmes as promoting nature's and forests' commodification.

To summarise, we are able to state that notions of nature's and forests' commodification are indeed introduced through PES programmes. 18 interviewees attributed a change towards a more economic evaluation method of nature and forests, expressed through a view that the price of both can now more or less be defined and its value quantified, directly to the receipt of information regarding the PES programme. However, and as Figure 37 depicted, not a single interviewee responded to all four statements and questions in the way which stood for a commodification/commercialisation view of nature of forests. Rather, some statements and questions were validated 'True' and others 'False', resulting in a mixed picture which offers, as discussed above, two different routes for explanation. Furthermore, we have seen that the likelihood that commodification effects were triggered was somewhat greater in case information was received from sources lying outside compared to sources lying inside the neighbourhood dimension ($\Phi = -0.24$). Considering only the neighbourhood dimension, the likelihood that commodification effects were triggered was greater ($\Phi = 0.486$) in case an interviewee heard about PES from persons who never had a contract themselves compared to interviewees who's contact persons were enrolled at some point in time, which might indicate differences in information transmission.

- *Changes in motivations towards environmental goals*

Having found that around 22 percent of respondents (n=18) in the collected sample expressed the existence of commodification effects, a subsequent question concerns motivational changes regarding the environment. These changes will become important when assessing crowding-out effects which will be examined in the second part of the research question. The motivation leading to the formulation of this block of question is, as outlined in chapter three 'Literature Review', the analysis of notions related to Impaired Self-Esteem (ISE), a psychological processes caused when "an intervention from outside carries the notion that the actor's motivation is not acknowledged, his or her intrinsic

motivation is effectively rejected. The person affected feels that his or her involvement and competence is not appreciated which debases its value...As a result of impaired self-esteem, individuals reduce effort” [Frey and Jegen, 2001]. For the analysis of this effect, two required Likert statements as well as two optional question were included in the questionnaire. The former enquired about whether interviewees’ motivations to conserve the environment decreased on receiving information regarding PES from their respective information source as they felt that their ‘own attempts to conserve the environment are not appreciated’ or whether a reversely directed motivational effect kicked in, namely that respondents felt ‘more motivated than before to undertake actions in the conservation of the environment’. The two optional questions were asked only in case a participant agreed with a statement (Likert-scale rating four= ‘agree’ or five= ‘totally agree’), requesting to more openly explain the reasons for the de- or increase in motivation.

Strongest source responsible for PES knowledge * Decrease in motivation				
		Decrease in motivation as own attempts to conserve the environment not appreciated		
		1	2	Total
		(totally disagree)	(disagree)	
Strongest source responsible for PES knowledge	Family/ Relatives never had	3	0	3
	Family/ Relatives have/ had	14	0	14
	Friends never had	7	1	8
	Friends have/ had	9	1	10
Due to...	Neighbour never had	4	0	4
	Neighbour have/ had	9	0	9
	Participation in meeting	2	0	2
	Radio/ TV/ Newspaper	18	2	20
	Work	8	1	9
Total		74	5	79

Table 20: Decrease in motivation, sorted by knowledge sources

Table 20 and Table 21 list results, revealing an unambiguous picture. In none of the two cases, an effect in either direction is detectable since all responses given can be described by Likert-scale ratings belonging to category one, standing for ‘totally disagree’, and category two, representing plain disagreement. As not a single person indicated motivational changes, a deeper analysis of the data can be skipped as the chance to reach a fruitful result appears not to be given. With reference to our outlined theories, this has several implications. First, an effect as suggested by the theory of impaired self-esteem cannot be validated through the present study, thus respondents did not seem to adjust their motivational levels with reference to the conservation of the environment on receiving information regarding PES from on of their respective information sources. Second, since no motivational changes can be detected, the theory of crowding-out of motivations can further not be validated.

Strongest source responsible for PES knowledge * Increase in motivation

		More motivated than before to undertake actions to conserve the environment		
		1	2	Total
		(totally disagree)	(disagree)	
Strongest source responsible for PES knowledge	Family/ Relatives never had	3	0	3
	Family/ Relatives have/ had	14	0	14
	Friends never had	7	1	8
	Friends have/ had	10	0	10
Due to...	Neighbour never had	4	0	4
	Neighbour have/ had	9	0	9
	Participation in meeting	2	0	2
	Radio/ TV/ Newspaper	18	2	20
	Work	8	1	9
Total		75	4	79

Table 21: Increase in motivation, sorted by knowledge sources

However, he have to keep in mind that this case-study did not draw on the standard definition of crowding theory. As outlined under 3.5 ‘Crowding-out’, cognitive evaluation theory (CET) was used for explaining the underlying effects for the occurrence of crowding-out. This theory, based on the assumption that people have a psychological need for self-determination, argues that individual actors ‘categorise’ events according to whether they are perceived as ‘controlling’ (contingent rewards, evaluation, surveillance, deadlines etc.) or as ‘autonomy enhancing’ (positive feedback, choice etc.), claiming that these effects either weaken or strengthen self-determination. PES schemes built their success upon compliance, i.e. the delivery of the subscribed environmental service, thus PES compliance can be regarded as an ‘controlling’ event which, in a second phase, could lead to impaired self-esteem as the monetary incentive can cater a feeling in which a persons regards his own attempts as not being sufficiently acknowledged. However, this study translated the standard definition to a modified context where interviewees did not receive payments themselves, thus the perception of being under a ‘controlling’ environment due to the necessity to comply with PES regulation could be missing, explaining why we were unable to detect any motivational changes. Nevertheless, due to the theory of impaired self-esteem upon which crowding-theory partly rests, this transformation represented a sensible approach.

Unfortunately, it was decided to pose the two more open questions only in case motivational changes were indicated (Likert-scale rating four= ‘agree’ or five= ‘totally agree’). To further analyse why we were unable to detect modifications in the motivational structure of participants, it would had been desirable to enquire about reasons why respondents

disagreed with the confronted statements. With reference to the developed model put forward in chapter four, the proposed effect-channel suggesting that events which are perceived as controlling or autonomy enhancing influence motivations to do something for the environment cannot be validated (independent vs. dependent component). However, and as discussed above, the absence of an effect might be explained through the modified context to which the theory for the occurrence of a controlling or an autonomy enhancing effects was tailored to.

- *Changes in views concerning the enforcement of the Forest Law*

Analysing if changes in views concerning the enforcement of the Forest Law were triggered upon receiving information regarding PES and if sources belonging to the neighbourhood dimension triggered, on average, distinct effects than sources which can not be treated as belonging to this dimension, builds the following subsection’s object of interest. Changes were assessed through responses to a single Likert statement, requesting interviewees to indicate their degree of (dis)agreement whether PES information received from their respective information source lead them to think that the ‘the government is now more capable than before to enforce the Forest Law’.

To filter eligible respondents, an introductory question checked if an interviewee was aware of the existence and the meaning of the Forest Law, a question to which 80 out of the 81 interviewees agreed to (98.7 percent). Through qualitative interviews, forest officials confirmed that generally every citizen is aware of the existence of the Forest Law and its proclaimed deforestation ban. Table 22 links responses given to the various sources responsible for the PES knowledge effect. At first sight, it becomes noticeable that hete-

		Government is now more capable than before to enforce the Forest Law					Total	Mean
		1 (totally disagree)	2 (disagree)	3 (indifferent)	4 (agree)	5 (totally agree)		
Strongest source responsible for PES knowledge	Family/ Relatives never had	1	0	0	0	2	3	3,66
	Family/ Relatives have/ had	3	1	2	3	5	14	3,43
	Friends never had	0	0	1	3	4	8	4,37
Due to...	Friends have/ had	1	0	2	2	5	10	4
	Neighbour never had	1	0	0	1	2	4	3,75
	Neighbour have/ had	2	0	0	4	2	9	3,11
	Participation in meeting	0	0	0	1	1	2	4,5
	Radio/ TV/ Newspaper	1	0	1	9	9	20	4,25
	Work	2	0	1	0	6	9	3,88
Total		11	1	7	23	36	79	

Table 22: Enforcement of Forest Law, sorted by knowledge sources

rogeneous responses were given, with all five possible answers ranging from ‘totally disagree’ to ‘totally agree’ being mentioned. Examining the last column, we can observe that means are all distributed between Likert-scale ratings three to five, demonstrating that interviewees were indeed of the opinion that the receipt of information regarding PES positively stimulated perceptions over the government’s capacity to enforce the Forest Law. This result in itself could be taken as an indication for the existence of neighbourhood effects. However, the finding that PES information received from the workplace, via electronic transmission, through newspapers or through the participation in an informational meeting about PES seem to have triggered similar effects, casts doubt upon the importance of the distinction made between the neighbourhood dimension and information sources lying outside of this dimension. t-Test statistics testing the null-hypothesis that means out of both dimension over all three research sites are equal, at a five percent significance level, reveal no difference ($t(df:78)= 1.247, p=0.216, \alpha = 0.05$). The same picture is obtained when testing the null-hypothesis for each research site individually (see Table 23, $\alpha= 5$ percent).

		All Areas		A1-07/08		A2-08		A3-10/11	
		\emptyset	p	\emptyset	p	\emptyset	p	\emptyset	p
Governm. better able to enforce Forest Law	Inside NB Dimension	3.77	.21	4.40	1.0	3.58	.78	3.61	.44
	Outside NB Dimension	4.16		4.40		3.75		4.13	

Table 23: t-Test statistics, enforcement of Forest Law and dimensions

Again, as in the analysis of information seeking effects, results suggest that effects triggered due to information received from sources belonging to the neighbourhood dimension are, on average and at a five percent significance level, not different from effects triggered due to sources lying outside the neighbourhood dimension, thus once more calling into question that the distinction made between the two dimensions appears useful. However, it remains unclear if participants understood the statement in the way I intended to phrase it. With the direct reference to the information source from which information regarding PES was obtained, I tried to assure the attribution of the change in the government’s capability to enforce the Forest Law to this same process of having received PES information. When recording responses to this Likert statement, many participants named reasons why they held a particular view, i.e. why agreement or disagreement was expressed. Figure 38 illustrates that 21 respondents stated for instance that the main reason why they held the view that the government is now better able to enforce the Forest Law is due to the fact that there exist more controls nowadays compared to in the past (police checkpoints where permissions are revised, more presence of forest officials in the countryside, generally more people working in the ‘green sector’ who pay attention

Reasons for agreement (Agm.) and disagreement (Dgm.)

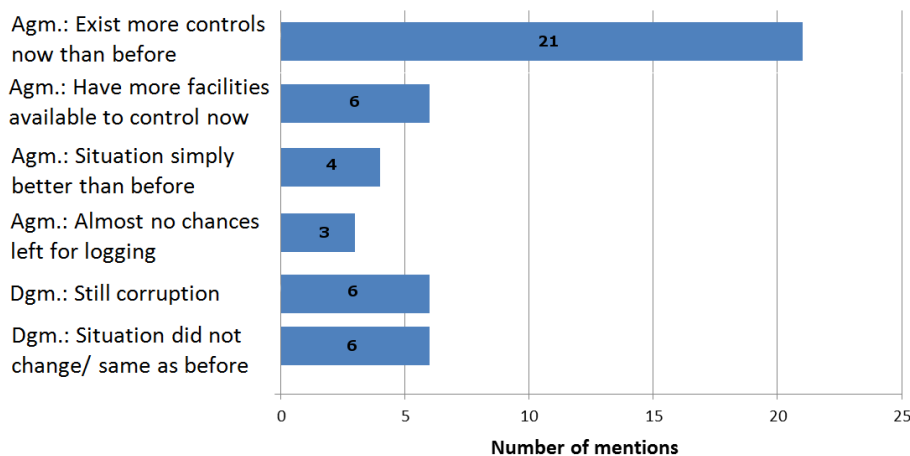


Figure 38: Reasons for agreement/disagreement, enforcement of Forest Law

etc.). Four interviewees named improved facilities as the main reason for agreement (new cars and motorcycles, more facilities to access remote areas, availability of satellite imagery etc.), whereas 12 persons disagreed by pointing towards corruption in the system (a sufficiently high payment will cover illegal actions) or by simply stating that the situation did not change at all.

In my opinion, it remains uncertain whether interviewees voiced their general impression over the government's capacity now compared to an earlier situation or whether this change in view was really triggered due to the receipt of information regarding PES (which surely can include information on how the government tries to assure compliance, namely through better presence in remote areas, satellite imagery etc.). As mentioned in subsection 5.4 'Measurement definitions', it was a-priori clear that a high willingness of participants to rethink and re-frame certain motivations/attitudes was demanded to finally being able to attribute these to a specific information source, quantifying how far this source was responsible for triggering a certain effect or for holding a certain opinion. With the explicit reference to the information source at the beginning of the statement, it was assumed that participants were well able to perform this task. In retrospect, it might had been useful to reassure the attribution through a subsequent question.

- *Which perceptions do people located in the distance of maximum of 500m to a PES site hold over PES with reference to its usefulness?*

To elicit participants' views on the usefulness of PES programmes, interviewees were asked to indicate, on a 5-point Likert scale, their degree of (dis)agreement to the following statement: 'I regard PES as an useful instrument to preserve forests and enhance biodiversity richness'. In methodological terms, this statement represents a 'general opinion statement' (see 5.4, 'Measurement definitions'). Therefore, no explicit reference to

a certain information source was made to which an effect could be attributed to, thus answers provide insights into attitudes only. Table 24 provides an overview of responses given, further subdivided according to whether the government was deemed more capable than before to enforce the Forest Law. Considering at first the horizontally listed variable, one notices the high rate of agreement: 95.5 percent asserted that the PES programme was indeed useful. Disagreement articulated one person only, whereas four respondents expressed indifference. Including the vertically ordered variable, a prominent feature appears that interviewees evaluating the PES programme useful were further of the opinion that the government’s capacity to enforce the Forest Law has increased. On the contrary, all five responses given pertaining to Likert-scale ratings one (‘totally disagree’) to three (‘indifference’) with reference to the usefulness of PES can be described by the same rating-scale ranging from ‘totally disagree’ to ‘indifference’ of the government’s capacity variable, indicating relationships between both views.

