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Abstract

Because the effectiveness of payment for ecosystem services (PES) programs depends on landowners' engagement, understanding the relationship between the type of payment and participation is a key issue. This paper reports on a choice experiment that quantifies landowners' preferences for cash and educational in-kind payment. The main results indicate a positive correlation between participation in a PES contract and the magnitude of the cash payment, while participation seems uncorrelated with the magnitude of the educational in-kind payment. In addition, we investigate the mix of payment types and heterogeneity in preferences, which can help policymakers design strategies to increase participation.

Keywords: Payment for ecosystem services, Cash payments, In-kind payments, Stated preferences, Land owners.

JEL classification: Q28, Q57

1. Introduction

Forests provide key ecosystem services such as clean water, timber, habitat for fisheries, carbon sequestration, pollination, and biodiversity. However, many of these services are being lost or degraded at a furious pace, brought about by human activity. This has led to an increased use of payments for ecosystem services (PES) programs.[1] PES offers conditional payments to motivate private landowners to invest in land-use practices that lead to conservation or production of ecosystem services (Ferraro and Kiss 2002, Wunder 2005). Payments are usually made in cash, in kind or in a mix of both. The main focus of this study is on how the relationship between participation in a PES contract and payment level varies across payment types.

There are many different ways to pay for ecosystem services. For instance, the Costa Rican Pagos por Servicios Ambientales (PSA) is a national program offering direct cash payments, while the PES program in Los Negros, Bolivia offers payments in kind by distributing beehives supplemented with apicultural training (Asquith et al. 2008). In Pimampiro, Ecuador, conservation of cloud forest is compensated by supporting the development of orchid nurseries, while land tenure is the main incentive mechanism for watershed protection and carbon sequestration in a PES program in Sumberjaya, Indonesia (Hangrove and Chandler 2004). Two of the largest PES programs in the world, the Chinese national sloping land conservation program (SLCP) and the Brazilian Bolsa Floresta Program (BFP) in the State of Amazonas, offer compensation packages combining direct cash with in-kind payments. SLCP offers combinations of cash and tree seedlings to subsidize reforestation or agro-forestry and grain to replace forgone production, while BFP rewards communities by combining cash with financial support to community level investments from which households benefit indirectly (Viana 2010).[2]

Even though in practice there is an extensive use of different types of payments, there is scarce knowledge about preferences regarding the type of payment for the provision of ecosystem services (for a few exceptions, see Porras and Hope 2005, Robertson and Wunder 2005, Porras et al. 2007, Zabel and Engel 2010, and Kaczan et al. 2013). Moreover, the voluntary nature[3] of most PES programs makes understanding the relationship between the type of payment and participation a key issue, as the effectiveness of a program hinges on enough landowners enrolling and fulfilling their management requirements (Pagiola 2008).

Because PES program design should adapt to the local circumstances (Jack et al. 2008, Swallow et al. 2009) by taking into account the preferences of those targeted for participation (Petheram and Campbell 2010), we use a survey-based choice experiment conducted with landowners from Costa Rica to quantify the ecosystem services providers' preferences for some key design attributes in PES schemes: length of contract and payment types. The main reason for using a choice experiment is that, with this method, landowners' preferences for individual program attributes can be quantified, even for payment types and/or payment levels presently not available or not being used. Our choice experiment is based on the Costa Rican PSA program that started in 1997 and was the first of its kind. Currently about 300,000 hectares of land are under contract. This program is frequently used as a blueprint for PES programs in other countries; therefore, the results of this paper may provide relevant input for policymakers designing new PES contracts.

In our study, landowners were asked to make trade-offs between varying levels of cash payments and varying levels of an educational in-kind payment. The two main reasons for using an educational in-kind payment were that (1) there is a demand for such courses and (2) such educational in-kind payments are not resalable, implying a clear trade-off with the cash payment.[4] Although the welfare effect of in-kind payments that cannot be directly sold in a market can be quantified by determining their returns over time, these returns vary greatly based on recipients' characteristics, which we do not study here. For example, in the case of the Bolivian PES program in Los Negros, the net present values of beehive transfers ranged from approximately –US $15/ha/year (negative value) to +US $13/ha/year (Robertson and Wunder 2005). This diversity in returns from apiculture was shown to be highly dependent on the beekeeping skills of the landowner (Asquith et al. 2008). This has implications for the design of our choice experiment. Even though the levels of the educational in-kind payment were made comparable to the levels of the cash payment in terms of the cost to the policymaker, these levels may not be comparable in terms of benefit, because the welfare outcomes of providing in-kind payments depend on the characteristics of the recipient. For instance, there is an extra cost for recipients to benefit from the educational in-kind payment since practical training demands time. Because the utility derived from a recipient's perspective may not be comparable between the cash and the in-kind payment levels, the main focus of this analysis is to determine the participation induced by various levels of payment within each payment type. A secondary focus is to compare preferences across payment types with the goal of helping policymakers choose the payment vehicle that will induce the most participation for a given expenditure.

The use of in-kind payments for ecosystem services provision is often motivated by the potentially more lasting benefits, as cash payments are more vulnerable to rapid and less welfare-enhancing spending[5] (Robertson and Wunder 2005). In the PES context, people express concern that cash payments are invested in timber extraction on non-contracted land. This kind of leakage (or slippage) obviously has negative effects on the efficiency of PES because then the deforestation is simply spatially shifted. Recent empirical evidence for the Mexican PSAH (Pago de Servicios Ambientales Hidrológicos) program shows an approximately 4 percent average reduction in program efficiency due to leakage, as a result of increased deforestation on property belonging to program recipients (Alix-Garcia et al. 2012).[6] From a landowner's point of view, signing a PES contract could be perceived as weakening his/her ownership of the land (Porras et al. 2007, Robertson and Wunder 2005, Asquith et al. 2008). This could result in a preference for not signing any kind of contract restricting land-use. Further, because individuals' ability to manage cash income varies, the same cash income could provide different outcomes for different individuals; in contrast, in-kind payments can provide more predicable welfare improvements (Thurow 1974). Still, cash payment allows for greater flexibility in the use of resources and more readily compensates for the lost income caused by the land-use restrictions of the PES contract. Cash payment is also less prone to be seen as paternalism.[7]

Even though the choice of payment type is far from obvious from a welfare perspective, there is some evidence that people might behave differently depending on the form in which the incentive is provided. Heyman and Ariely (2004), for instance, argue that recipients seem to be more likely to view in-kind payments as compatible with reciprocal exchange and are therefore less concerned about the magnitude of in-kind payments. On the contrary, Gneezy and Rustichini (2000) found evidence that magnitude seems to matter for cash payments. In their real-behavioral experiments, students who were paid small amounts of cash performed worse, both mentally (answering a set of questions taken form an IQ test) and physically (collecting donations for a charitable cause) than those who were not paid. Further, in labor economics, it has been found that monetary and non-monetary incentives are treated differently by employees. Monetary incentives seem to be treated as compensation for working hard, while non-monetary incentives are rather considered a means of recognition (e.g., Pfister 2007, Kube et al. 2012). In line with this, Lacetera and Macis (2010) show that there is a difference in hypothetical willingness to donate blood depending on whether the payment is made in cash (10 euros) or non-cash (a 10-euro voucher to purchase books or food). In their study, cash payments were found to have a larger probability than non-cash

payments of crowding out blood donations. Additionally, by using a field experiment where subjects were given the opportunity to become blood donors with or without any compensation, Mellström and Johannesson (2008) show that crowding out of blood donations can be alleviated by allowing individuals to donate the payment to charity. However, gender differences seem to be driving their results, as blood donations by men were unaffected.

This possibility of obtaining different outcomes depending on the type of payment used is important in understanding the landowner's decision to participate in a PES contract. This paper provides a choice experiment analysis focusing on the effect of different levels of the cash and in-kind payment on participation in a PES contract including heterogeneity in preferences regarding types of payment and participation. This enables us to provide policymakers with information regarding the relationship between the type of payment used and participation.

The remainder of the paper is structured as follows: Section 2 presents a synopsis of determinants of participation in PES programs and preferences for the type of payment. Section 3 describes the attributes and levels in the choice experiment, as well as the design and the econometric model. The results are presented and discussed in Section 4 and Section 5 concludes the paper.

2. Determinants of participating in Payments for Ecosystem Services contracts and preferences for the type of payment

Who participates in ecosystem protection schemes?

So far, a considerable amount of research has been conducted to understand the socioeconomic factors that determine who participates in ecosystem protection schemes in developed countries; these include studies of the Conservation Reserve program in the US (Ervin and Ervin 1982, Cooper 2003) and Agri-Environment Schemes in the EU (Wilson and Hart 2000, Siebert et al. 2006, Knowler and Bradshaw 2007). In the context of developing countries, research is much scarcer. Examples include the SLCP in China (Mullan and Kontoleon 2009) and the PES programs in Mexico (Kosoy et al. 2008) and Costa Rica (Zbinden and Lee 2005).

In this study, we have collected data on various socioeconomic variables to be able to investigate determinants of the preferences for the type of payment. In previous studies of the Costa Rican PSA program, education, age, off-farm income, information and land size have been found to be positively correlated with participation (Hope et al. 2005, Zbinden and Lee 2005, Arriagada et al. 2009). Studies regarding the socioeconomic outcomes[8] have found that most payments go to landowners with large land size and relatively wealthy landowners for whom the main source of income does not depend on the land (Miranda et al. 2003, Ortiz et al. 2003, Sierra and Russman 2006, Porras 2010). Nevertheless, there is evidence suggesting that the number of smallholder contracts has increased as a result of a new PSA category: agroforestry systems (Porras 2010). This suggests that the opportunity to mix productive activities with conservation better meets these landowners' needs than conservation activity alone. Further evidence of the connection between PES and productive activities comes from Miranda et al. (2003), who found that the cash payment, representing a share of 10-15% of total income, was mainly used for investments and improvements on other areas of the land, i.e., those under agriculture and/or livestock use, as well as for maintenance of the parcel enrolled.

Preferences for the type of payment

In the process of deciding whether to participate in ecosystem services contracts, there are various characteristics of the contract to take into consideration. These include duration of the contract, requirements and punishments if not fulfilled, cost of participating, compensation in cash and/or in-kind payments and whether payments should be made individually or collectively. For instance, in community-forestry contracts in Indonesia and in wildlife protection programs in India, long-term contracts have been found to be particularly favored by landowners when the provision of the ecosystem service requires large investments (Arifina et al. 2009, Zabel and Engel 2010).

When it comes to landowners' preferences for the type of payment, Kaczan et al. (2013) used a choice experiment in the East Usambara Mountains, Tanzania, to investigate the preferences for four payment approaches: constant and variable annual cash payments to individual farmers, a constant annual cash payment to a village fund on behalf of farmers and an upfront manure fertilizer payment. They found that the cash and the in-kind payment, manure fertilizer, significantly motivated participation in the PES program while the group payment did not. Zabel and Engel (2010) applied a stated preference study investigating villagers' preferences on several aspects of scheme design for wildlife protection contracts in

India. In a multiple choice situation, respondents were asked to select their preferred contract, described by (i) payment vehicle of monetary or in-kind payment (no amount given, but both types of payments were assured to be equivalent in value); ii) whether the payment should be made to a group or individually; and iii) the duration of the contract, where longer duration was connected to slightly lower payments. Their results indicated that villagers living closer to the market preferred cash payment; in that situation, cash has a comparative advantage over in-kind payments, as it can easily be transformed into preferred goods. With increasing distance to the market, stronger preferences for in-kind payments were indicated, as buying goods at the market was not effortless because it included transportation costs. Porras et al. (2007) used a choice experiment applied to landowners in Upper Tana, Kenya, where they found in-kind payments (i.e., seeds, seedlings, implements and equipment) to be preferred over cash payments in return for adoption of soil and water conservation practices. Similarly, in a study regarding landowners' preferences for adoption of the Costa Rican PSA program in a tropical mountain cloud forest in Monteverde, Costa Rica, the likelihood of adoption increased with a combination of cash and in-kind payments, i.e., access to state benefits such as housing, tax exemption, etc. (Porras and Hope 2005). However, none of these studies have taken the magnitude of the in-kind payment into account to investigate the relationship between participation in PES contacts and type of payment.

Even though cash is an important asset for landholders, landowners in Kenya, Costa Rica and Bolivia, who have varying income, land size and dependency on on-farm income, seem to perceive in-kind incentives as a more permanent benefit (Porras et al. 2007, Porras and Hope 2005, Robertson and Wunder 2005). However, some empirical evidence from other conditional payment programs points in the direction of in-kind payments being preferred in poor societies (Hoynes and Schanzenbach 2009). Further, characteristics of the market − price and supply fluctuation − as well as experience with in-kind payments have been found to be important determinants for preferences for food instead of cash payments in food security programs (Thomson and Metz 1997).

3. Design of the Payment for Ecosystem Services Contract Choice Experiment

To investigate how the relationship between participation in a PES contract and payment level varies across payment types, we used a choice experiment where the respondents were asked to choose their preferred contract for a hypothetical piece of land of 10 hectares. Because cash payments in the current PSA program in Costa Rica are made per hectare and land size is highly diversified, the number of hectares in the scenario was fixed so that each

respondent faced a trade-off between the same stakes. The fixed size of the proposed area under contract was chosen to represents an equivalent cost for the policymaker of either cash or the educational in-kind payment. The 10 hectares represents the minimum land size of most respondents. Even though this was not necessarily what the respondent owned, the discussions with the respondents in the pilot studies show that most respondents could relate to this size of land.

The scenario, reported in Figure 1,[9] was read to each respondent by an enumerator.[10] The scenario informed the respondents of the requirements stated in the contract, e.g., that the area has to be fenced, cattle cannot enter, there must be firebreaks, no trees can be cut, and hunting on the land under contract is not allowed. These requirements are the same as those in the current PSA contracts. In the PSA program, there are four types of contracts: forest conservation, reforestation (timber plantation), agroforestry, and natural regeneration. However, agroforestry and natural regeneration account for a rather small share of both applications for the program and total area under PSA contracts, and were therefore not taken into consideration in the choice experiment scenario.

>> Figure 1 around here.

3.1 The attributes and their levels

Because payment for ecosystem services contracts already exist, the key attributes of the current contracts were included, i.e., duration and type of payment. The levels of the different attributes were identified and developed through focus groups and interviews with officials of the PSA program and organizations[11] with a long history of providing training to landowners in Costa Rica. The survey was tested in various pilot studies with a focus on the payment levels and the participants' understanding of them.[12] This preparatory work was crucial in order to ensure that the attributes and attribute levels in the choice experiment were well understood by the respondents. A description of the attributes and their levels is given in Table 1.

>> Table 1 around here

Duration of the contract

The information that emerged as a result of discussions with policymakers and various pilot studies shows that most respondents seem to have strong preferences for shorter contracts; thus, duration could, in many cases, be treated as a negative attribute. The final contract duration levels were 5, 10, and 15 years. These levels did not deviate much from the levels that were used for PSA contracts until 2011 (5 years for forest conservation and 15 years for reforestation).[13] However, there was enough variation to identify the landowners' preferences regarding contract duration.

In-kind payment

In the current PSA program, there are no in-kind payments. In the choice experiment, however, we use an educational in-kind payment in the form of days of practical training offered free of charge to the recipients. According to the pilot studies and organizations offering various kinds of training programs, preferences for this type of training are highly heterogeneous. Therefore, in order not to evaluate the preferences for a specific capacity-building course, the respondents were informed that they were able to choose the practical training in an area of relevance for their land. The practical training can hence be seen as a voucher for the tuition fee, where the recipients choose which courses they would benefit from. The most commonly requested practical training courses in the pilot studies were used to create some examples of potential courses to choose from, e.g., cattle or crops improvement, tree planting, land administration, and tourism management.