**Enforcement of Forest Law * PES regarded as useful
instrument to preserve forests and enhance biodiversity richness**

		PES regarded as useful instrument to preserve forests and enhance biodiversity richness				
		1 (totally disagree)	3 (indifferent)	4 (agree)	5 (totally agree)	Total
Government is now more capable than before to enforce the Forest Law	1 (totally disagree)	1	2	1	7	11
	2 (disagree)	0	0	0	1	1
	3 (indifferent)	0	2	0	5	7
	4 (agree)	0	0	4	19	23
	5 (totally agree)	0	0	3	33	36
Total		1	4	8	65	78

Table 24: Usefulness of PES, sorted by enforcement of Forest Law

Testing for bivariate correlation, Spearman’s rho (ρ) has to be calculated as variables are not at an interval/ ratio level of measurement, thus Pearson’s r cannot be used. Table 25 shows the correlation coefficient which is given with $\rho = 0.272$, indicating a moderate positive relationship. At a significance level of $\alpha = 5$ percent, the alternative hypothesis that a correlation between the two variables exist (2-tailed test) cannot be rejected (N= 78, $p= 0.016^*$), thus attesting a significant result.

Analysing for which reasons interviewees judged the PES programme as useful, Figure 39 can be consulted. The most frequently stated response included the view that without these programmes, land owners would simply deforest “People are destructive” (‘la gente es destructora’) or “there are rude people” (‘hay gente grosera’) was mentioned several times in this category. Some older participants referred to Guanacaste province, stating that when they were young, deforestation led this strip of land appear like a desert, thus

Correlations Usefulness of PES * Enforcement of Forest Law

			Usefulness of PES	Enforcement of Forest Law
Spearman's rho	Usefulness of PES	Correlation Coefficient	1,000	,272
		Sig. (2-tailed)	.	,016
		N	81	78
	Enforcement of Forest Law	Correlation Coefficient	,272*	1,000
		Sig. (2-tailed)	,016	.
		N	78	78

Table 25: Spearman’s rho (ρ) test statistics

experience has shown that without payments, people would just cut down trees. One interviewee claimed that some laws do not function well, thus programmes such as PES are deeply needed to impede deforestation. This response points towards a relevant issue: The Forest Law already bans deforestation, limiting the possibilities to cut down trees to a small amount of cases. From a legal point of view, the clearing of a large amount of land represents already an illegal act in itself in case it is not covered by the law, which seems sensible to assume in this case. Assuming further that people generally stick to the law, the receiving of PES payments should be detached from the actual decision whether to clear a forest or not.

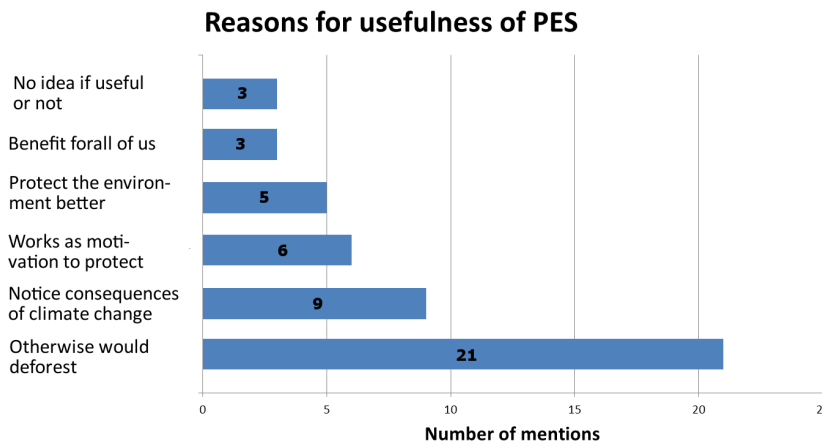


Figure 39: Reasons for usefulness of PES

If interviewees perceive the possibilities for illegal logging on private Fincas subscribed to PES compared to Fincas without any contract agreement differently, will be assessed in more detail in the following research question. Referring back to Figure 39, we see that nine respondents explained the usefulness of PES programmes with felt consequences of climate change. The majority of persons based their answer on the feeling of climate warming, stating that they are able to notice an increase in temperatures over the last years/decades. Six respondents saw the usefulness of PES in its function as a motivation

source for forest protection, whereas five interviewees mentioned that these programmes simply support in protecting the overall environment better.

To summarise, it becomes apparent that a large majority of participants deemed PES programmes as being useful (95.5 percent) out of displayed reasons. Furthermore, a significant correlation was found between the perceptions on the usefulness of PES and the government’s capacity to enforce the Forest Law ($\alpha = 5$ percent).

- *How do people located close to a PES site view the deforestation ban imposed by the Forest Law and the chances for illegal logging on private Fincas?*

In the following, the assessment of how questionnaire participants view the deforestation ban imposed by the Forest Law will form the object of interest. This part will be succeeded by analysing whether interviewees perceive the possibilities for illegal logging on private Fincas subscribed to PES compared to Fincas without any contract agreement differently - an issue which the previous research question already touched upon.

As participants’ general knowledge of the existence and meaning of the Forest Law has already been verified through study results, interviewees were asked to rate the following question using one out of three possible answers, including ‘Reasonable’, ‘Undecided’ or ‘Not reasonable’: ‘Let us think now of a person that you know who has a Finca/property with forest. Do you think that it is reasonable that, even though it is her private property, the Forest Law says that it is not permitted to cut trees there or do you think that normally the owner should have the right to change the land use as she desires to?’. Answers are recorded in Table 26, further subdivided according to property ownership. The division was derived out of the assumption that interviewees who own land might perceive the imposed deforestation ban differently, as they are directly affected by the law. However, with eight out of nine property owners rating the imposed ban as reasonable, results provide no support for this expectation.

Property ownership * Perception of Forest Law

		Is the deforestation ban imposed by the Forest Law on private Fincas reasonable? (shortened version of questionnaire question)			Total
		Not reasonable	Undecided	Reasonable	
Owns property (more than 1ha)	No	6	4	62	72
	Yes	0	1	8	9
Total		6	5	70	81

Table 26: Perception of Forest Law, sorted by property ownership

Accordingly, no significant correlation could be found between land owners (ownership of land ≥ 1 ha) interpreting the imposed ban as ‘Not reasonable’ and interviewees without

any land title considering the deforestation ban as ‘Reasonable’ using Spearman’s rank order correlation coefficient (n=81, $\rho = -0.3$, p= 0.76)³⁰. Overall, it becomes visible that approximately 88 percent (70 observations) regard the deforestation ban imposed by the Forest Law as reasonable, indicating that respondents did not evaluate individual rights to forest clearing on private land/Finca as standing above the general necessity to protect forests.

Besides enquiring about whether the implications of the Forest Law are perceived as reasonable or not, interviewees have been asked whether they consider the Forest Law to be of greater importance nowadays compared to what they have thought earlier. Results are depicted in Table 27, demonstrating that 87 percent of respondents (71 observations)

Usefulness of PES * Importance of Forest Law

		Do you think that the Forest Law is now of greater importance compared to what you have thought about earlier?		
		No	Yes	Total
PES regarded as useful instrument to preserve forests and enhance biodiversity richness	1 (totally disagree)	1	0	1
	3 (indifferent)	1	3	4
	4 (agree)	1	8	9
	5 (totally agree)	7	60	67
Total		10	71	81

Table 27: Importance of Forest Law, sorted by usefulness of PES

indeed held that view, confirming an increase in importance of the Forest Law over the past. Ten study participants (12 percent) did not agree, implying either a view that the importance has not changed at all or that it has decreased in meaning. The Table further links responses recorded to whether the PES programme was regarded as useful or not to preserve forests and enhance biodiversity richness. An interesting feature observable appears that eight out of the ten persons deeming the Forest Law as being of no greater importance still regarded PES as a useful instrument. Unfortunately, the claim that interviewees are more aware of the usefulness of the specific PES instrument than the usefulness of the overall Forest Law cannot be made, since questions differ in their phrasing. Whereas the horizontally listed variable asks for an increase in the level of importance, the vertically listed variable enquires about usefulness only, thus without knowing the initial level of importance that an interviewee had in mind when responding, no conclusion can be drawn. This represents a weakness in the formulation, as a similar verbalisation of both questions might have resulted in a deeper insight.

³⁰To compute the Spearman’s rank coefficient, property owners have been coded ‘0’ and interviewees without land as ‘1’ to match the categories ‘Not reasonable’ (coded ‘0’), ‘Undecided’ (‘1’) and ‘Reasonable’ (‘2’). Therefore, the test input is slightly different that represented in Table 26.

Analysing the second part of the above stated research question, namely whether interviewees perceived the possibilities for illegal logging on private Fincas subscribed to PES compared to Fincas without any contract agreement differently, interviewees were confronted with two similar questions. At first, questionnaire participants were asked what they would expect to happen ‘in case a person cuts trees in a forest standing on her private Finca which is under a PES contract’, followed by enquiring about whether the consequences would be any different ‘in case a person cuts trees in a forest standing on her private Finca which has no contract whatsoever’. Possible answers were pre-coded, and results are depicted in Figure 40 and Figure 41. Judging both Figures at first sight, it becomes apparent that the most dominant sector, ‘Pay a fine’, is bigger in the upper than in the lower Figure. Looking at the numbers, this implies that participants saw it 10 percent more likely that persons who cut trees in a PES protected forest have to pay a fine compared to when no contract whatsoever is made for the forest. Furthermore, the possibility that ‘nothing’ will happen (‘no one applies the law’) is more than doubled in the latter case (7 percent compared to 17 percent). In almost one third of cases (five out of 14 observations) where interviewees stated that the illegal activity generally does not entail repercussions, the impression was expressed that MINEA and other relevant agencies do not work on the weekend, thus on Saturdays and Sundays tree-cutting could still take place without consequences. Thus, it got apparent that these five persons applied their view that ‘nothing’ would happen to the weekend only, and not to every single day during the week.

This issue has been taken up in qualitative interviews with forest experts, leading to a mixed result. Fernando Salaz Sarkis, head of MINEA’s regional office in Sarapiquí agreed by stating that weekends represent the time when most of forest related delicts are occurring. Therefore, MINEA tried to change the working schedule of some government employees (‘funcionarios del estado’) to secure more presence during the weekend. However, these plans were rejected by the administration. “We should be more preventive” (‘deberíamos ser más preventivos’), he acknowledged, but at the same time pointing towards the 2002 established ‘brigada de control de tala ilegal’, a group of four ‘funcionarios’ created out of an alliance between MINEA, Fundecor and an NGO to show institutional presence by visiting sites registered as problematic by motorcycle. Pedro González Chaverri, forest expert at Fundecor also refers to the 2002 established forest brigade, emphasising that these should not be understood as a substitute for the police but more as means to demonstrate presence. Only Eduardo Solórzano, head of Fonafifo’s regional office in Sarapiquí, disagreed with the statement that much of the deforestation that is still occurring could be curtailed by showing more presence during the weekend. In case a person is determined to cut down a tree, he claimed, that person will somehow find a way, thus the weekday does not appear to matter.

What would you expect to happen in case a person cuts trees in a forest standing on her private Finca which is under a PES contract?

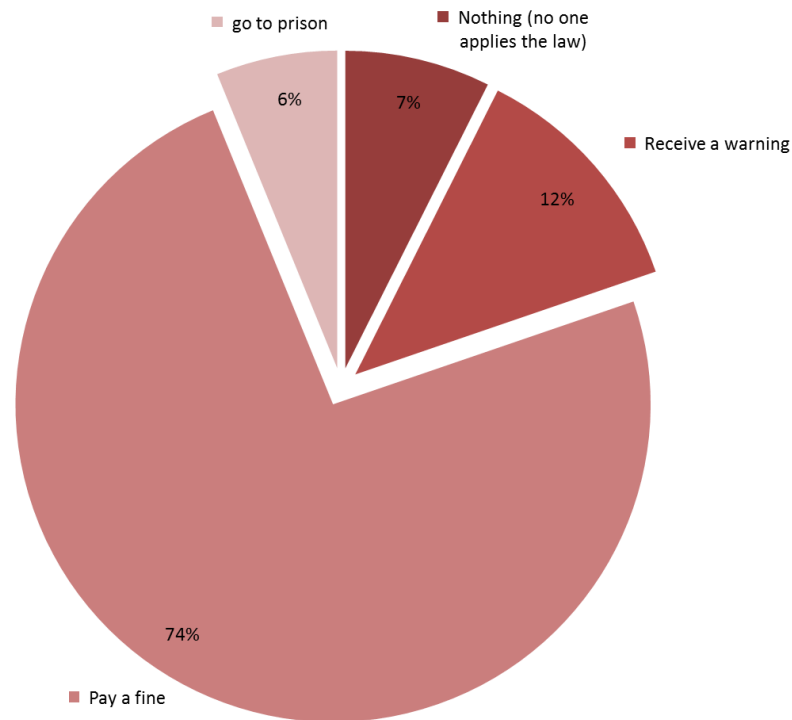


Figure 40: Consequences for cutting trees in a PES protected forest

What would you expect to happen in case a person cuts trees in a forest standing on her private Finca which has no contract whatsoever?