An educational in-kind payment was used for three main reasons. First, according to some of the institutions offering capacity-building courses, landowners highly appreciate and demand such services. Second, despite the fact that there is a market offering different capacity-building courses to landowners in Costa Rica, such educational in-kind payments are not resalable, so that the experiment presented a clear trade-off between cash and in-kind payment. Thirdly, education has particular long-term benefits by equipping landowners with knowledge of alternative income opportunities. For example, capacity building with respect to production technologies to reduce the need to purchase animal feed may lead both to increased income from livestock farming and to more trees (see examples of silvopastural practices in Pagiola et al. 2005).

On the negative side, as Blank (2002) points out, gains from education (or other in-kind payments) might look more promising to society than to the individual herself because

benefits from such consumption might be received by others than the person receiving the training. Further, it seems reasonable to assume diminishing marginal utility of training because, after a certain amount of days of practical training, the benefits of improved knowledge — ultimately leading to potentially increased income due to improved or new production techniques on the farm — might be outweighed by the cost of time for each day of extra training. Thus, in the choice experiment, it was important to not exceed a reasonable and credible number of days of training per year that in reality would be received as a benefit and not as a burden. After consulting both suppliers and users of capacity-building courses, 20 days of practical training was set as the maximum amount of days per year. Hence, the educational in-kind payment was not intended to be increased even if the contracted area was scaled up. To further assure that training would be a benefit rather than a burden, the scenario provided that training could be taken by the landowner, family members, or farm staff, all of which are presumed to benefit the landowner.

One central claim made by critics of stated preference methods is that the respondent does not react sensitively to the magnitude of increased compensation, implying insensitivity to value. This problem occurs if respondents are unable to distinguish between the different attribute levels, which is often connected to situations where the respondents are asked to value a good or service unfamiliar to them.[14] In this case, respondents were familiar with the educational service. Even though in-kind payments are not used in the current PSA program, Costa Rican farmers are very familiar with capacity-building programs and many of the respondents had previously paid to participate in such courses.

Cash payment

All payments to contracted landowners in Costa Rica are currently made in cash. A forest conservation contract of 10 hectares pays up to 320,000 colones[15] per year (equivalent to US $640 per year), according to the payment levels in 2011. As a reference, a day of farm labor would cost on average 10,000 colones. Subtracting the mandatory cost of a forest engineer, accounting for around 18% of the total payment, and some other deductions (e.g., 1% for legal fees), the landowner would potentially be left with around 260,000 colones per year for 10 hectares (equivalent to US $520). This money has to cover the costs of fulfilling the requirements of the contract and the transaction costs. For reforestation, the payment is higher and is paid out during the first five years because the costs (e.g., for tree seedlings and planting) are much higher than for forest conservation. Clearly, net payments are highly diversified between landowners. Therefore, only net payments at present value were used in

the choice experiment. Note that the lowest level of 0 colon means that no money is left after covering all the investment costs.

The levels of the cash payment were made comparable to the levels of the educational in-kind payment in terms of the cost for the policymaker. A capacity-building course in agriculture, livestock, or ecotourism generally has a tuition fee starting at 10,000 colones (US $20) per person per day.[16] The highest level of the in-kind payment, i.e., 20 days of practical training, at the current market price would thus cost around 200,000 colones, which is set to be the highest net cash payment level. This is comparable to the current cash payment level for forest conservation in the PSA program if investment costs are low.

3.2 Design of choice sets

When designing a choice experiment, all researchers face an intrinsic problem of how much information or complexity to incorporate. Even though some studies have focused on the effect of the choice set complexity and found that it matters for the ability to make consistent choices or the rate of non-responses (e.g., DeShazo and Fermo 2002, Hensher 2006 Carlsson and Martinsson 2008), in the end the researcher has to make a judgment regarding the capacity of the targeted audience. In this study, most respondents had relatively low levels of education and were not experienced with this type of multiple choice situation. Therefore, pilot studies with three to six choice sets were conducted. We found that the majority of respondents maintained a high level of concentration when answering three choice sets. However, when we added up to three more choice sets, we observed a decreased concentration in the last choice sets. Thus, to achieve a balance between collecting as much information as possible and the cognitive burden of answering many choice sets, five choice sets were used in the main study.

We used a cyclical design to construct the choice sets.[17] A cyclical design is based on an orthogonal approach and the attribute level for each new alternative is set to be the next higher attribute level. When the highest level is reached, the new alternative is assigned the lowest level (Bunch et al. 1996). In total, our final design consisted of ten choice sets, blocked into two blocks with five choice sets in each version [1,2,3,4,5] and [6,7,8,9,10]. To test for order effects, two more blocks were created by reordering the first five choice sets into two more versions, [2,3,4,5,1] and [3,4,5,2,1]. These four versions were randomly distributed between respondents and enumerators.

As can be seen in the choice set in Figure 2, the respondents were asked to make their choice between two contract alternatives and an "opt-out" alternative, i.e., preferring not to have any contract. There was always an "opt-out" alternative because participation is voluntary in most PES programs. Those who always chose the "opt-out" alternative were asked a follow-up question about their reason for this preference. Respondents were also asked questions about prior participation in capacity-building courses as well as their need for such training. These questions were asked because the current demand for practical training may be an important explanatory variable for preferences regarding this type of payment.

>> Figure 2 around here.

3.3 Econometric model

To analyze the choice experiment, we used a standard random utility approach (McFadden 1974, Manski 1977). In this model, the utility of an individual's choice is decomposed into a non-random component, which can be observed, and a stochastic non-observable term. It is assumed that the respondents consider the alternatives and the attributes offered in a specific choice situation and then choose the alternative that would give them the highest utility.

Our estimations of the parameters start with a basic model, referred to as **Model 1**, where the utility of individual *q* from alternative *i* (Contract1; Contract2; No Contract) is expressed as

$$U_{iq} = \alpha_i + \boldsymbol{x_i'\beta} + \varepsilon_{iq}$$

where α_i is an alternative specific constant capturing the intrinsic preferences for having a contract (a dummy variable of 0 for no contract at all and 1 for a contract, recalling that some individuals have a preference for no contract restricting their land use at all (Porras et al. 2007, Robertson and Wunder 2005, Asquith et al. 2008)), $\boldsymbol{x_i}$ is a vector of the attributes describing alternative *i*, namely the duration of the contract and different levels of payments in cash and in kind (including no cash payment and no practical training). The vector of parameters for the attributes, $\boldsymbol{\beta}$, is the focus of our estimation. ε_{iq} is the stochastic term

representing the unobservable factors or measurement errors. Individual q would choose alternative *i* over alternative *j* if $U_{iq} > U_{jq}$.

In this basic model, the relationship between participation and the type of payment is estimated without taking into account heterogeneity in preferences due to individual characteristics. Additional information regarding to what extent observable socioeconomic characteristics could explain the preference for participation and preferences for different types of payments could be used by policymakers to target certain payment types at different landowners. Thus, a full model is estimated, including interaction terms between socioeconomic variables and the alternative specific constant, i.e., having a contract or not, and between socio-economic variables and the levels of cash and in-kind payments. We refer to this model as **Model 2**, which is specified as

$$U_{iq} = \alpha_i + \boldsymbol{x_i'\beta} + \left(\boldsymbol{z_q}\alpha_i\right)'\boldsymbol{\gamma} + \left(\boldsymbol{x_i'z_q}\right)'\boldsymbol{\delta} + \varepsilon_{iq},$$

where, in addition to Model 1, $\left(\boldsymbol{z_q}\alpha_i\right)$ is a vector of interaction terms between socio-economic variables $(\boldsymbol{z_q})$ and the alternative specific constant (α_i), and $\boldsymbol{\gamma}$ captures the heterogeneity in preferences for participating in a contract as a function of individual characteristics (e.g., age, gender, and on-farm income dependency). $\left(\boldsymbol{x_i'z_q}\right)$ is a vector of interaction terms between the attributes and socioeconomic variables, and $\boldsymbol{\delta}$ captures the heterogeneity in preferences for the attributes that is due to individual characteristics.

The parameters $(\alpha, \beta, \gamma, \delta)$ are estimated using a standard conditional logit model, which applies maximum likelihood estimation. Even if observed heterogeneity is captured in Model 2 by including socioeconomic variables, it should be noted that the standard conditional logit model is limited in the taste variation modeling, as the unobservable heterogeneity is not captured.[18]

3.4 Hypotheses to be tested

Previous studies have found differences between payment types in terms of how people react to different levels of the payment. In general, people seem sensitive to the level of cash payments while levels do not tend to matter for the in-kind payment (e.g., Gneezy and Rustichini 2000, Heyman and Ariely 2004, Pfister 2007, Kube et al. 2012). In this paper, the following hypotheses will be tested regarding the relationship between payment levels (i.e., cash and in kind) and participation in payment for ecosystem services contracts:

Hypothesis 1: Participation in a PES contract is positively correlated with the magnitude of the cash payment, $\beta_{100\text{cash}} < \beta_{150\text{cash}}$; $\beta_{100\text{cash}} < \beta_{200\text{cash}}$; $\beta_{150\text{cash}} < \beta_{200\text{cash}}$.

Hypothesis 2: Participation in a PES contract is uncorrelated with the magnitude of the in-kind payment, i.e., $\beta_{10\text{days}} = \beta_{15\text{days}}$; $\beta_{10\text{days}} = \beta_{20\text{days}}$; $\beta_{15\text{days}} = \beta_{20\text{days}}$.

Hypotheses 1 and 2 are first tested by using the parameters (β) estimated by a standard conditional logit of Model 1. This model is also used to test the effect of mixed payments (both cash and in-kind) and different contract length on participation. Heterogeneity is not considered in this basic model. To capture heterogeneity in preferences for the payment attributes, the hypotheses presented above are also tested using parameters estimated by a standard conditional logit of Model 2. In these tests, Hypothesis 1 and 2 are tested by adding the estimated parameters that capture heterogeneity in preferences for the payment attributes that is due to individual characteristics, (δ), to the estimated parameters of the levels of payments (β). The specific hypotheses are presented in Table A4 in the Appendix.

3.5 Data collection

We used two key databases to obtain the sampling frame: i) all applications received by the agency responsible for the PSA program (National Fund for Forest Financing – FONAFIFO) in 2011[19] and ii) all registered farms in Costa Rica, almost 46,550, from the census conducted by the Ministry of Livestock and Agriculture (MAG) in 2006 and 2007. The data collection was concentrated in three out of nine geographical regions of FONAFIFO: Guápiles, San José Oriental, and Nicoya.[20] These regions were selected on recommendation by FONAFIFO because data was available and because these regions represent both urban and rural regions. These three regions comprise about 40% of all applications received by FONAFIFO in 2011. The sample was created by randomly selecting almost 25% of the observations in the FONAFIFO dataset for the selected regions and, in addition, 40 observations per region from the MAG dataset. The intensity of sampling of the FONAFIFO dataset implies that there is an overrepresentation of applicants to the current PES program compared with the population.

In-person interviews were conducted only with the land use decision-maker. We focused on private households, which represent about 90% of all applicants to the PSA program. Corporations and indigenous reserves were excluded from the analysis because our main

interest is the preferences of private agents. Appointments with respondents were made through telephone calls before visiting their home.[21] Most of those who were contacted were interested in participating in the study. However, due to logistical reasons it was impossible to meet the preferences of all landowners regarding date and time, hence in the end around 50% of all those who were contacted were actually interviewed.[22] The choice sets were randomly distributed among the individuals in each region and among the enumerators.

4. Results

The choice experiment was integrated in a survey regarding the socio-economic impact of the payment for ecosystem services (PSA) program in Costa Rica[23] conducted from November 2011 to January 2012. A total of 246 successful interviews[24] with private landowners were undertaken. To check for differences between the regions, where San José represents an urban region, while Guapiles and Nicoya represent more rural regions, the descriptive statistics are divided by region and regional dummy variables are included in the econometric analysis. The descriptive statistics of the pooled sample, the subsample for each region, and the subsamples of applicants and non-applicants to the current PSA program are presented in Table 2.

4.1 Descriptive statistics

The majority of the respondents, over 80%, are men and the average age is 58 years. The educational level of the respondents is generally quite low, with the average highest level attained being incomplete secondary school. More than half of the respondents are on-farm income dependent and the average land size is around 108 hectares, while the median is 34 hectares. Looking at the regions, the average size of the land is significantly different between the regions, with Guapiles having the smallest average land size and Nicoya the largest (significant at a 1% level according to a Kruskal-Wallis test).

Moreover, around 50% of the respondents had previously participated in some kind of capacity building and over 80% of the respondents stated a need for a training program connected to their land. The most frequently demanded courses are connected to agriculture and livestock, but tourism and forestry are also popular topics. Landowners from Guapiles have significantly less experience in capacity building than those from the other regions,

while San José had significantly more (significant at a 1% level according to a Kruskal-Wallis test). This might be explained by the region of San José having proximity to markets offering such services.

More than half of the respondents had applied to the PSA program and 40% had at some point held a contract. At the time the choice experiment was conducted, 31% of the respondents held an ongoing contract. This high proportion of landowners holding a contract or applying to the program is a result of deliberate use of applicants to the program within the sample frame and hence does not reflect the proportion of applicants in the population. There are some differences between the regions, with Nicoya having a significantly higher share of applicants to the PSA program.

Applicants to the PSA program have a significantly higher education level (completed secondary school) than non-applicants (completed primary school) (significant at a 5% level according to a Mann-Whitney test). Similar results are found for on-farm income, where applicants are less likely than non-applicants to be dependent on on-farm income (36% vs. 66%, significant at a 5% level according to a Mann-Whitney test). Further, land size is significantly larger for applicants. The results of a probit model (see Table A1a in Appendix) show that on-farm income independency, farm size, and higher education level significantly increase the probability of applying to the current PSA program. These results support earlier findings that those participating in the PSA program have larger farms, lower dependency on on-farm income, and higher education levels (Miranda et al. 2003, Ortiz et al. 2003, Hope et al. 2005, Zbinden and Lee 2005, Sierra and Russman 2006, Arriagada et al. 2009, Porras 2010).

>> Table 2 around here.

In the choice experiment, 33% of the respondents (81 out of 246) chose not to participate in any PES contract. The share of non-participants in the choice experiment was significantly higher in the group that had never applied for the existing contracts (significant at 5% according a Mann-Whitney test). Within that group, almost half of those (57 out of 121 respondents) chose not to participate in any contract in the choice experiment, compared with only 19% of the respondents who had applied (24 out of 125).

We use a probit model to analyze whether any observable socioeconomic variables can explain the probability of participation in the PES contract described in the choice experiment, and find that being an applicant to the current PSA program significantly increases the probability of choosing to participate in a contract (results are presented in Table A1a in the Appendix). Similar results have been found in the Chinese Sloping Lands Conservation Program (SLCP), where those who had already participated in the program were more likely to continue participation even if the new contract had different characteristics (Mullan and Kontoleon 2009).

Earlier, we showed that dependence on on-farm income decreases both the probability of applying to the current PSA program and the probability of participating in a contract in the choice experiment. These results are what we intuitively would have expected, which gives validity to our choice experiment. We further expect on-farm income dependency to have both a direct negative effect on participation in the PES contracts in the choice experiment and an indirect negative effect. The indirect negative effect is as follows: on-farm income dependence decreases the likelihood of prior participation in the PSA program, which in turn decreases the likelihood of choosing a PES contract during the experiment. We decompose the effect of on-farm income dependency by using the *khb* method in Stata (Kohler et al. 2011). The results, presented in Table A1b in the Appendix, show that 57% of the total negative effect of on-farm income on participation goes through the channel of not having applied for the PSA program.

In addition, our results from the probit model show that a stated need for capacity building increases the probability of participating in a PES contract. This variable is later included in the econometric analysis of heterogeneity in preferences for type of payment.