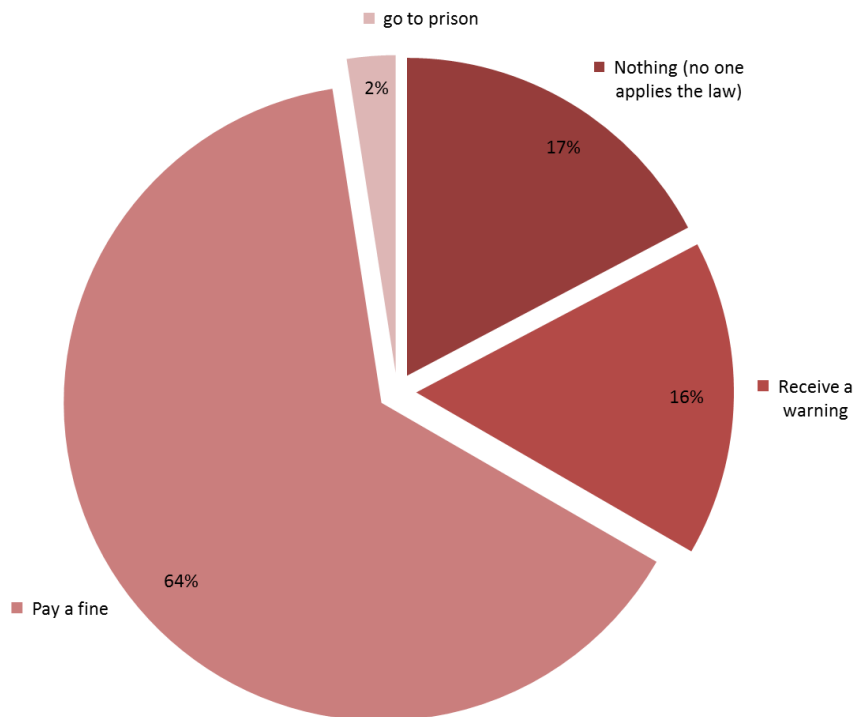


Figure 41: Consequences for cutting trees in a non-protected forest

Referring back to Figure 40 and Figure 41, differences in responses can be analysed using the Mann-Whitney-*U*-Test, as data are on an ordinal level of measurement only. This non-parametric statistical hypothesis test enables us to assess whether consequences to the act of tree-cutting in case i) a forest is under a PES contract or ii) no contract whatsoever is made for the forest are perceived differently. Table 42 shows test statistics, demonstrating that the null-hypothesis stating that no statistical difference in the central tendency between perceived consequences exist, can be rejected at a five percent significance level (2-tailed test, $p = 0.025^*$, $\alpha = 0.05$). Furthermore, we see that the mean rank is higher in case a forest is PES protected, implying stricter reactions to the act of tree-cutting compared to when no contract whatsoever is made for the forest.

Mann-Whitney-U-Test, Ranks				Test Statistics		
	N	Mean Rank	Sum of Ranks			
Tree-cutting in...	a Finca under PES contract	81	88,25	7148,00	Mann-Whitney U	2734,000
	in a Finca with no contract whatsoever	81	74,75	6055,00	Wilcoxon W	6055,000
	Total	162			Z	-2,245
				Asymp. Sig. (2-tailed)	,025	

Figure 42: Mann-Whitney-*U*-Test, PES protected Finca vs. no contract

Despite the significant results, it appears interesting that in the second case (tree cutting in a non-protected forest), 83 percent of interviewees generally expected a reaction of any kind to happen, such as the receipt of a warning, the payment of a fine or imprisonment. Understandably, this rate is, with 93 percent, higher in the first case (tree-cutting in a PES protected forest) as signing of a contract might be associated with controls or supervision. However, the fact that 83 percent of respondents expected consequences for tree-cutting in a non-protected forest implies that the chances for illegal logging on private Fincas are generally considered to be low in the sample. This finding is consistent with responses given to the statement that the government is now more capable than before to enforce the Forest Law (see research question above). Here, 85 percent of interviewees (67 out of 79 observations) did not disagree. Further checking the consistency of the responses, views expressing that ‘nothing’ will happen in a case a person cuts trees in a forest standing on her private Finca can be examined together with attitudes not agreeing to the statement that PES is an effective instrument to preserve forests and enhance biodiversity richness. A reasonable assumption would be to expect a relationship between both views. However, out of the five respondents who disagreed to the statement that PES is a useful instrument to preserve forests and enhance biodiversity richness, only one person stated that nothing would happen in case the illegal activity was undertaken in a PES protected forest. In a non-protected forest, two out of the five persons voiced that nothing would happen, indicating that the majority of respondents who did not agree to the usefulness of PES still considered a reaction in the form of a warning, a fine or imprisonment in case trees were being cut on private land. This insight points either towards an inconsistency in

responses or might tell us that for these interviewees, the law in itself is sufficient for enforcement and no monetary incentive mechanisms are needed to assure compliance.

- *How do people located close to PES site perceive the fairness of their neighbours receiving PES, even though their land is already under a deforestation ban by the Forest Law?*

The deforestation ban imposed by the Forest Law already prohibits to cut trees and change the land use in forests standing on private property, only in some circumstances permits are issued, such as for the construction of houses, offices, infrastructural projects of national interest, security reasons, for the prevention of forest fires etc.. Since the condemnation of tree cutting is already inscribed in law, an interesting topic to conduct research on concerns the question of fairness, namely whether the disbursement of PES payments to subscribed landowners is perceived as a just practise, even though the Forest Law already forbids to cut down trees or change the land use in a forest standing on private property (except in the above mentioned cases). For the assessment of fairness concerns, participants were asked to rate a statement using a five-point Likert scale. Depending on the response given, one to three open questions followed.

Property ownership * Perception of fairness/ unfairness of PES						
Fair that people receive PES payments even though the Forest Law already exists (shortened version of questionnaire statement)						
		1 (totally disagree)	3 (indifferent)	4 (agree)	5 (totally agree)	Total
Owns property (more than 1 ha)	No	9	4	8	50	71
	Yes	0	1	1	7	9
Total		9	5	9	57	80

Table 28: Fairness of PES payments, sorted by property ownership

Table 28 depicts responses, further being subdivided according to whether interviewees were property owners or not (ownership of land ≥ 1 ha). Out of all 80 valid responses, 88 percent (71 observations) did not disagree with the view that the receipt of payments is fair, despite the existence of the Forest Law. Before highlighting mentioned reasons for holding a certain view, it is worth remembering that subsection 3.7 (‘Fairness concerns’) in the literature review proposed equity theory as appropriate approach to examine fairness concerns. The basic proposition of this theory is that individuals review their respective inputs and outputs and check them with others, with negative motivational consequences in case unfairness is perceived. This effect-channel has been picked up in the developed model, with fairness concerns affecting motivations (see chapter 4, ‘The Model’). However, with nine observations only disagreeing, possibilities for the analysis of fairness concerns are severely hampered. This in itself can already be taken as a first finding, namely that

the majority of respondents (88 percent) were indeed of the opinion that the receipt of payments for forest protection is a just practise. Differentiating between property owners and respondents without land title does, at first sight, not appear to reveal patterns of association. Using a non-parametric test, Spearman’s rank correlation coefficient testing the null-hypothesis that there is no correlation in the data is given with $\rho = 0.06$ and a significance of sig.= 0.56 (2-tailed), thus the hypothesis that there is no correlation in the data cannot be rejected (N=80, $\alpha = 0.05$). That no significant correlation can be found implies for instance that interviewees without land title did not tend to regard made PES payments as unfair whereas property owners, potentially qualifying to enter the PES application pool, view payments as fair.

Taking a closer look at Figure 43, we recognise that the most frequently cited reason for regarding payments as fair was that respondents thought of payments more as a compensation or a support for the services contracted PES receivers provide. “Because

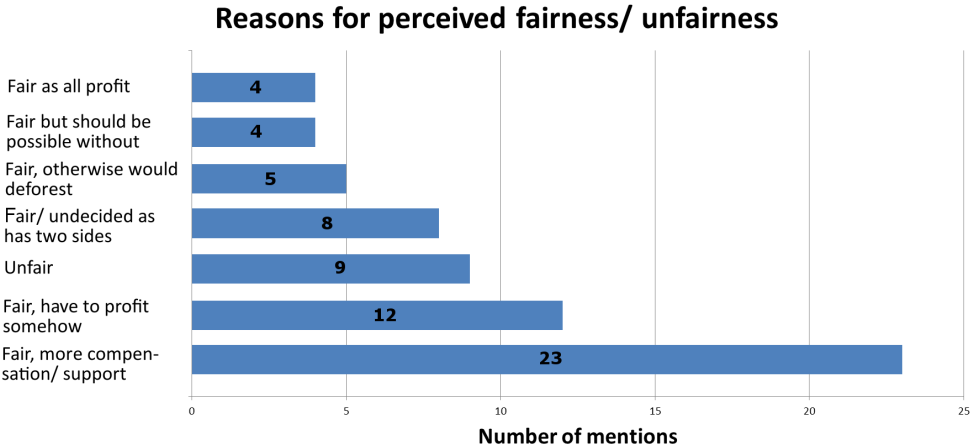


Figure 43: Reasons for perceived fairness/unfairness of PES

they keep protecting” (‘porque siguen protejiendo’), “because they do something” (‘porque están haciendo algo’) or “with [financial] support, it is easier for these persons to accept such programmes” (‘con el apoyo, es más facil para esas personas de aceptar los programas’) was put forward. Most of the reasons belonging to this category emphasised an active component, as illustrated by the first two quotes. By contrast, responses being grouped into the second category were characterised through a more passive notion. Twelve interviewees stated here that PES receivers have to profit somehow from the land they own, otherwise a forest standing on private property would be of no use. “They also have to aliment their families, and if they cannot take advantage of their territory...” (‘también tienen que dar comida a su familia, y si no pueden aprovechar su tierra...’), “somehow, land owners have to have a benefit from their Finca” (‘de alguna manera, la gente tiene que beneficiar de su finca’) or “people have to eat, people hace to support their children...that is why its very good that they pay” (‘hay que comer, hay que apoyar

a sus hijos...por eso es muy bien que pagan’) represented some responses.

As mentioned already, nine participants disagreed with the confronted statement, thus expressing fairness concerns. The reason that every person should conserve the environment and forests out of their own motivation without the necessity of being paid was put forward four times, followed by the view that the Forest Law already prohibits tree cutting, thus payments are simply not needed, a reason articulated twice. One participant said that “it is unfair because only few people receive payments but we are all paying with our money for it. They use taxes for the payment” (‘Es injusto, porque solo alguna gente recibe pagos pero todos de nosotros pagamos con nuestra plata. Ellos utilizan impuestos para pagar’). After enquiring about reasons, these nine persons have further been asked if, due to their view on payments as being unfair, new perceptions, feelings, changes in motivations etc. resulted out of the perceived unfairness with reference to the receivers of these payments. Besides the intention to discover motivational changes to support the proposed model, space wanted to be given to catch further effects, such as conflict potential for example attributable to these changes in motivations. However, not a single person indicated any modifications in perceptions, feelings or motivations. As a consequence, the effect-channel as proposed in the model cannot be validated. However, it has to be kept in mind that the analysis included nine observations only, thus the sample is extremely small. As outlined, the majority perceived made payments as fair.

Referring back to Figure 43, the main reason for interviewees being ‘undecided’ (Likert-scale rating three) or to plainly ‘agree’ (Likert-scale rating four) can be found in the bar to the middle of the graph. Most out of the eight questionnaire participants adduced two arguments, describing one reason in favour of fairness and one why the same practise could be regarded as unfair. Furthermore, five respondents attributed fairness to the fact that without payments, forest owners would simply deforest. This aspect already figured prominently when analysing reasons for the usefulness of PES as illustrated in Figure 39. The reason that the receipt of PES payments is fair i) but protection should also be possible without payments or ii) due the fact that all citizens profit from increased environmental protection were named four times each.

6.4 Results RQ part II

The objective of the second part of the research question has been to investigate how identified neighbourhood effects could be explained, looking at relationships between variables on the one side and certain theories and their proposed effect-channels on the other. Research questions belonging to this part two are distinct from questions belonging to the former part, as the possibility for analysis depends partly on responses given to part one. Thus, the characteristic of results can determine whether the analysis of a proposed

effect-channel put forward in the literature becomes possible or not.

- *Low motivations towards the environment are negatively correlated with self-reported negative motivational effects concerning the environment due to the introduction of a PES scheme close-by*

This research question has been formulated with the intention to measure tangible ‘crowding out’ effects. The feasibility for the analysis of crowding out effects depended on the responses given to two Likert-scale items, one enquiring about whether interviewees’ motivations to conserve the environment decreased on receiving information regarding PES from their respective information source as they felt that their ‘own attempts to conserve the environment are not appreciated’ or whether a reversely directed motivational effect kicked in, namely that respondents felt ‘more motivated than before to undertake actions in the conservation of the environment’. However, it has been demonstrated that no effect in either direction could be detected, thus respondents did not seem to adjust their motivational levels with reference to the conservation of the environment on receiving information regarding PES from one of their respective information sources. This result makes the analysis of the proposed correlation impossible to carry out.

- *Views on nature’s commodification are correlated with self-reported negative motivational effects concerning the environment due to the introduction of a PES scheme close-by*

Assessing whether the introduction of monetary evaluation methods for the description of the environment is correlated with motivational modifications should be examined in the following. In sub-section 3.6 ‘Commodification of nature’, the theoretical considerations for the occurrence of such an effect have already been outlined. Furthermore, we have shown that 18 respondents indeed stated that they are now of the opinion that nature and forests have a price which is more or less defined and that it became possible to quantify the value of nature and forests whereas this has been impossible at earlier times. However, a correlation between views on nature’s commodification and self-reported motivational effects concerning the environment due to the introduction of a PES scheme close-by has to be denied right from the outset, as no motivational adjustments are reported in the study.

Being enabled to formulate a first guess, it might be worthwhile to substitute self-reported negative motivational effects with expressed motivations towards the environment, using the latter as a proxy for the former. In the questionnaire, interviewees were asked to self-rate their motivation to take action for the environment in a number ranging from zero to ten (for potential biases associated with this question, see sub-section 5.5 and ‘Pre-test modifications’). Thus, the alternative hypothesis could be tested that participants who fulfilled the two basic preconditions with reference to commodification effects

exhibit a lower value in terms of their motivation to take action in favour of the environment than participants who did not indicate commodification effects (one-tailed test). Surely, the test is not conclusive as we do not know participants' initial level of motivation to take actions in favour of the environment, thus a lowered value of the group expressing commodification effects cannot be attributed exclusively to the imposition of "a single language of valuation" [Kosoy et al., 2007, p.1232] triggered through a change in the logic of a situation. However, a significant result could be taken as an indication that a relationship exists between low motivations to take action in favour of the environment and the introduction of economic evaluation methods. Taking a first look at descriptive statistics as depicted in Table 29, we can discard these thoughts: With a higher mean value and a lower standard deviation of the group indicating commodification effects, the existence of an effect as proposed is unlikely.

Descriptive Statistics

		N	Minimum	Maximum	Mean	Std. Deviation
Preconditions fulfilled (indicated commodification effects)	Motivation to take action in favour of the environment	18	5	10	9,33	1,237
	Valid N (listwise)	18				
Preconditions not fulfilled (no commodification effects)	Motivation to take action in favour of the environment	60	5	10	8,67	1,244
	Valid N (listwise)	60				

Table 29: Descriptives, commodification effects and motivation towards the environment

- *Fairness concerns with reference to the neighbour who receives PES are negatively correlated with self-reported negative motivational effects concerning the environment due to introduction of a PES scheme close-by*

The possibility for the analysis of the described correlation is hindered in two ways. Besides the fact that no motivational effects could be detected, which already hampered the analysis of the two previous research questions, it has been shown that only nine participants articulated fairness concerns. This number is relatively small, thus limiting statistical assessment methods. Therefore, only descriptive statistics will be presented to provide a first impression, again with expressed motivations towards the environment as proxy for self-reported negative motivational effects concerning the environment due to introduction of a PES scheme close-by.

Table 30 highlights results, showing an opposite trend than proposed in the research question. Respondents perceiving the disbursement of PES payments as unfair exhibit a slightly higher mean combined with a lower standard deviation, indicating that the data points are scattered closer to the mean. However, a meaningful analysis seems difficult to conduct due to the small amount of observations in one of the two categories.

		Descriptive Statistics				
		N	Minimum	Maximum	Mean	Std. Deviation
Unfair that a person in neighbourhood receives PES payments	Motivation to do something for the environment	9	7	10	8,89	1,054
	Valid N (listwise)	9				
Fair (including "undecided") that neighbour receives PES payments	Motivation to do something for the environment	70	5	10	8,81	1,300
	Valid N (listwise)	70				

Table 30: Descriptives, fairness and motivation towards the environment

- *Neighbourhood effects increase with the time of being located next to a PES site*

With households being sampled in the distance of zero to 500m from a property which currently receives PES payments, it was assumed that most of participants were aware of the existence of such a PES site due to the narrow geographical radius. Based on this assumption, the hypothesis has been formulated that neighbourhood effects increase with the time households find themselves located next to a PES site as more possibilities for influences are given. However, with only nine out of 80 respondents (see Table 10) expressing awareness, the scope of the analysis is severely constrained. Therefore, the formulated hypothesis seems difficult to test as even a significant result demonstrating for instance that the information seeking behaviour with reference to PES is higher, on average, for interviewees who have lived for a longer time period close to a PES site compared to respondents who living in an area where the PES site has just recently been established, could not properly be explained.

Nevertheless, for the matter of interest, t-Test statistics have been calculated for the four variables where information received from the neighbourhood dimension could be separated from information sources lying outside of this definition, retaining only the former observations: i) Information seeking behaviour; ii) decrease in motivation due to own attempts to conserve the environment not being appreciated; iii) more motivated than before to undertake actions to conserve the environment; iv) increase in the government's capacity to enforce the Forest Law. For each one of these four variables, interviewees naming that information about PES was received from sources belonging to the neighbourhood dimension were selected and grouped according to whether they belonged to research site A1-07/08 and A2-08 on the one side or to A3-11/12 on the other to check for temporal effects. Testing for differences in means between both groups (information received from the neighbourhood dimension and living in research site A1-07/08 or A2-08 vs. information received from the neighbourhood dimension and living in research site A3-11/12) using t-Tests with an alpha-level of $\alpha = 0.05$ reached no significant results, thus in all four cases the null-hypothesis could not be rejected. Given the fact explained above, namely that only nine out of 80 respondents expressed awareness, the assumption

that neighbourhood effects increase with the time a household finds itself located next to PES site cannot be verified.

- *Is the assessment of neighbourhood effects conducive to geographical analysis?*

This question dates back to when it was planned in the research proposal to focus exclusively on geographical neighbourhood effects, i.e. to attribute all effects analysed in this study to geographical proximity only without opening up for effects triggered due to the wider neighbourhood dimension, i.e. effects triggered due to contact to the family, friends etc.. To analyse if the assessment of neighbourhood effects is conducive to geographical analysis, it appears useful to examine at first how often interviewees attributed an effect to an information source which can be linked to geographical proximity. For this purpose, we can organise the already depicted pie chart represented in Figure 34 in a slightly different way as done in the illustrated Figure 44. Looking at the three sources belong-

Strongest sources for information provision regarding PES

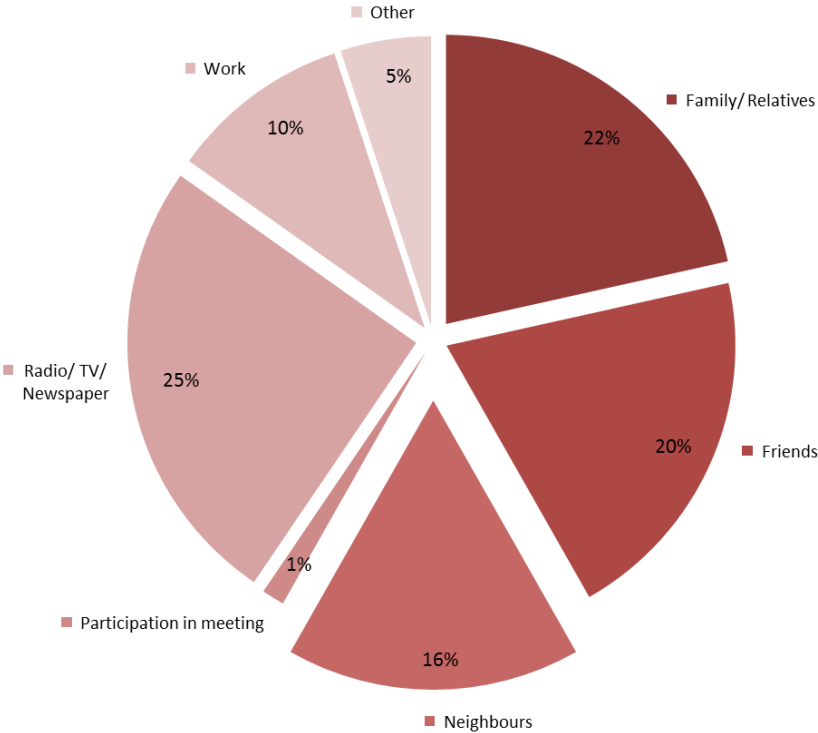


Figure 44: Strongest source for PES information II, sorted by categories

ing to the neighbourhood dimension such as a) family/relatives, b) friends and c) neighbours, only the final information source ‘Neighbours’ can clearly be linked to geographical proximity. As shown in Figure 44 ‘Family/relatives’ rank first with 22 percent, followed by information received from friends with 20 percent. However, the category of ‘Neighbours’ stands, with 16 percent, last when ranking the importance of the three sources belonging

to the neighbourhood dimension.

This finding seems consistent with other results found in the study. As outlined in the previous research question, only nine out of 80 respondents were aware that a property with PES exists in the distance of zero to 500m from their place of residence. Re-considering Table 11 and PES information-sharing within the vicinity, we have further seen that 96.3 percent of study participants have never spoken about PES with persons living in the distance of maximum of 500m from their homes. Taking results out of all three areas together, these indicate that i) an argument for the relevance of a geographical neighbourhood definition over other, more wider neighbourhood definitions cannot be made (comparison-perspective) and that ii) an analysis of spill-over effects focusing exclusively on geographically determined triggers does not seem to be conducive for the analysis of neighbourhood effects in the case-study region (single-perspective), as other, potentially more important factors than geographical distance could be missed out.

7 Conclusions

The aim of this study has been to assess ex-post neighbourhood-effects of payments for environmental services, i.e. to analyse the influences PES schemes exert beyond its demarcated area over the surrounding environment (spill-over effects), and understanding from this neighbourhood perspective the effects and reactions that are being triggered. For this purpose, a case-study in the Sarapiquí canton in Costa Rica has been designed and undertaken.

I found that the distinction made between whether an interviewee received information regarding PES out of sources belonging to the neighbourhood dimension, i.e. from family/relatives, friends and neighbours, or whether information was obtained from contact to intermediaries, the attendance of an informational meeting, radio, TV and newspapers, thus from sources which are not related to the neighbourhood dimension, could not be used as an indication for the strength of measured effects. In fact, with reference to information seeking behaviour and the perception over the government's capacity to enforce the Forest Law, parametric tests resulted in non-rejection of the hypothesis that means of responses grouped according to the two defined dimensions are equal, thus casting heavy doubt upon the usefulness of the distinction made. Moreover, this result was not only confirmed in the aggregate picture when data over all three research sites were analysed (A1-07/08, A2-08, A3-11/12), it was also stable when carrying out the same test for each research site individually. Only in the case of commodification effects, non-parametric tests led to a moderate correlation, implying that the likelihood that commodification effects were triggered was somewhat greater in case information was received from sources lying outside the neighbourhood dimension compared to when information was received from sources belonging to the neighbourhood dimension. However, also in this case a stronger relationship could be found when examining the neighbourhood dimension only, separating whether information was received from persons who had a PES contract at some point in time compared to whether information came from persons who never had such a contract, possibly indicating differences in information transmission. Overall, the implications for the proposed model are clear: A distinction in intensity levels of effects triggered due to one of the two respective information sources cannot be verified.

However, when information sources which served only as a first contact point to PES were contrasted with the strongest sources responsible for PES knowledge transfers, a substantial increase in the importance of the neighbourhood dimension could be identified. This finding indicates that family/relatives, friends as well as neighbours are important sources for information transmission and that they, even when a different first contact point to the PES topic has been made, can complement and deepen knowledge. In this case, contact to persons who still receive or had received a PES contract in the past appeared of par-

ticular relevance, as the most significant increase in percentage points was registered there.

The analysis of proposed effect-channels put forward in the literature, i.e. the direction in which independent components exert an influence over dependent ones, revealed a mixed picture. With reference to the developed model, four variables were examined in more detail.

- The effect suggesting that events which are perceived as controlling or autonomy enhancing influence motivations to do something for the environment could not be validated. Therefore, no evidence for the validity of the theory of impaired self-esteem could be found in the present study. In consequence, possibilities for the assessment of crowding-out effects were ruled out. However, the absence of an effect might be explained through the modified context to which the theory was tailored to.
- Notions related to nature's and forests' commodification could be traced in the study. However, not a single interviewee responded to all statements and questions in a way which stood for a commodification/commercialisation view, implying that even though economic evaluation methods are introduced through the promotion of PES, these views are still not intense enough to dominate. That interviewees who expressed commodification views are characterised through a lower value in terms of their motivation to take action in favour of the environment than participants who did not indicate commodification effects, could not be supported.
- Fairness concerns were found to be minimal. For the few participants expressing concerns, no one indicated any modifications in perceptions, feelings or motivations attributable to the felt unfairness, thus an effect of fairness concerns on motivations, as proposed by the developed model has to be denied. Generally, it was found that interviewees regarded made payments as fair and just, with the most cited reasons being that PES providers contribute to environmental protection (active component) or that providers should somehow profit from their territory (passive component).
- The majority of questionnaire participants was not aware that at the time of research, a property with PES was located in the distance of zero to 500m from their place of residence. Furthermore, information sharing within the vicinity was close to non-existent. Therefore, preconditions for the analysis of temporal effects attributable to the fact of being situated for a shorter/longer time period next to a PES site were not fulfilled, rendering the assessment impossible. Thus, an analysis of spill-over effects focusing exclusively on geographically determined triggers does not seem to be conducive for the analysis of neighbourhood effects.

Regarding the Forest Law, I found that interviewees were indeed of the opinion that the receipt of information regarding PES positively stimulated perceptions over the government's capacity to enforce the Law established in 1996. Furthermore, the imposed deforestation ban was generally considered to be reasonable, irrespective of whether study participants owned land or not, indicating that respondents did not evaluate individual rights to forest clearing on private land as standing above the general necessity for forest protection.

With respect to the consequences of tree-cutting, a significant difference could be identified whether the act is carried out on PES protected or non-PES protected land, a result which is consistent with views over the usefulness of PES and the government's capacity to enforce the Forest Law. In itself, this result appears straightforward as signing of a contract might be associated with controls or supervision. However, the finding that the great majority of interviewees expected consequences of any sort to happen (receipt of a warning, the payment of a fine or imprisonment) even in case no contract was made whatsoever, indicates that chances for illegal logging on private Fincas were generally considered to be low.