To understand the reasons for choosing not to participate in any contract in the choice experiment, some follow-up questions were asked. The answers reveal that the main reason for non-participation is the fear of losing control over land-use decisions or even losing property rights to the land. Comparable results have been found for farmers in Kenya, where non-participation in soil conservation programs was motivated by the perception that direct cash payments could weaken ownership (Porras et al. 2007). Another common reason stated in our study is that payments are too low. This result supports the findings of Arriagada et al. (2009), who found low payments to be one of the main reasons among landowners in the Sarapiquí Region for not enrolling land in the Costa Rican PSA program. Similarly, in a developed-country setting, Wilson and Hart (2000) found that the two main reasons for not

enrolling land in agro-ecosystem schemes in ten European countries were that the offered payments were too low and that such contracts did not fit with farm management plans. In our study, the average stated sufficient payment was almost 776,000 colones (US $1,552)[25] for 10 hectares of land per year. Comparing the actual 2011 payment levels of US $640 per year (for the same size area) with the average stated payment in the choice experiment suggests that the current payments are too low to induce substantial participation. According to these results, the choice of having no contract seems to imply that the landowners are making a choice where staying in the current land-use is the preferred option. Although status quo bias has, in fact, been found to be quite common in decision making in general (Samuelson and Zeckhauser 1988) and in choice experiments in particular (Adamowicz et al. 1998) — i.e., the respondent prefers to stay in the current situation even though another alternative would make him/her better off — there does not appear to be a status quo bias in this experiment.

Our results show that several factors influence non-participation in the PES contracts presented in the choice experiment. However, respondents who chose to always opt out made no trade-offs between the attributes. Because no additional information is derived from these respondents, they were excluded from the econometric analysis of the data. Note that this does not mean that the remaining respondents did not opt out, but only that those who never chose to participate are excluded from the tests of the hypotheses concerning the relationship between participation in a PES contract and type of payment.

4.2 Estimations of parameters for choice experiment

In the econometric analysis of the choice experiment, the levels of payment attributes are coded using a dummy variable approach, where the zero-payment levels (i.e., zero net cash payment and zero days of training) are taken as baseline. This allows us to describe utility changes for each of the other levels of the in-kind and cash payments without assuming a particular functional form. It also allows us to test the hypotheses regarding the relationship between the type of payment and participation in a PES contract. Dummy variables for duration were tested and showed a linear effect in number of years. Duration is treated as a continuous variable, as a dummy variable approach showed that the effect is approximately linear in number of years.

In the first stage in the econometric analysis, we test for order effects by using **Model 1** and the three versions [1,2,3,4,5] , [2,3,4,5,1], and [3,4,5,2,1]. If such an effect cannot be

rejected, this has to be taken into account in the estimation of the parameters. The log-likelihood values of the separate conditional logit models are –207.56, –111.86, and –170.47, respectively, and the log-likelihood value of the concatenated model is –498.15. The likelihood ratio test leads to $\lambda = -2\ [-498.15 - (-207.56 - 111.86 - 170.47)] = 16.52$. This value is smaller than 26.30, the critical value of the $\chi 2$ distribution at the 5% significance level with (8+8+8)–8=16 degrees of freedom. Hence, the hypothesis of equal parameters could not be rejected. In other words, there is no order effect for the four tested alternative orderings.

The parameter estimation starts with **Model 1**, a basic model specified as the probability of selecting a particular PES contract as a function of the attributes of the contract and of a dummy variable representing a choice of any contract at all, i.e., the alternative specific constant. The results of the conditional logit estimates of **Model 1** are reported in the first column in Table 3.[26] The insignificant coefficient of the alternative specific constant implies that, all else equal, the respondents are neither likely nor unlikely to choose a contract instead of no contract. The duration of the contract is significantly negative, showing a tendency of respondents to prefer short-term contracts.

Focusing on the parameters of greatest interest for this study, i.e., the types of payments, we find a significantly positive effect on the probability of choosing to participate in a contract for both cash and in-kind payments, compared with the reference alternative of zero payment.[27] The coefficients and the 95% confidence intervals for each level of the cash and the in-kind payment from the conditional logit Model 1 are plotted in Figure 3. As can be seen, participation seems uncorrelated with the level of the in-kind payment, while increasing cash payments seems to lead to a higher probability of choosing to participate in a contract.

>> Figure 3 around here.

>> Table 3 around here.

The hypothesis that the relationship between the magnitude of the payment and participation in a PES contract differs depending on the type of payment is tested using a Wald chi-square test for the estimated parameters in Model 1. The results are presented in Table 3.

Hypothesis 1: The null hypothesis of larger coefficients for higher level of cash payment cannot be rejected at a significance level of 5%: the magnitude of the cash payment seems to have a positive effect on participation in a contract.

Hypothesis 2: The null hypothesis of equal coefficients for in-kind payment cannot be rejected at a significance level of 5%: the magnitude of the in-kind payment seems to have no effect on participation in a contract.

According to the results of this study, higher cash payments increase the probability of participation. In-kind payments, on the other hand, seem to imply a rather constant probability of participating in a PES contract. Note that the attribute levels of the type of payments are comparable in terms of the cost for the policymaker. Thus, for a given cost, there would be higher participation with cash payment than with educational in-kind payment.

Participation in a PES contract is also connected to the commitment of following the requirements during the contract period. Hence, respondents' utility in choosing a contract depends on i) the payment, which is shown to give positive utility for both cash and in-kind payments; ii) the duration of the contract, which is shown to give disutility; and iii) the intrinsic preference for having a contract or not, represented by the alternative specific constant, which is shown to give disutility, even though insignificantly so. Using a Wald chi-square test for the estimated parameters in Model 1, we test the null hypothesis of no impact on utility from the different levels of cash and in-kind payments, separately and in combination, accounting for the disutility of having a contract (α) and the duration ($\beta_{duration}$). The hypotheses and the p-values are presented in Table A3 in the Appendix.

The null hypothesis of no impact on utility can be rejected at the 5% significance level for all levels of the cash payment in combination with each level of the duration of the contract, i.e., 5, 10, and 15 years, with the exception of a cash net payment of 100,000 colones per year in combination with a contract of 15 years. However, combining the analysis of cash and educational in-kind payments for longer contracts demonstrates a positive effect on utility in certain cases. For the educational in-kind payment alone, the null hypothesis of no impact on utility is rejected at 10% for short contracts, i.e., 5 years, and practical training of 10 or 15 days. In summary, shorter contracts for both cash and in-kind payments result in positive utility under certain circumstances and hence are expected to increase participation. However, because there is no significant utility derived from 20 days of practical training, fewer days of practical training seems to be a better choice to increase participation in shorter contracts. For

longer contracts, in this case 10 or 15 years, in-kind payment alone does not seem to have the potential to increase participation. Instead, higher cash payments or a combination of cash and educational in-kind payments seem to be what is needed to ensure utility from participation in longer contracts.

4.3 Estimations of parameters accounting for observable heterogeneity

To capture heterogeneity in preferences for participating in a contract and for type of payment as a function of individual characteristics, **Model 2** is estimated.[28] In this model, an interaction term between the levels of the in-kind payment and the stated need for capacity building is included. Stated need for the in-kind payment is expected to increase the preference for more days of practical training and is hence included to test for this. On-farm income dependency is shown to be an important explanatory variable for participation in the current PSA program, where payments are made in cash. Thus, this variable is of great interest when investigating heterogeneity in preferences for type of payment.[29] All levels of both types of payments are interacted with on-farm income dependency. The results of the conditional logit estimates are reported in the second column in Table 3.

For the heterogeneity in preferences for participating in a contract or not, we find that, in general, men seem less likely than women to participate in new PES contracts. Further, previous experience with capacity-building programs significantly increases the likelihood of participating in a contract. When it comes to the heterogeneity in preferences for the level of in-kind payment, landowners with a stated need for capacity building prefer both 15 days and 20 days of free practical training, compared with the reference alternative of no practical training; this can be seen from the positive interaction effects between the dummy for stated need of capacity building and the dummy for 10 days or 15 days of practical training, respectively. Landowners who are on-farm income dependent prefer higher levels of cash payments compared with the reference group of those who are on-farm income independent; this is shown by the significant positive interaction effect between the on-farm income dependency dummy and cash payment levels of 150,000 colones and 200,000 colones.

Using the parameters estimated in **Model 2,** we test our hypotheses by running a test where the parameters of the interaction terms between the payment levels and on-farm income dependency and stated need for capacity building, respectively, are taken into account. The results, presented in Table A4 in the Appendix, show that, for those who are on-farm income dependent, each increase in cash payment implies a higher probability of participating in a

PES contract. For those who are not dependent on on-farm income, there is only a significant difference between a net cash payment of 100,000 colones and 200,000 colones.

For the in-kind payment, the likelihood of participating in a PES contract still seems to be uncorrelated with the number of paid days of practical training. However, those with on-farm income dependency and a stated need for capacity building seem to lean toward preferences for higher in-kind payments, i.e., more days of practical training, even though it is not statistically significant. Although the relationship between participation in a PES contract and type of payment is in line with what is found in Model 1, Model 2 gives a better understanding of some of the heterogeneity that seems to be important to preferences for the type of payment.

5. Conclusions

This paper uses a choice experiment, conducted with landowners in Costa Rica, to explore how the relationship between participation in a payment for ecosystem services (PES) contract and payment level varies across the type of payment used, i.e., cash and/or in kind. We use an educational in-kind payment in the form of days of practical training offered free of charge to the recipients. The main findings are that 1) there is a positive correlation between participation in a PES contract and the magnitude of the cash payment — higher cash payment seems to give a higher probability of participating in a contract, 2) participation seems uncorrelated with the magnitude of the in-kind payment, 3) for shorter PES contracts (i.e., 5 years), both cash and low levels of the in-kind payments increase the likelihood of participation, and 4) for longer contracts, higher levels of cash payment or a mix of cash and in-kind payment are needed to increase the likelihood of participation.

The results of this paper contribute to the literature by providing information regarding the relationship between participation in PES contracts and type of payment used. This knowledge is important in order to efficiently provide ecosystem services. Further, our results extend the findings that magnitude seems to matter more for cash payments than for in-kind payments (e.g., Gneezy and Rustichini 2000, Heyman and Ariely 2004, Pfister 2007, Kube et al. 2012) by exploring the heterogeneity in preferences regarding participation and type of payment. We show that our results regarding the relationship between participation and type of payment hold even if we control for heterogeneity due to individual characteristics. In addition, we find that 1) in-kind payments are more likely to increase participation among

those with a stated need for the in-kind payment offered and 2) landowners who depend on on-farm income have stronger preferences for higher levels of cash payments. In line with previous studies, our results indicate that non-participants in the current PSA program in Costa Rica are more dependent on on-farm income (cf. for instance Arriagada et al. 2009). To motivate this group to participate, higher cash payments are needed. However, landowners who are dependent on on-farm income are also more experienced with capacity-building programs, which in turn are shown to make them more likely to state a need for capacity building. Thus, increased participation of on-farm income-dependent landowners may be achieved if free days of practical training are also offered.

Further, because the levels of the cash and in-kind payments are designed to be comparable in terms of cost, for a given cost there would be higher participation with cash payments than with in-kind payments. Our results are conservative in the sense that we have only compared costs and not tried to compare the utility across payment types. Furthermore, our analysis is also cautious in that the cost of providing practical training is calculated at current market prices, whereas in-kind payments in a national PES program could realistically be offered much more cheaply than in the market due to the economies of scale that larger provision of goods or services implies. A natural extension of this study would be to run further choice experiments with a larger set of levels of different types of payments and test for different combinations of payments to increase participation at the lowest cost. Further studies could consider appropriate payment for different land sizes, something that was limited in this study due to our desire to hold constant the expenditure on the PES program and explore the most cost effective payment type.

Among all the factors influencing participation, two crucial factors are certainly the type of payment used and the magnitude of the payment. This paper offers some important insights in this regard by showing that increased cash payments seem to increase participation, while participation seems unaffected by increased payments in the form of practical training. However, payments in practical training are preferable in shorter contracts and in shorter courses. In contrast, cash payments are preferable when used in larger amounts and in longer contracts. The question of which payment type should be used further depends on the degree of freedom that individuals ought to be given in using payments. Addressing this is beyond the scope of this paper. Nevertheless, our results call for a greater consideration of the preferences of providers of ecosystem services regarding type of payment when designing PES contracts. For policymakers, this type of input can be used to help design the most effective payment systems for ecosystem services when the goal is to maximize participation.

Appendix

Table A1a. The probit estimation results of the probability of a yes or no answer to being an applicant to the current PSA program (yes = 1, no = 0) and of the probability of a yes or no answer to participate in a PES contract in the choice experiment (yes = 1, no = 0); standard errors in parentheses.

	Dependent variable application to current PSA program	Dependent variable participation in PES in choice experiment
	Coefficient (Standard error)	Coefficient (Standard error)
Age	-0.02** (0.01)	-0.01 (0.01)
Male	0.02 (0.28)	-0.41 (0.30)
Education	0.12** (0.05)	-0.05 (0.05)
Household members	-0.11 (0.06)	0.03 (0.06)
Farm income	-0.75*** (0.20)	-0.15 (0.20)
Average land size	0.01*** (0.001)	-0.001 (0.001)
Stated need for capacity building	0.14 (0.25)	0.44* (0.23)
Applied to the program	-	0.87*** (0.21)
Constant	1.10 (0.74)	0.83 (0.74)
Log-likelihood	-122.27	-136.60
Pseudo R-square	0.28	0.11
Number of observations	244[#]	244[#]

***, **, and * significant at the 1%, 5%, and 10% levels, respectively.

[#]Two of the respondents did not answer the question concerning need for capacity building.

Table A1b. Result from the *khb* method to decompose the direct effect of on-farm income dependency (*Farm income*) on participation in a PES contract in the choice experiment and the indirect effect through being an applicant (*Applied to the program*).[30]

Farm income	Coefficient (Standard error)	Summary of confounding
Total effect (reduced model)	-0.35***** (0.20)	*Conf_ratio*
Direct effect (full model)	-0.15 (0.20)	The total effect is 2.3 times larger than the direct effect
Indirect effect (difference)	-0.20******* (0.07)	*Conf_Percentage*
Pseudo R-square	0.11	57% of the total effect is due to being an applicant.
Number of observations	244	

***, **, and * significant at the 1%, 5%, and 10% levels, respectively.

Table A2. Random parameter logit estimation results; standard errors in parentheses.

Random parameters	Mean coefficient (Standard error)	Coeff std. (Standard error)
Duration of contract, $\beta_{duration}$	-0.09*** (0.02)	0.20*** (0.02)
Payment in training, 10 days, β_{10days}	1.26*** (0.19)	0.32 (0.65)
Payment in training, 15 days, β_{15days}	1.35*** (0.27)	<0.01 (0.70)
Payment in training, 20 days, β_{20days}	1.10*** (0.19)	0.07 (1.01)
Non-random parameters [a]		
Contract, α	0.44 (0.30)	
Payment in cash, 100,000 colones, $\beta_{100cash}$	1.74*** (0.22)	
Payment in cash, 150,000 colones, $\beta_{150cash}$	2.40*** (0.30)	
Payment in cash, 200,000 colones, $\beta_{200cash}$	2.81*** (0.30)	
Log-likelihood	-609.56	
Pseudo R-square	0.33	
Number of respondents	165	
Number of observations	825	

***, **, and * significant at the 1%, 5%, and 10% levels, respectively.

[a] The contract parameter and the cash payment parameters were assumed to be fixed in the random logit model. However, we tried letting the cash payment parameters be random and normal/log-normally distributed but no significant heterogeneity was found, nor any differences in signs.