8 Recommendations

Methodological improvements

Besides the distinction made in this study between whether an interviewee received information regarding PES out of sources belonging to the neighbourhood dimension or not, particular attention was directed towards geographically determined triggers. In methodological terms, this has been expressed in the formulation of sampling criteria. As discussed, these pre-set criteria turned out to be highly restrictive, thus complicating and lengthening the sampling process quite substantially. However, results found in this study suggest that an analysis of spill-over effects focusing exclusively on geographically determined triggers does not seem to be conducive for the analysis of neighbourhood effects. Therefore, less thought should be put into the question of how spatial overlaps can be controlled for, i.e. where PES sites had previously been established at a research site.

Policy recommendations

- Results demonstrated that interviewees' awareness of the existence of a PES site in the nearby geographical neighbourhood is minimal. This finding is inconsistent with views expressed by forest experts, as I was told during qualitative interviews that neighbours generally should be aware of the existence of a PES site. All experts attributed their impression to the mandatory labelling of a PES receiving Finca ('rotulación'), stating that the sign put up signaling that the respective territory is enrolled in the PES programme is enough to raise awareness. As Fernando Salaz Sarkis (Minae) puts it, these signs indeed represent "a way to promote, at the level of neighbours, that he [PES receiver] is enrolled in PES" ('una manera de promover a nivel de los vecinos que él está en PSA'). To improve awareness, i) the amount of signs could be increased or ii) more criteria for the placement of signs could be set, e.g. to installing them near main roads where visibility is assured.
- As no difference in intensity levels of effects being triggered due to either information sources belonging to the neighbourhood dimension or due to information sources lying outside of this dimension could be detected in the study, a statement for the superiority of one dimension for information provision cannot be made. This means, in turn, that a broad approach to information dissemination should be pursued. However, particular attention should be placed upon radio, television or newspapers (above all: television). These mediums did not only represent the most frequently cited first contact point to PES or ranked top when assessing the strongest source from which information regarding PES was received, they further were of substantial relevance for interviewees who had not a single person who has ever received PES among their family members, friends, or distant acquaintances.

- Concerns that awareness raising, as suggested by both points described above, might lead to motivational crowding-out effects or the fuelling of envy can, according to study results, be put aside. As the majority of questionnaire participants did not express fairness concerns or indicated motivational adjustments, the promotion of information can be pursued without doubts.
- The study demonstrated that chances for illegal logging are generally considered to be low by study participants. However, some respondents indicating that tree-cutting could still take place without legal repercussions attributed their view to relaxed controls during the weekend. Therefore, an increase in presence on Saturdays and Sundays should be considered, e.g. through an increase in the usage of the ‘forest brigades’ (‘brigada de control de tala ilegal’) during these days.

References

- [Adesina and Chianu, 2002] Adesina, A. and Chianu, J. (2002). Determinants of farmers' adoption and adaptation of alley farming technology in nigeria. *Agroforestry Systems*, 55(2):99–112.
- [Adesina et al., 2000] Adesina, A., Mbila, D., Nkamleu, G., and Endamana, S. (2000). Econometric analysis of the determinants of adoption of alley farming by farmers in the forest zone of southwest cameroon. *Agriculture, ecosystems & environment*, 80(3):255–265.
- [Alix-Garcia et al., 2010] Alix-Garcia, J., Shapiro, E., and Sims, K. (2010). Forest conservation and slippage: Evidence from mexicos national payments for ecosystem services program. *University of Wisconsin-Madison, Department of Agricultural and Applied Economics, Staff Paper Series*, 548:1–53.
- [Arriagada et al., 2010] Arriagada, R., Ferraro, P., Sills, E., Pattanayak, S., and Cordero, S. (2010). Do payments for environmental services reduce deforestation? a farm level evaluation from costa rica. *Arbor*, 1001:48195.
- [Arriagada et al., 2009] Arriagada, R., Sills, E., Pattanayak, S., and Ferraro, P. (2009). Combining qualitative and quantitative methods to evaluate participation in costa rica's program of payments for environmental services. *Journal of Sustainable Forestry*, 28(3-5):343–367.
- [Bem, 1967] Bem, D. (1967). Self-perception: An alternative interpretation of cognitive dissonance phenomena. *Psychological Review; Psychological Review*, 74(3):183.
- [Bem, 1972] Bem, D. (1972). Self-perception theory. In *Advances in Experimental Social Psychology (Vol. 6, pp.1-62)*, New York: Academic Press, volume 6, pages 1–62.
- [Benabou and Tirole, 2003] Benabou, R. and Tirole, J. (2003). Intrinsic and extrinsic motivation. *Review of economic studies*, 70(3):489–520.
- [Bewley, 1999] Bewley, T. (1999). *Why wages don't fall during a recession*. Harvard University Press.
- [Blackman, 2012] Blackman, A. (2012). Ex post evaluation of forest conservation policies using remote sensing data.
- [Boneau, 1960] Boneau, C. (1960). The effects of violations of assumptions underlying the t test. *Psychological bulletin*, 57(1):49.
- [Brock and Durlauf, 2001] Brock, W. and Durlauf, S. (2001). Discrete choice with social interactions. *Review of Economic studies*, 68(2):235–260.
- [Brotherton, 1989] Brotherton, I. (1989). Farmer participation in voluntary land diversion schemes: some observations from theory. *Journal of Rural Studies*, 5(3):299–304.
- [Brotherton, 1991] Brotherton, I. (1991). What limits participation in eas? *Journal of Environmental Management*, 32(3):241–249.
- [Bryman, 2008] Bryman, A. (2008). *Social research methods- Third edition*. CSIRO.
- [Camacho et al., 2000] Camacho, M., Segura, O., Reyes, V., and Aguilar, A. (2000). Pago por servicios ambientales en costa rica. *PRISMA*.
- [Camacho et al., 2012] Camacho, M., Segura, O., Reyes, V., and Aguilar, A. (2012). De rio a rio+: Lecciones de 20 años de experiencia en servicios ambientales en costa rica. *International Institute for Environment and Development (IIED)*.
- [Cardenas et al., 2000] Cardenas, J., Stranlund, J., and Willis, C. (2000). Local environmental control and institutional crowding-out. *World Development*, 28(10):1719–1733.
- [Carrell and Dittrich, 1978] Carrell, M. and Dittrich, J. (1978). Equity theory: The recent literature, methodological considerations, and new directions. *Academy of Management Review*, pages 202–210.
- [Census-CR, 2011] Census-CR (2011). C01. población total, zona, sexo, provincia, cantón, distrito. *Instituto Nacional de Estadística y Censos (INEC)*.

- [Clements et al., 2010] Clements, T., John, A., Nielsen, K., An, D., Tan, S., and Milner-Gulland, E. (2010). Payments for biodiversity conservation in the context of weak institutions: Comparison of three programs from cambodia. *Ecological Economics*, 69(6):1283–1291.
- [Cohen et al., 2007] Cohen, L., Manion, L., Morrison, K., and Morrison, K. (2007). *Research methods in education*. Psychology Press.
- [Colquitt et al., 2001] Colquitt, J., Conlon, D., Wesson, M., Porter, C., and Ng, K. (2001). Justice at the millennium: a meta-analytic review of 25 years of organizational justice research. *Journal of applied psychology*, 86(3):425.
- [Corbera et al., 2007] Corbera, E., Brown, K., and Adger, W. (2007). The equity and legitimacy of markets for ecosystem services. *Development and Change*, 38(4):587–613.
- [Curran et al., 2004] Curran, L., Trigg, S., McDonald, A., Astiani, D., Hardiono, Y., Siregar, P., Caniango, I., and Kasischke, E. (2004). Lowland forest loss in protected areas of indonesian borneo. *Science*, 303(5660):1000–1003.
- [Daniels et al., 2010] Daniels, A., Bagstad, K., Esposito, V., Moulaert, A., and Rodriguez, C. (2010). Understanding the impacts of costa rica’s pes: Are we asking the right questions? *Ecological economics*, 69(11):2116–2126.
- [De Cremer and Stouten, 2005] De Cremer, D. and Stouten, J. (2005). When does giving voice or not matter? procedural fairness effects as a function of closeness of reference points. *Current psychology*, 24(3):203–213.
- [Deci, 1971] Deci, E. (1971). Effects of externally mediated rewards on intrinsic motivation. *Journal of personality and Social Psychology*, 18(1):105–115.
- [Deci, 1975] Deci, E. (1975). *Intrinsic motivation*. New York: Plenum Publishing Co.
- [Deci et al., 1999] Deci, E., Koestner, R., and Ryan, R. (1999). A meta-analytic review of experiments examining the effects of extrinsic rewards on intrinsic motivation. *Psychological bulletin*, 125(6):627.
- [Deci and Ryan, 1980] Deci, E. and Ryan, R. (1980). The empirical exploration of intrinsic motivational processes. In *Advances in Experimental Social Psychology (Vol. 13, pp.39-80)*, New York: Academic Press, volume 13, pages 39–80.
- [Deci and Ryan, 1985] Deci, E. and Ryan, R. (1985). *Intrinsic motivation and self-determination in human behavior*. Springer.
- [Deci and Ryan, 1991] Deci, E. and Ryan, R. (1991). A motivational approach to self: Integration in personality. In *Nebraska Symposium on Motivation: Vol. 38. Perspectives on motivation*, University of Nebraska Press, volume 38, pages 237–288.
- [Deci and Ryan, 2000] Deci, E. and Ryan, R. (2000). The "what" and "why" of goal pursuits: Human needs and the self-determination of behavior. *Psychological inquiry*, 11(4):227–268.
- [Emden et al., 2008] Emden, F., Llewellyn, R., and Burton, M. (2008). Factors influencing adoption of conservation tillage in australian cropping regions. *Australian Journal of Agricultural and Resource Economics*, 52(2):169–182.
- [Engel and Palmer, 2008] Engel, S. and Palmer, C. (2008). Payments for environmental services as an alternative to logging under weak property rights: the case of indonesia. *Ecological Economics*, 65(4):799–809.
- [Engel et al., 2009] Engel, S., Wünscher, T., and Wunder, S. (2009). Increasing the efficiency of forest conservation: The case of payments for environmental services in costa rica. *Avoided deforestation: Prospects for mitigating climate change*. Oxford, Routledge, pages 314–328.
- [Falk et al., 1999] Falk, A., Gächter, S., and Kovács, J. (1999). Intrinsic motivation and extrinsic incentives in a repeated game with incomplete contracts. *Journal of Economic Psychology*, 20(3):251–284.
- [Fehr and Falk, 2002a] Fehr, E. and Falk, A. (2002a). Psychological foundations of incentives. *European Economic Review*, 46(4):687–724.
- [Fehr and Falk, 2002b] Fehr, E. and Falk, A. (2002b). Psychological foundations of incentives. *The Institute for the Study of Labor (IZA)*.
- [Folger and Cropanzano, 2001] Folger, R. and Cropanzano, R. (2001). Fairness theory: Justice as accountability. *Advances in organizational justice*, 1:3–33.

- [Fonafifo, 2012] Fonafifo (2012). Statistics on sarapiquí. *Fonafifo online database*, retrieved 07.10.2012 <http://www.fonafifo.go.cr>.
- [Freeman, 1997] Freeman, R. (1997). Working for nothing: The supply of volunteer labor. *Journal of Labor Economics*, 15(1):140–166.
- [Frey and Jegen, 2001] Frey, B. and Jegen, R. (2001). Motivation crowding theory. *Journal of economic surveys*, 15(5):589–611.
- [Frey and Oberholzer-Gee, 1997] Frey, B. and Oberholzer-Gee, F. (1997). The cost of price incentives: An empirical analysis of motivation crowding-out. *The American economic review*, 87(4):746–755.
- [Fuligni et al., 1999] Fuligni, A., Tseng, V., and Lam, M. (1999). Attitudes toward family obligations among american adolescents with asian, latin american, and european backgrounds. *Child Development*, 70(4):1030–1044.
- [Galdeano-Gómez et al., 2008] Galdeano-Gómez, E., Céspedes-Lorente, J., and Martínez-del Río, J. (2008). Environmental performance and spillover effects on productivity: evidence from horticultural firms. *Journal of environmental management*, 88(4):1552–1561.
- [GeoMid, 2012] GeoMid (2012). Calculation methods - random points, rectangular region. *GeoMidpoint*, retrieved 01.11.2012 <http://www.geomidpoint.com/random/calculation.html>.
- [Gneezy and Rustichini, 2000a] Gneezy, U. and Rustichini, A. (2000a). Fine is a price, a. *J. Legal Stud.*, 29:1.
- [Gneezy and Rustichini, 2000b] Gneezy, U. and Rustichini, A. (2000b). Pay enough or don't pay at all. *The Quarterly Journal of Economics*, 115(3):791–810.
- [Goudas et al., 1995] Goudas, M., Biddle, S., Fox, K., and Underwood, M. (1995). It ain't what you do, it's the way that you do it! teaching style affects children's motivation in track and field lessons. *Sport Psychologist*, 9:254–254.
- [Grieg-Gran et al., 2005] Grieg-Gran, M., Porras, I., and Wunder, S. (2005). How can market mechanisms for forest environmental services help the poor? preliminary lessons from latin america. *World development*, 33(9):1511–1527.
- [Grubb et al., 2002] Grubb, M., Hope, C., and Fouquet, R. (2002). Climatic implications of the kyoto protocol: the contribution of international spillover. *Climatic Change*, 54(1):11–28.
- [Hartmann, 2012] Hartmann, F. (2012). Pay fairness and intrinsic motivation: the role of pay transparency. *The International Journal of Human Management*.
- [HDI, 2011] HDI (2011). Human development report 2011, sustainability and equity: A better future for all, explanatory note on 2011 hdr composite indices costa rica. *UNDP HDR*.
- [Homans, 1966] Homans, G. (1966). *Social behaviour: Its elementary forms*. Taylor & Francis.
- [ICR, 2011] ICR (2011). Anuario estadístico 2010. *Instituto Costarricense de Turismo*.
- [Ikeme, 2003] Ikeme, J. (2003). Equity, environmental justice and sustainability: incomplete approaches in climate change politics. *Global Environmental Change*, 13(3):195–206.
- [IMF-Stat, 2012] IMF-Stat (2012). World economic outlook database, april 2012. *International Monetary Fund (IMF) Statistics*, retrieved 04.10.2012 <http://www.imf.org/external/pubs/ft/weo/2012/01/weodata/weoselgr.aspx>.
- [Jaffe et al., 2005] Jaffe, A., Newell, R., and Stavins, R. (2005). A tale of two market failures: Technology and environmental policy. *Ecological Economics*, 54(2):164–174.
- [Jamieson, 2004] Jamieson, S. (2004). Likert scales: how to (ab) use them. *Medical Education*, 38(12):1217–1218.
- [Johansson-Stenman and Konow, 2011] Johansson-Stenman, O. and Konow, J. (2011). Fairness concerns in environmental economics â€ do they really matter and if so how? In *Three types of environmental justice: From concepts to empirical studies of social impacts of policy instruments for conservation of biodiversity*.
- [Kinnaird et al., 2003] Kinnaird, M., Sanderson, E., O'Brien, T., Wibisono, H., and Woolmer, G. (2003). Deforestation trends in a tropical landscape and implications for endangered large mammals. *Conservation Biology*, 17(1):245–257.