Table A3. The null hypotheses of no impact on utility of different combinations of attribute levels using estimated parameters from Model 1 and p-values from a Wald chi-square test.

Hypotheses of using only one payment type	P-value	Hypotheses of using mixed of cash and in-kind payments	P-value
$U = \alpha + \beta_{duration} * 5 + \beta_{100cash} = 0$	0.01	$U = \alpha + \beta_{duration} * 5 + \beta_{100cash} + \beta_{10days} = 0$	0.01
$U = \alpha + \beta_{duration} * 10 + \beta_{100cash} = 0$	0.01	$U = \alpha + \beta_{duration} * 10 + \beta_{100cash} + \beta_{10days} = 0$	0.01
$U = \alpha + \beta_{duration} * 15 + \beta_{100cash} = 0$	0.07	$U = \alpha + \beta_{duration} * 15 + \beta_{100cash} + \beta_{10days} = 0$	0.01
$U = \alpha + \beta_{duration} * 5 + \beta_{150cash} = 0$	0.01	$U = \alpha + \beta_{duration} * 5 + \beta_{150cash} + \beta_{10days} = 0$	0.01
$U = \alpha + \beta_{duration} * 10 + \beta_{150cash} = 0$	0.01	$U = \alpha + \beta_{duration} * 10 + \beta_{150cash} + \beta_{10days} = 0$	0.01
$U = \alpha + \beta_{duration} * 15 + \beta_{150cash} = 0$	0.01	$U = \alpha + \beta_{duration} * 15 + \beta_{150cash} + \beta_{10days} = 0$	0.01
$U = \alpha + \beta_{duration} * 5 + \beta_{200cash} = 0$	0.01	$U = \alpha + \beta_{duration} * 5 + \beta_{200cash} + \beta_{10days} = 0$	0.01
$U = \alpha + \beta_{duration} * 10 + \beta_{200cash} = 0$	0.01	$U = \alpha + \beta_{duration} * 10 + \beta_{200cash} + \beta_{10days} = 0$	0.01
$U = \alpha + \beta_{duration} * 15 + \beta_{200cash} = 0$	0.01	$U = \alpha + \beta_{duration} * 15 + \beta_{200cash} + \beta_{10days} = 0$	0.01
$U = \alpha + \beta_{duration} * 5 + \beta_{10days} = 0$	0.07	$U = \alpha + \beta_{duration} * 5 + \beta_{100cash} + \beta_{15days} = 0$	0.01
$U = \alpha + \beta_{duration} * 10 + \beta_{10days} = 0$	0.70	$U = \alpha + \beta_{duration} * 10 + \beta_{100cash} + \beta_{15days} = 0$	0.01
$U = \alpha + \beta_{duration} * 15 + \beta_{10days} = 0$	0.39	$U = \alpha + \beta_{duration} * 15 + \beta_{100cash} + \beta_{15days} = 0$	0.01
$U = \alpha + \beta_{duration} * 5 + \beta_{15days} = 0$	0.09	$U = \alpha + \beta_{duration} * 5 + \beta_{150cash} + \beta_{15days} = 0$	0.01
$U = \alpha + \beta_{duration} * 10 + \beta_{15days} = 0$	0.91	$U = \alpha + \beta_{duration} * 10 + \beta_{150cash} + \beta_{15days} = 0$	0.01
$U = \alpha + \beta_{duration} * 15 + \beta_{15days} = 0$	0.17	$U = \alpha + \beta_{duration} * 15 + \beta_{150cash} + \beta_{15days} = 0$	0.01
$U = \alpha + \beta_{duration} * 5 + \beta_{20days} = 0$	0.24	$U = \alpha + \beta_{duration} * 5 + \beta_{200cash} + \beta_{15days} = 0$	0.01
$U = \alpha + \beta_{duration} * 10 + \beta_{20days} = 0$	0.63	$U = \alpha + \beta_{duration} * 10 + \beta_{200cash} + \beta_{15days} = 0$	0.01
$U = \alpha + \beta_{duration} * 15 + \beta_{20days} = 0$	0.04[#]	$U = \alpha + \beta_{duration} * 15 + \beta_{200cash} + \beta_{15days} = 0$	0.01
		$U = \alpha + \beta_{duration} * 5 + \beta_{100cash} + \beta_{20days} = 0$	0.01
		$U = \alpha + \beta_{duration} * 10 + \beta_{100cash} + \beta_{20days} = 0$	0.01
		$U = \alpha + \beta_{duration} * 15 + \beta_{100cash} + \beta_{20days} = 0$	0.01
		$U = \alpha + \beta_{duration} * 5 + \beta_{150cash} + \beta_{20days} = 0$	0.01
		$U = \alpha + \beta_{duration} * 10 + \beta_{150cash} + \beta_{20days} = 0$	0.01
		$U = \alpha + \beta_{duration} * 15 + \beta_{150cash} + \beta_{20days} = 0$	0.01
		$U = \alpha + \beta_{duration} * 5 + \beta_{200cash} + \beta_{20days} = 0$	0.01
		$U = \alpha + \beta_{duration} * 10 + \beta_{200cash} + \beta_{20days} = 0$	0.01
		$U = \alpha + \beta_{duration} * 15 + \beta_{200cash} + \beta_{20days} = 0$	0.01

[#]This is found to be significantly negative.

Table A4. This matrix shows test results of Hypotheses 1 and 2 depending on on-farm income dependency and stated need for capacity building. Parameters from Model 2 used.

	Dependent on on-farm income	**Not dependent on on-farm income**
Stated need for capacity building	***Cash payments*** $\beta_{100cash} + \delta_{\text{Depending on on-farm income*100,000 colones}} < \beta_{150cash} + \delta_{\text{Depending on on-farm income*150,000 colones}}$ n**ot rejected** (p-value=0.999) [31] $\beta_{100cash} + \delta_{\text{Depending on on-farm income*100,000 colones}} < \beta_{200cash} + \delta_{\text{Depending on on-farm income*200,000 colones}}$ **not rejected** (p-value=0.999) $\beta_{150cash} + \delta_{\text{Depending on on-farm income*150,000 colones}} < \beta_{200cash} + \delta_{\text{Depending on on-farm income*200,000 colones}}$ **not rejected** (p-value=0.973) ***In-kind payments*** $\beta_{10days} + \delta_{\text{Depending on on-farm income*10 days training}} + \delta_{\text{Stated need of capacity*10 days training}} = \beta_{15days} + \delta_{\text{Depending on on-farm income*15 days training}} + \delta_{\text{Stated need of capacity*15 days training}}$ **not rejected** (p-value=0.131) $\beta_{10days} + \delta_{\text{Depending on on-farm income*10 days training}} + \delta_{\text{Stated need of capacity*10 days training}} = \beta_{20days} + \delta_{\text{Depending on on-farm income*20 days training}} + \delta_{\text{Stated need of capacity*20 days training}}$ **not rejected** (p-value=0.870) $\beta_{15days} + \delta_{\text{Depending on on-farm income*15 days training}} + \delta_{\text{Stated need of capacity*15 days training}} = \beta_{20days} + \delta_{\text{Depending on on-farm income*20 days training}} + \delta_{\text{Stated need of capacity*20 days training}}$	***Cash payments*** There is only a significant difference between the parameters of cash payment level of 100,000 colones and 200,000 colones, hence only these parameters are tested for inequality.[32] $\beta_{100cash} < \beta_{200cash}$ **not rejected** (p-value=0.992). ***In-kind payments*** $\beta_{10days} + \delta_{\text{Stated need of capacity*10 days training}} = \beta_{15days} + \delta_{\text{Stated need of capacity*15 days training}}$ **not rejected** (p-value=0.247) $\beta_{10days} + \delta_{\text{Stated need of capacity*10 days training}} = \beta_{20days} + \delta_{\text{Stated need of capacity*20 days training}}$ **not rejected** (p-value=0.260) $\beta_{15days} + \delta_{\text{Stated need of capacity*15 days training}} = \beta_{20days} + \delta_{\text{Stated need of capacity*20 days training}}$ **not rejected** (p-value=0.880) *Share of respondents in this group: 40%*