- [Kosoy and Corbera, 2010] Kosoy, N. and Corbera, E. (2010). Payments for ecosystem services as commodity fetishism. *Ecological Economics*, 69(6):1228–1236.
- [Kosoy et al., 2007] Kosoy, N., Martinez-Tuna, M., Muradian, R., and Martinez-Alier, J. (2007). Payments for environmental services in watersheds: Insights from a comparative study of three cases in central america. *Ecological Economics*, 61(2):446–455.
- [Kuzon et al., 1996] Kuzon, W., Urbanchek, M., and McCabe, S. (1996). The seven deadly sins of statistical analysis. *Annals of plastic surgery*, 37:265–272.
- [Likert, 1932] Likert, R. (1932). A technique for the measurement of attitudes. *Archives of psychology*.
- [Loft and Lux, 2010] Loft, L. and Lux, A. (2010). Ecosystem services–ökonomische analyse ihres verlusts, ihre bewertung und steuerung. *BiKF Knowledge Flow Paper*, 10.
- [Mcdowell and Sparks, 1989] Mcdowell, C. and Sparks, R. (1989). The multivariate modelling and prediction of farmers’ conservation behaviour towards natural ecosystems. *Journal of Environmental Management*, 28(3):185–210.
- [McIver and Carmines, 1981] McIver, J. and Carmines, E. (1981). *Unidimensional scaling*, volume 24. Sage Publications, Incorporated.
- [Mideplan, 2007] Mideplan (2007). Indice de desarrollo social 2007. *Ministerio de Planificacion Nacional y Politica Economica (MIDEPLAN)*, 33(2):237–253.
- [Miranda et al., 2003] Miranda, M., Porras, I., and Moreno, M. (2003). The social impacts of payments for environmental services in costa rica. a quantitative field survey and analysis of the virilla watershed. *International Institute for Environment and Development, IIED*.
- [Morris and Potter, 1995] Morris, C. and Potter, C. (1995). Recruiting the new conservationists: farmers’ adoption of agri-environmental schemes in the uk. *Journal of rural studies*, 11(1):51–63.
- [Moss, 1994] Moss, J. (1994). The baseline assessment for a new esa: the case of the mourne mountains and slieve croob. *Incentives for countryside management: the case of Environmentally Sensitive Areas.*, pages 153–178.
- [Murray et al., 2004] Murray, B., Mccarl, B., and Lee, H. (2004). Estimating leakage from forest carbon sequestration programs. *Land Economics*, 80(1):109–124.
- [Nef, 2012] Nef (2012). The happy planet index. *About the Happy Planet Index*, retrieved 05.10.2012 <http://www.happyplanetindex.org/about/>.
- [Norman, 2010] Norman, G. (2010). Likert scales, levels of measurement and the âcelawsâ of statistics. *Advances in health sciences education*, 15(5):625–632.
- [Ortiz Malavasi et al., 2003] Ortiz Malavasi, E., Sage Mora, L., and Borge Carvajal, C. (2003). Impacto del programa de pago de servicios ambientales en costa rica como medio de reducci3n de la pobreza en los medios rurales. *Rute, San Jos3*.
- [Ostmann, 1998] Ostmann, A. (1998). External control may destroy the commons. *Rationality and Society*, 10(1):103–122.
- [Pagiola et al., 2005] Pagiola, S., Arcenas, A., and 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.
- [Pagiola et al., 2002] Pagiola, S., Landell-Mills, N., and Bishop, J. (2002). Making market-based mechanisms work for forests and people. *Selling forest environmental services: market-based mechanisms for conservation and development*.
- [Parker and Van Alstyne, 2005] Parker, G. and Van Alstyne, M. (2005). Two-sided network effects: A theory of information product design. *Management Science*, pages 1494–1504.
- [Pascual et al., 2010] Pascual, U., Muradian, R., Rodr3guez, L., and Duraiappah, A. (2010). Exploring the links between equity and efficiency in payments for environmental services: A conceptual approach. *Ecological Economics*, 69(6):1237–1244.
- [Patchen, 1961] Patchen, M. (1961). *The choice of wage comparisons*. Prentice-Hall Englewood Cliffs, NJ.
- [Pearson, 1931] Pearson, E. (1931). The analysis of variance in cases of non-normal variation. *Biometrika*, 23(1-2):114–133.

- [Pelletier et al., 1998] Pelletier, L., Tuson, K., Green-Demers, I., Noels, K., and Beaton, A. (1998). Why are you doing things for the environment? the motivation toward the environment scale (ntes) 1. *Journal of Applied Social Psychology*, 28(5):437–468.
- [Peters, 2011] Peters, S. (2011). Robust understanding of statistical variation. *Statistics Education Research Journal*, 10(1):52–88.
- [Pfaff et al., 2008] Pfaff, A., Robalino, J., and Sanchez-Azofeifa, G. (2008). Payments for environmental services: empirical analysis for costa rica. *Terry Sanford Institute of Public Policy, Duke University, Durham, NC, USA*.
- [Porras, 2010] Porras, I. (2010). *Fair and Green? Social Impacts of Payments for Environmental Services in Costa Rica*. International Institute for Environment and Development (IIED).
- [Porras et al., 2006] Porras, I., Neves, N., and Miranda, M. (2006). Developing markets for watershed protection services and improved livelihoods. *International Institute for Environment and Development, IIED*.
- [Rege and Telle, 2001] Rege, M. and Telle, K. (2001). An experimental investigation of social norms. *Discussion papers*.
- [Rigby et al., 2001] Rigby, D., Young, T., and Burton, M. (2001). The development of and prospects for organic farming in the uk. *Food Policy*, 26(6):599–613.
- [Robalino and Pfaff, 2011] Robalino, J. and Pfaff, A. (2011). Contagious development: Neighbor interactions in deforestation. *Journal of Development Economics*.
- [Sánchez-Azofeifa et al., 2003] Sánchez-Azofeifa, G., Daily, G., Pfaff, A., and Busch, C. (2003). Integrity and isolation of costa rica’s national parks and biological reserves: examining the dynamics of land-cover change. *Biological Conservation*, 109(1):123–135.
- [Sánchez-Azofeifa et al., 2007] Sánchez-Azofeifa, G., Pfaff, A., Robalino, J., and Boomhower, J. (2007). Costa rica’s payment for environmental services program: intention, implementation, and impact. *Conservation Biology*, 21(5):1165–1173.
- [Sánchez-Azofeifa et al., 2002] Sánchez-Azofeifa, G., Rivard, B., Calvo, J., and Moorthy, I. (2002). Dynamics of tropical deforestation around national parks: remote sensing of forest change on the osa peninsula of costa rica. *Mountain Research and Development*, 22(4):352–358.
- [Sheikh et al., 2003] Sheikh, A., Rehman, T., and Yates, C. (2003). Logit models for identifying the factors that influence the uptake of new no-tillage technologies. *Agricultural Systems*, 75(1):79–95.
- [Sidibe, 2005] Sidibe, A. (2005). Farm-level adoption of soil and water conservation techniques in northern bf. *Agricultural water management*, 71(3):211–224.
- [Sierra and Russman, 2006] Sierra, R. and Russman, E. (2006). On the efficiency of environmental service payments: A forest conservation assessment in the osa peninsula, costa rica. *Ecological Economics*, 59(1):131–141.
- [Sills et al., 2006] Sills, E., Arriagada, R., Pattanayak, S., Ferraro, P., Carrasco, L., Ortiz, E., and Cordero, S. (2006). Impact of the psa program on land use. In *Workshop on Costa Ricas Experience with Payments for Environmental Services*. San José, pages 25–26.
- [Simpson and Weiner, 1989] Simpson, J. and Weiner, E. (1989). *The Oxford English Dictionary, Moul-Ovum*, volume 10. Clarendon Press, Oxford.
- [Skerratt, 1994] Skerratt, S. (1994). Itemized payment systems within a scheme: the case of breadalbane.
- [Sohnngen and Brown, 2004] Sohnngen, B. and Brown, S. (2004). Measuring leakage from carbon projects in open economies: a stop timber harvesting project in bolivia as a case study. *Canadian Journal of Forest Research*, 34(4):829–839.
- [Spector, 1992] Spector, P. (1992). *Summated rating scale construction: An introduction*. Number 82. Sage Publications, Inc.
- [Svarstad et al., 2011] Svarstad, H., Sletten, A., Paloniemi, R., Barton, D., and Grieg-Gran, M. (2011). *Three types of environmental justice: From concepts to empirical studies of social impacts of policy instruments for conservation of biodiversity*. Policymix.

- [TB, 2012] TB (2012). Home-welcome to the tirimbina rainforest center. *La Tirimbina*, retrieved 25.10.2012 <http://www.tirimbina.org>.
- [Thacher et al., 1996] Thacher, T., Lee, D., and Schelhas, J. (1996). Farmer participation in reforestation incentive programs in costa rica. *Agroforestry Systems*, 35(3):269–289.
- [Titmuss, 1970] Titmuss, R. M. (1970). *The Gift Relationship*. Allen and Unwin, London.
- [UNEP, 2012] UNEP (2012). About costa rica. *UNEP*, retrieved 06.10.2012 <http://www.unep.org/climateneutral/Default.aspx?tabid=235>.
- [Upton, 1973] Upton, W. (1973). *Altruism, attribution, and intrinsic motivation in the recruitment of blood donors*. Cornell University.
- [USC, 2012] USC (2012). Organizing Your Social Sciences Research Paper, Characteristics of Qualitative Research. *University of Southern California*, retrieved 07.11.2012 <http://libguides.usc.edu/content.php?pid=83009&sid=615866>.
- [Vatn, 2009] Vatn, A. (2009). Cooperative behavior and institutions. *Journal of Socio-Economics*, 38(1):188–196.
- [Vatn, 2010] Vatn, A. (2010). An institutional analysis of payments for environmental services. *Ecological Economics*, 69(6):1245–1252.
- [Villacorta et al., 2003] Villacorta, M., Koestner, R., and Lekes, N. (2003). Further validation of the motivation toward the environment scale. *Environment and Behavior*, 35(4):486–505.
- [Walker, 2010] Walker, G. (2010). Environmental justice, impact assessment and the politics of knowledge: The implications of assessing the social distribution of environmental outcomes. *Environmental impact assessment review*, 30(5):312–318.
- [WB, 2012] WB (2012). World development indicators. *The World Bank*, retrieved 04.10.2012 <http://data.worldbank.org/indicator/SI.POV.GINI?order=wbapidatavalue2009+wbapidatavalue&sort=asc>.
- [Webster and McKechnie, 1983] Webster, N. and McKechnie, J. (1983). *Websters New Universal Unabridged Dictionary*. Dorset and Baber.
- [Wei et al., 2009] Wei, Y., Chen, D., White, R., Willett, I., Edis, R., and Langford, J. (2009). *Farmers' perception of environmental degradation and their adoption of improved management practices in alxa*. *Land Degradation & Development*, 20(3):336–346.
- [Wilson, 1992] Wilson, G. (1992). *A survey on attitudes of landholders to native forest on farmland*. *Journal of Environmental Management*, 34(2):117–136.
- [Wilson, 1997] Wilson, G. (1997). *Factors influencing farmer participation in the environmentally sensitive areas scheme*. *Journal of environmental management*, 50(1):67–93.
- [Wunder, 2006] Wunder, S. (2006). *The efficiency of payments for environmental services in tropical conservation*. *Conservation biology*, 21(1):48–58.
- [Wunder et al., 2008] Wunder, S., Engel, S., and Pagiola, S. (2008). *Taking stock: A comparative analysis of payments for environmental services programs in developed and developing countries*. *Ecological Economics*, 65(4):834–852.
- [Wünscher et al., 2008] Wünscher, T., Engel, S., and Wunder, S. (2008). *Spatial targeting of payments for environmental services: A tool for boosting conservation benefits*. *Ecological Economics*, 65(4):822–833.
- [Zbinden and Lee, 2005] Zbinden, S. and Lee, D. (2005). *Paying for environmental services: an analysis of participation in costa ricas psa program*. *World Development*, 33(2):255–272.

Appendix I

Group Statistics

Know that there exists programme where ...		N	Mean	Std. Deviation	Std. Error Mean
Highest education level	Yes	81	1,41	1,010	,112
	No	17	1,29	1,213	,294

Independent Samples Test

		Levenes Test for Equality of Variances		t-Test for Equality of Means						
		F	Significance	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Highest education level	Equal variances assumed	,564	,455	,406	96	,686	,113	,279	-,441	,667
	Equal variances not assumed			,360	20,906	,723	,113	,315	-,542	,768

Table 31: t-Test for education level, eligible vs. not eligible interviewees

Group statistics

Know that there exists programme where ...		N	Mean	Std. Deviation	Std. Error Mean
years	Yes	81	42,1481	14,16784	1,57420
	No	17	36,0000	13,51851	3,27872

Independent Samples Test

		Levenes Test for Equality of Variances		t-Test for Equality of Means						
		F	Significance	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Age	Equal variances assumed	,559	,457	1,639	96	,105	6,14815	3,75132	-1,29816	13,59446
	Equal variances not assumed			1,690	23,972	,104	6,14815	3,63705	-1,35881	13,65511

Table 32: t-Test for age, eligible vs. not eligible interviewees

Group statistics

Know that there exists programme where ...		N	Mean	Std. Deviation	Std. Error Mean
Total consumption	Yes	80	4,61	1,227	,137
	No	17	3,76	,903	,219

Independent Samples Test

		Levenes Test for Equality of Variances		t-Test for Equality of Means						
		F	Significance	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Total consumption	Equal variances assumed	1,676	,199	2,693	95	,008	,848	,315	,223	1,473
	Equal variances not assumed			3,279	30,073	,003	,848	,259	,320	1,376

Table 33: t-Test for consumption, eligible vs. not eligible interviewees

Appendix II



Encuesta sobre Efectos de Vecindad de Pagos por Servicios Ambientales (PSA)

Número de Encuesta: _____

Coordenadas GPS: _____

Fecha: _____ En vecindad del contrato: C1, C2, C3

Hora de inicio: _____ Hora de finalización: _____ Duración: _____ min

Buenos días/tardes. Soy estudiante de la Universidad Noruega de Ciencias de la Vida (UMB). Estoy realizando una encuesta en Sarapiquí para hacer un estudio que será parte de mi tesis final de una maestría de los estudios de desarrollo. Esta investigación será realizada en colaboración con el CATIE (Centro Agronómico Tropical de Investigación y Enseñanza) de Turrialba, Cartago.

El fin de esta encuesta es investigar efectos de vecindad de Pagos por Servicios Ambientales (PSA) en la zona de Sarapiquí. Para esto, vamos a entrevistar a aproximadamente 80 personas para poder comparar los asuntos mencionados.

Participación en la encuesta es voluntaria y usted tiene la posibilidad de terminar en cualquier momento si así lo desea. En caso de que se retire, toda la información proporcionada será anónima. La información solicitada para este estudio será tratada de forma confidencial y no se utilizará para otros fines. La información será analizada únicamente en forma grupál.. Toda la información será anónima al finalizar el proyecto.

La duración de la encuesta es de entre 30-45 minutos. Si a Usted le interesa los resultados del estudio, le puedo de enviar la conclusión de la investigación por correo electrónico. En ese caso, por favor indíquelo en la última página de esta encuesta.

Si tiene alguna pregunta, me pueden llamar al número 8411-4308 o enviar un correo a julian.michel@student.umb.no. También puede ponerse en contacto con mi persona de contacto en CATIE, Muhammad Ibrahim al número 8313-4091.

Confirmando haber entendido el propósito de la encuesta y doy permiso para realizar la encuesta:

Firma:

Muchas gracias por su colaboración.

A. General information about PES

1 a. Have you ever heard about the Payments for Environmental Services (PES) programme?

- No (→ *continue with 1b*)
 Yes (→ *continue with 1c*)

b1. Have you ever heard the name "Fonafifo"?

- Yes → **b2.** Do you know what they do? _____
 No

c. Do you know if there exists a programme here in Costa Rica in which the government and its institutions pay persons who protect forest or reforest on their private finca?

- No (→ *Impossible to realize the interview* → *continue with part C*)
 Yes (→ *continue with 1c*)

d. What is the name of this programme? _____ (name)

Now, I would like to refer to this programme as
Payments for Environmental Services, that is to say PES

e. In which year _____ (year) and

f. From whom did you hear for the first time about the PES programme? _____

2 How many people do you know who have/ had a PES contract within your/the:

- a1.** Family/ relatives: _____ **a2.** How many of them live in Sarapiquí? _____
b1. Friends: _____ **b2.** How many of them live in Sarapiquí? _____
c1. Neighbours: _____ **c2.** How many of them live in Sarapiquí? _____
d1. People who work in the field of PES, such as Fonafifo or Minaet? _____
d2. How many of them live in Sarapiquí? _____
e1. Other people that you know: _____ **e2.** How many of them live in Sarapiquí? _____

3 a. If you, departing from your home where we are at the moment, would say "this is my neighbourhood", how many meters/ blocks/ cubits/ minutes of walking etc. does your own definition of "neighbourhood" include? _____ (unit and number)

[Has she **indicated** the distance in **meter units**?

No → *continue with 3b*

Yes → *continue with 3c*

b. In how many meters does this translate more or less? _____ (meters)

[**Muestra copias del área de Google Earth**]

c. Could you please indicate the area that you regard as your neighbourhood on the maps that I have got here?

4 a. In general, what is the first and the second strongest source out of which you received information about PES? (Please indicate the first and the second strongest source)

- Family/ relatives who 1) never had 2) had/have... PES.
- Friends/ other people who 1) never had 2) had/have... PES.
- Neighbours who 1) never had 2) had/have... PES.
- Intermediaries (Fundecor etc.)
- Participation in informational meeting
- Radio/TV/ Newspapers
- Fonafifo/ Minaet
- Other: _____

[For each participant, ask the two corresponding blocks of questions (first and second strongest source of information respectively). Then → continue with 5a]

(In case she has marked i) "Family/never..." → 4b1, 4c, 4d; ii) "had/have" → 4b2
 i) "Friends/never..." → 4e1, 4f, 4g; ii) "had/have" → 4e2
 i) "Neighbours/never..." → 4h1, 4i, 4j ii) "had/have" → 4h2
 "Intermediaries..." → 4k, 4l
 "Participation in informational meeting" → 4m, 4n
 "Radio/TV/ Newspaper" → 4o, 4p
 "Fonafifo/ Minaet" → 4q, 4r)

[Show political map of Costa Rica]

b1. Could you please indicate on this map where the persons of your family/ relatives live that have influenced your knowledge about PES?

b2. Could you also indicate in which area approximately their property with PES was located?

c. Why did they speak with you about PES? What did they say? _____

d. Can you think of any reason why these particular persons of your family/ relatives have influenced your knowledge of PES and other persons of your family/relatives not? _____

[Show political map of Costa Rica]

e1. Could you please indicate on this map where your friends/ other people live that have influenced your knowledge about PES?

e2. Could you also indicate in which area approximately their property with PES was located?

f. Why did they speak with you about PES? What did they say? _____

g. Can you think of any reason why these particular persons of your friends/ other persons have influenced your knowledge of PES and other friends or persons not? _____

[Show political map of Costa Rica and Google Earth printouts where she has marked her definition of neighbourhood]

h1. Could you please indicate on this map where your neighbours live that have influenced your knowledge about PES?

h2. Could you also indicate in which area approximately their property with PES was located?

i. Why did they speak with you about PES? What did they say? _____

j. Can you think of any reason why these particular persons of your neighbourhood have influenced your knowledge of PES and other neighbours not? _____

k. About which intermediary/ organisation are you talking? _____ (name)

l. Where is the office located where you received your information? _____ (place)

m. In which city/ town did you participate in the meeting? _____ (place)

n. Do you remember who organised that event? _____ (name)

o. Do you remember the name of the Radio Station/ Channel/ Newspaper? _____ (name)

p. Do you know if it was a local or a national Radio Station/ Channel/ Newspaper?

local national

q. In which year did you receive information from Fonafifo/Minaet? _____ (year)

r. Which role played Fonafifo's Regional Office here in Sarapiquí in this process? _____

5 a. Do you know if there is a property in the distance of maximum 500m from here which currently has a PES contract?

Yes (→ continue with 5b)

No (→ continue with 5j1)

[Show Google Earth printouts of the area]

b. Where is it located?

c. Do you know who the owner is? _____ (name)

d. How many hectares does the Finca with PES contract have? _____ (ha)

e. Do you remember in which year it was established? _____ (year)

f. Do you know for which modality she receives PES payments? _____ (modality)

[Show question 4a on the paper "Answer sheet for the interviewee" that the interviewee has]

g. Now, I would like to go back to question 4a. In case you would have again the chance to choose the first and the second strongest source out of which you received information about PES, only with the additional option to choose this property with PES close-by, how would you decide?

Different (→ continue with 5i)

Same as before (→ continue with 5j)

h.

- Family/ relatives who 1) never had 2) had/have... PES.
- Friends/ other people who 1) never had 2) had/have... PES.
- Neighbours who 1) never had 2) had/have... PES.
- Intermediaries (Fundecor etc.)
- Participation in informational meeting
- Radio/ TV/ Newspapers
- Property with PES close-by
- Fonafifo/ Minaet
- Other: _____

i. What do you think is the reason why the person living nearby participates in the PES programme?

- Payment of the programme
- Help the environment
- Other land uses are not possible
- Easy application process
- Recommendation by family/ relatives/ friends
- Other: _____

j1. If there exists a property/ a finca in the distance of zero to 500m from here, so more or less nearby, which receives government payments for reforestation or forest protection at the moment, would you know?

- Yes → **j2.** Why? _____
- No

k. How many persons do you know in the distance of maximum 500m from here who had/have a PES contract? _____(persons)

l. Have you ever spoken with people who live in the distance of maximum 500m from here about PES?

- Yes
- No

6 a. Have you ever applied for PES?

- Yes → **b.** Did you receive a contract?
 - Yes → [If "Yes" and "Yes" → continue with 7a. After 12 → go to 14a]
 - No → [If "Yes" and "No" → continue with 7a. After 9 → go to 13]
- No → [If "No" → go to 13]

[Has the same box already been ticked under 4a?

If Yes → continue with 7e

If No → continue with 7f1]

[Show question 4a on the paper "Answer sheet for the interviewee" that the interviewee has]

e. Are you talking about the same persons that served as a source of information about PES as indicated under question 4a?

- Yes (→ Block is done. Check for other mentioned factors of influence)
- No (→ continue with 7f1)

f1. Could you please indicate on this map where your friends/ other people live that have influenced your decision to apply for PES?

f2. Could you also indicate in which area approximately their property with PES was located?

g. Can you think of any reason why these particular persons of your friends/ other persons have influenced your decision to apply for PES and other friends or persons not? _____

[Has the same box already been ticked under 4a?

If Yes → continue with 7h

If No → continue with 7i1]

[Show question 4a on the paper "Answer sheet for the interviewee" that the interviewee has]

h. Are you talking about the same persons that served as a source of information about PES as indicated under question 4a?

- Yes (→ Block is done. Check for other mentioned factors of influence)
- No (→ continue with 7i1)

[Show political map of Costa Rica and Google Earth printouts where she has marked her definition of neighbourhood]

i1. Could you please indicate on this map where your neighbours live that have influenced your decision to apply for PES?

i2. Could you also indicate in which area approximately their property with PES was located?

j. Can you think of any reason why these particular persons of your neighbourhood have influenced your decision to apply for PES and other neighbours not? _____

[Has the same box already been ticked under 4a?

If Yes → continue with 7k

If No → continue with 7l]

[Show question 4a on the paper "Answer sheet for the interviewee" that the interviewee has]

k. Are you talking about the same Intermediary(ies) that served as a source of information about PES as indicated under question 4a?

- Yes (→ Block is done. Check for other mentioned factors of influence)
- No (→ continue with 7l)

l. About which intermediary/ organisation are you talking? _____(name)

m. Where is the office located where you received your information? _____(place)

[Has the same box already been ticked under 4a?

If Yes → continue with 7n

If No → continue with 7o]

[Show question 4a on the paper "Answer sheet for the interviewee" that the interviewee has]

n. Are you talking about the same informational meeting that served as a source of information about PES as indicated under question 4a?

- Yes (→ Block is done. Check for other mentioned factors of influence)
- No (→ continue with 7o)

o. In which city/ town did you participate in the meeting? _____(place)

p. Do you remember who organised that event? _____(name)

[Has the same box already been ticked under 4a?

If Yes → continue with 7q

If No → continue with 7r]

[Show question 4a on the paper "Answer sheet for the interviewee" that the interviewee has]

q. Are you talking about the same Radio Station/ Channel/ Newspaper that served as a source of information about PES as indicated under question 4a?

- Yes [→ Block is done. Check for other mentioned factors of influence]
- No (→ continue with 7r)

r. Do you remember the name of the Radio Station/ Channel/ Newspaper? _____(name)

s. Do you know if it is a local or a national Radio Station/ Channel/ Newspaper?

- local
- national

[Has the same box already been ticked under 4a?

If Yes → continue with 7t

If No → continue with 7u]

[Show question 4a on the paper "Answer sheet for the interviewee" that the interviewee has]

t. Are you talking about the same Fonafifo/Minaet that served as a source of information about PES as indicated under question 4a?

- Yes [→ Block is done. Check for other mentioned factors of influence]
- No (→ continue with 7u)

u. In which year did you receive information from Fonafifo/Minaet? _____(year)

v. Which role played Fonafifo's Regional Office here in Sarapiquí in this process? _____

w. Why did you not know what to do with the land? Can you explain it a bit? _____

8 When and for which modality did you apply for the first time to the PES programme?

a. In the year: _____ b. For the PES modality: _____

9 a. What was the outcome of the application process?

- It was approved
- It was rejected
- It is still on the waiting list
- Invalid contract
- It expired
- Other: _____

*[In case "It was approved" → continue with 10
In all other cases → continue with 9b]*

- b.** What was the land used for at the time of application to PES? _____
- c.** Can you explain a bit what changes have occurred to the land for which you wanted to obtain PES since then? Any changes in land use for example? _____

[Remember relevance of the following questions is based on answer to question 6]

10 Please list the PES contracts that you have had/ have:

Contract and contract-nr.*1	Year	Ha	Physical (name of owner) or legal (name of entity)*2	Principal person?*3	Soil classes I and II (in %)*4	Soil classes VII and VIII (in %)*5

*1 The contract number refers to the number under which Fonafifo manages the contract.

*2 Was/is the PES contract signed in the name of the owner as physical person or in the name of an entity as a legal person?

*3 Are you or is your family the principal person that takes the decisions that affect the Finca?

*4 If under "good soils" [soil class I and II] one understands soils which are appropriate for agricultural production and soils that are appropriate but need a development plan such as irrigation, fertilization etc., how much, in percentage points, of your Finca possesses "good soils"?

*5 If under "poor soils" [soil class VII and VIII] one understands soils which limit agricultural production quite a lot and soils which are appropriate only for forest plantations or forest management or protection of basins, how much, in percentage points, of your Finca possesses "poor soils"?

11 a. In case you would not have been in the PES programme, what do you think you have done with the territory that is/was under PES protection?

- I'd have waited till the value of the territory had increased and put it for sale
- I would have sold it
- I would have kept it in the same state as it was
- Conversion to pasture
- Conversion to forest plantation

- Conversion to farming
- I don't know
- Other: _____

11b. Did you know that the Forest Law (Nr. 7575, established in 1996) generally prohibits to cut trees and change land use in forests standing on private property, except in certain cases such as the construction of houses, offices, infrastructural projects of national interest, security reasons, prevent forest fire etc.?

- Yes
- No

12 In case you would not have been in the PES programme and there would not be any laws restricting the usage of your forest/ land, what do you think you would have done with the forest/ land that is/was under PES protection?

- I'd have waited till the value of the territory had increased and put it for sale
- I would have sold it
- I would have kept it in the same state as it was
- Conversion to pasture
- Conversion to forest plantation
- Conversion to farming
- I don't know
- Other: _____

[Remember relevance of the following question is based on answer to question 6]

13 Why did you never apply for a PES contract? (max. 2 factors)

- I don't know the programme very well
- I don't know how to apply/ very complicated
- The application process is very costly
- The programme does not appear very useful
- I don't trust the government or the intermediaries (or I don't want them in my property)
- The payment is less than what I could earn when I use the land for something else
→ for what? _____
- I don't have enough money for the application process
- I don't think that I would be eligible for PES
 - Not enough land/ forest
 - Insecure property rights
 - Other: _____
- Other: _____

14 If a person cuts trees in a forest standing on her private Finca which is under a PES contract, what would you expect to happen?

- Nothing (no one applies the law)
- She will receive a warning
- She will have to pay a fine
- She will have to go to prison

15 And if a person has no PES contract whatsoever and cuts trees, what would you expect to happen?

- Nothing (no one applies the law)
- She will receive a warning
- She will have to pay a fine
- She will have to go to prison

16 Imagine you would own a Finca with a forest on it for which you would like to receive payments to protect it, or you would like to reforest a part of your Finca and wish to receive payments for this activity, where would you go? _____

17 a. Please think now about a typical person in your neighbourhood who had/ has a PES contract for forest protection or reforestation: In case no PES programme had existed, what do you think they would have done with the land that is/was under PES contract?

- They'd have waited till the value of the territory had increased and put it for sale
- They would have sold it
- They would have kept it in the same state as it was
- Conversion to pasture
- Conversion to forest plantation
- Conversion to farming
- Don't know, everyone would have had a different use
- Other: _____

[17b only in case she does not have already answered questions 11b]

17b. Did you know that the Forest Law (Nr. 7575, established in 1996) generally prohibits to cut trees and change the land use in forests standing on private property, except in certain cases such as the construction of houses, offices, infrastructural projects of national interest, security reasons, prevent forest fire etc.?

- Yes
- No

18 You are offered to formulate your view on PES in a sentence or two. What would you say?

B. Attitude measurements

In this part, I would like to ask a series of questions about if you agree or disagree to certain statements. It is important for me to be able to measure the degree of how much you agree or disagree or if you are "neither hot, nor cold" (indifferent).

Please use the scale ranging from 1 (totally disagree) to 5 (totally agree) as indicated in this showcard to select which response reflects best what you think.

[Show showcard and explain the 5 options]

	1	2	3	4	5
1. Information Seeking Behaviour	<i>Degree of (dis)agreement</i>				
a. Due to...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1) contact with persons of my family/ relatives who know about PES,					
2) contact with friends/ other people who know about PES,					
3) contact with neighbours who know about PES,					
4) the existence of a property with PES close-by,					
5) contact I had with intermediaries,					
6) my participation in an informational meeting about PES,					
7) hearing about PES in the Radio/ TV/ Newspaper,					
8) contact I had with Fonafifo/ Minaet,					
...I became more interested in the topic of PES.					
<i>[Has she has checked a box with the number 4 or 5?</i>					
<i>Yes → continue with 1b</i>					
<i>No → continue with block 2]</i>					
b. What was it in particular that you wanted to know about PES?	_____				
2. Regard Nature as a Commodity	<i>True</i>				<i>False</i>
a. 1) The contact with persons of my family/ relatives who know about PES	<input type="radio"/>				<input type="checkbox"/>
2) The contact with friends/ other people who know about PES					
3) The contact with neighbours who know about PES					
4) The existence of a property with PES close-by					
5) The contact I had with intermediaries					
6) The participation in an informational meeting about PES					
7) The hearing about PES in the Radio/ TV/ Newspaper					
8) The contact I had with Finafifo/ Minaet					
... led me to think that the nature and the forests now have a price which is more or less defined.					
b. Before, I though that it is not possible to quantify the value of nature and forests, but now, due to	<input type="radio"/>				<input type="checkbox"/>
1) contact with persons of my family/ relatives who know about PES,					
2) contact with friends/ other people who know about PES,					
3) contact with neighbours who know about PES,					
4) the existence of a property with PES close-by,					
5) contact I had with intermediaries,					
6) my participation in an informational meeting about PES,					
7) hearing about PES in the Radio/ TV/ Newspaper,					
8) contact I had with Fonafifo/ Minaet,					
... I think that it is well possible to quantify it.					
c. I still view the environment and forests as a whole ecosystem and not as a particular service,	<input type="checkbox"/>				<input type="radio"/>
1) the contact with persons of my family/ relatives who know about PES					
2) the contact with friends/ other people who know about PES					

- 3) the contact with neighbours who know about PES
- 4) the existence of a property with PES close-by
- 5) the contact I had with intermediaries
- 6) the participation in an informational meeting about PES
- 7) the hearing about PES in the Radio/ TV/ Newspaper
- 8) the contact I had with Finafifo/ Minaet

... had no effect at all on this view (way of thinking).

d. Do you think that these programmes contribute to regard nature as a commodity/ good or do these programmes have nothing to do with this? _____

3. Perception over Usefulness of PES

Degree of (dis)agreement

a. I regard PES as a useful instrument to preserve forests and enhance biodiversity richness.

[Has she has checked a box with the number 4 or 5?

Yes → continue with 3b

No → continue with block 3c]

b. Why do you think that it is a useful instrument? _____

c. Why do you think that it does not seem like a useful instrument? _____

4. Motivational Changes Regarding the Environment

Degree of (dis)agreement

a. When 1a) I heard about PES from family-members/ relatives who know about PES,

- 1b) I noticed that family-members/ relatives had/have a PES contract,
- 2a) I heard about PES from friends/ other people who know about PES,
- 2b) I noticed that friends/ other people had/ have a PES contract,
- 3a) I heard about PES from neighbours who know about PES,
- 3b) I noticed that neighbours had/ have a PES contract,
- 4) I noticed that there exists a property with PES close-by,
- 5) I had contact with intermediaries,
- 6) I participated in an informational meeting about PES,
- 7) I heard about PES in the Radio/ TV/ Newspaper,
- 8) I had contact with Finafifo/ Minaet,

... my motivation to conserve the environment has gone down as I think that my own attempts to conserve the environment are not appreciated.

[Has she has checked a box with the number 4 or 5?

Yes → continue with 4b

No → continue with block 4c]

b. Can you explain a bit why your motivation has gone down? _____

c. When 1a) I heard about PES from family-members/ relatives who know about PES,

- 1b) I noticed that family-members/ relatives had/have a PES contract,
- 2a) I heard about PES from friends/ other people who know about PES,
- 2b) I noticed that friends/ other people had/ have a PES contract,
- 3a) I heard about PES from neighbours who know about PES,
- 3b) I noticed that neighbours had/ have a PES contract,
- 4) I noticed that there exists a property with PES close-by,
- 5) I had contact with intermediaries,
- 6) I participated in an informational meeting about PES,
- 7) I heard about PES in the Radio/ TV/ Newspaper,

8) I had contact with Finafifo/ Minaet,

...I felt more motivated than before to undertake actions to conserve the environment.

[Has she has checked a box with the number 4 or 5?

Yes → continue with 4d

No → continue with block 5]

d. Can you explain a bit why you felt more motivated than before to undertake actions to conserve the environment? _____

5. Perceptions over deforestation ban

(Not) reasonable

Let us think now of a person that you know who has a Finca/ property with forest.

Do you think that it is reasonable that, even though it is his private property, the

Forest Law says that it is not permitted to cut trees there or do you think that

normally the owner should have the right to change the land use as he desires to?

Reasonable

Undecided

Not reasonable

6. Perceptions over a better enforcement of the Forest Law

Degree of (dis)agreement

1) The contact with persons of my family/ relatives who know about PES

2) The contact with friends/ other people who know about PES

3) The contact with neighbours who know about PES

4) The existence of a property with PES close-by

5) The contact I had with intermediaries

6) The participation in an informational meeting about PES

7) The hearing about PES in the Radio/ TV/ Newspaper

8) The contact I had with Finafifo/ Minaet

... led me to think that the government is now more capable than before to enforce the Forest Law.

7. Perceptions over the importance of the Forest Law

Yes

No

Do you also think that the Forest Law is now of greater importance compared to what you have thought about it earlier?

b. What do you generally think about the Forest Law? _____

8. Justice with reference to the people who receive PES

Degree of (dis)agreement

a. I think that it is fair that a person in my neighbourhood receives PES for forest protection, even though it's already generally forbidden by the Forest Law to cut down trees or change the land use in a forest standing on private property.

[Has she has checked a box with the number 4 or 5?

Yes → continue with 8b. After 8b → continue with block 9

No → continue with block 8c]

b. Why do you think that it is fair? _____

c. Why do you think that it is unfair? _____

d. You said that it is unfair. Can you also explain if there resulted any new perceptions/ feelings/ changes in views out of this with reference to the receivers of these payments? _____

e. Apart from effects in perceptions, did you notice a change in the relationship that you have with these persons? No Yes → Please explain _____

9. Perceptions over the importance of forest protection

Degree of (dis)agreement

- a. Due to... 1) contact with persons of my family/ relatives who know about PES,
- 2) contact with friends/ other people who know about PES,
- 3) contact with neighbours who know about PES,
- 4) the existence of a property with PES close-by,
- 5) contact I had with intermediaries,
- 6) my participation in an informational meeting about PES,
- 7) hearing about PES in the Radio/ TV/ Newspaper,
- 8) contact I had with Fonafifo/ Minaet,

...I now regard deforestation and forest destruction/ degradation as a bigger problem than what I have thought before.

10. Motivation to do something for the environment

Number between 1 and 10

If you had to describe your motivation to undertake actions in favour of the environment, such as recycle, save water or electricity etc., with a number ranging from 1 to 10 where 1 means that you don't care at all and never think about how to do something for the environment and 10 means that you are super-motivated and always think about a way how to improve it, with which number would you describe yourself? _____ (number)

C. Socio-economic information

19 Gender? *[fill out without asking]*

- Masculine
- Feminine

20 In which year were you born? _____

21 What is your marital status? _____

22 Since when do you live here in this house? Since: _____ (year)

23 a. What is the total size of your property? (all Fincas that you have) _____ (ha)

b. How many hectares of your property are covered with forests? _____ (ha)

c. Would you be eligible to apply for PES?

- Yes
- No
- I don't know

24 How many people live in your household (including yourself)? _____ (number)

25 What is your highest completed education level?

- Completed primary
- Completed secondary
- Completed technician
- Completed university

26 What is your principal occupation? _____

27 Could you indicate in the following list the total consumption* per month in your home including all expenses of all persons living in the house?

*Consumption includes all expenses that are not for the farm, for example food, clothing, school expenses (school, high school, university), expenses for the car, electrodomestics, reparations, medicines, doctor, medical insurances, gifts for friends or family, energy, telephone, water etc..

- | | |
|--|--|
| <input type="checkbox"/> Less than 25 000 colones | <input type="checkbox"/> 25 001 – 50 000 colones |
| <input type="checkbox"/> 50 001 – 100 000 colones | <input type="checkbox"/> 100 001 – 200 000 colones |
| <input type="checkbox"/> 200 001 – 300 000 colones | <input type="checkbox"/> 300 001 – 400 000 colones |
| <input type="checkbox"/> 400 001 – 500 000 colones | <input type="checkbox"/> 500 001 – 750 000 colones |
| <input type="checkbox"/> 750 001 – 1 000 000 colones | <input type="checkbox"/> More than 1 000 000 colones |

Are you interested in the results of this study? Please indicate your e-mail address in order to send you the conclusion of the investigation: _____