	not rejected (p-value=0.112) *Share of respondents in this group: 43%*	
	Dependent on on-farm income	**Not dependent on on-farm income**
No stated need for capacity building	**Cash payments** $\beta_{100cash} + \delta_{\text{Depending on on-farm income}*\text{100,000 colones}} < \beta_{150cash} + \delta_{\text{Depending on on-farm income}*\text{150,000 colones}}$ **not rejected** (p-value=0.999) $\beta_{100cash} + \delta_{\text{Depending on on-farm income}*\text{100,000 colones}} < \beta_{200cash} + \delta_{\text{Depending on on-farm income}*\text{200,000 colones}}$ **not rejected** (p-value=0.999) $\beta_{150cash} + \delta_{\text{Depending on on-farm income}*\text{150,000 colones}} < \beta_{200cash} + \delta_{\text{Depending on on-farm income}*\text{200,000 colones}}$ **not rejected** (p-value=0.973) **In-kind payments** $\beta_{10days} + \delta_{\text{Depending on on-farm income}*\text{10 days training}} = \beta_{15days} + \delta_{\text{Depending on on-farm income}*\text{15 days training}}$ **not rejected** (p-value=0.861) $\beta_{10days} + \delta_{\text{Depending on on-farm income}*\text{10 days training}} = \beta_{20days} + \delta_{\text{Depending on on-farm income}*\text{20 days training}}$ **not rejected** (p-value=0.827) $\beta_{15days} + \delta_{\text{Depending on on-farm income}*\text{15 days training}} = \beta_{20days} + \delta_{\text{Depending on on-farm income}*\text{20 days training}}$ **not rejected** (p-value=0.676) *Share of respondents in this group: 7%*	**Cash payments** There is only a significant difference between the parameters of cash payment level of 100,000 colones and 200,000 colones, hence only these parameters are tested for inequality.[33] $\beta_{100cash} < \beta_{200cash}$ **not rejected** (p-value=0.992). **In-kind payments** $\beta_{10days} = \beta_{15days}$ **not rejected** (p-value=0.131) $\beta_{10days} = \beta_{20days}$ **not rejected** (p-value=0.295) $\beta_{15days} = \beta_{20days}$ **not rejected** (p-value=0.539) *Share of respondents in this group: 10%*

Table A5. The probit estimation results of the probability of the yes/no answer to dependency on on-farm income (yes = 1, no = 0) and of the probability of the yes/no answer to need for capacity building (yes = 1, no = 0); standard errors in parentheses.

	Dependent variable Dependent on on-farm income	*Dependent variable* Stated need for capacity building
	Coefficient (Standard error)	Coefficient (Standard error)
Age	-0.02*** (0.01)	-0.01 (0.01)
Male	0.67*** (0.27)	-0.60* (0.36)
Education	-0.19*** (0.05)	0.09 (0.06)
Farm income		0.35 (0.23)
Average land size	0.001 (0.001)	-0.001 (0.001)
Experience of capacity building	0.36** (0.18)	0.41** (0.21)
Applied to the program	-0.73*** (0.20)	0.08 (0.23)
Constant	1.40 (0.56)	1.56 (0.71)
Log-likelihood	-140.43	-103.84
Pseudo R-square	0.18	0.07
Number of observations	246	244[#]

***, **, and * significant at the 1%, 5%, and 10% level, respectively.

[#]Two of the respondents did not answer the question about their need for capacity building.

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Tables

Table 1. The attributes and the attribute levels of the choice experiment.

Attributes	**Description**	**Levels**
Duration of contract	The length of the contract in years.	0 (no contract), 5, 10, 15 years
Payment in training	Annual educational in-kind payment for a PES contract described as the number of days of practical training, free of charge, offered to the respondent or someone appointed by the respondent.	0, 10, 15, 20 days per year.
Payment in cash	Annual cash payment for a PES contract described as the net payment, i.e., money left after covering the investment costs, in present value.	0; 100,000; 150,000; 200,000 colones net per year.

* US$1 = 500 colones (November 2011 exchange rate)

Table 2. Descriptive statistics presented as mean values and standard deviation in parentheses.

Variable	Description	Pooled sample	Guapiles	San José	Nicoya	p-value[1]	Applied	Never applied	p-value[2]
Age	The respondent's age in years	58 years (12.27)	61 years (12.40)	57 years (12.50)	59 years (12.80)	0.12	56 years (11.91)	61 years (12.12)	<0.01
Male	Dummy for male (1 = male, 0 = female)	86%	85%	88%	85%	0.79	84%	88%	0.32
Education	The respondent's highest level of education	Incomplete secondary school (2.02)	Complete primary school (1.90)	Incomplete secondary school (1.94)	Incomplete secondary school (2.11)	0.08	Complete secondary school (2.12)	Complete primary school (1.55)	<0.01
Household members	Number of household members	3.57 (1.63)	3.33 (1.27)	3.89 (1.86)	3.36 (1.48)	0.16	3.42 (1.44)	3.72 (1.80)	0.45
Farm income	Dummy for whether the respondent's main income comes from the farm (1 = yes, 0 = no)	51%	48%	58%	45%	0.17	36%	66%	<0.01
Average land size	Average land size measured in hectare.	108 ha (189)	51 ha (88)	108 ha (215)	135 ha (191)	<0.01	175 ha (241)	39 ha (59)	<0.01
Median land size	Median land size measured in hectares.	34 ha	15.5 ha	30 ha	56.5 ha		73 ha	16.5 ha	
Experienced capacitation	Dummy for whether the respondent participated in capacity building before (1 = yes, 0 = no)	51%	28%	59%	53%	<0.01	49%	53%	0.52

Stated need for capacity	Dummy for whether the respondent stated a need for capacity building before (1 = yes, 0 = no)	83%	67%	87%	86%	<0.01	84%	82%	0.61
Applied to the program	Dummy for whether the respondent applied to the PES program (1 = yes, 0 = no)	51%	30%	52%	59%	<0.01	100%	N/A	
Contract at any time	Dummy for if the respondent has held a contract at any time (1 = yes, 0 = no)	40%	26%	36%	51%	<0.01	79%	N/A	
Contract at present	Dummy for if the respondent holds a contract at time of the survey (1 = yes, 0 = no)	31%	20%	31%	36%	0.13	62%	N/A	
# of respondents		246	46	100	100		125	121	

[1] p-values according to Kruskal-Wallis test for three independent groups. [2] p-values according to Mann-Whitney test for two independent groups.

Table 3. Conditional logit estimation results, standard errors in parentheses.

	Model 1	**Model 2**
	Coefficient (Standard error)	Coefficient (Standard error)
Contract, α	-0.24 (0.24)	-0.78 (0.84)
Duration of contract, $\beta_{duration}$	-0.07*** (0.02)	-0.07*** (0.02)
Payment in training, 10 days, β_{10days}	1.02*** (0.16)	0.69* (0.37)
Payment in training, 15 days, β_{15days}	0.94*** (0.22)	-0.09 (0.49)
Payment in training, 20 days, β_{20days}	0.82*** (0.15)	0.21 (0.34)
Payment in cash, 100,000 colones, $\beta_{100cash}$	1.59*** (0.20)	1.57*** (0.27)
Payment in cash, 150,000 colones, $\beta_{150cash}$	2.12*** (0.24)	1.86*** (0.31)
Payment in cash, 200,000 colones, $\beta_{200cash}$	2.47*** (0.23)	2.15*** (0.31)
Guapiles*contract	-	-0.01 (0.34)
San José*contract	-	0.33 (0.28)
Age*contract	-	0.01 (0.01)
Male*contract	-	-0.70** (0.36)
Education*contract	-	0.05 (0.07)
Depending on on-farm income*contract	-	0.31 (0.50)
Total land size[#]*contract	-	0.001 (0.001)
Experienced capacity*contract	-	0.55** (0.27)
Contract at any time*contract	-	-0.42 (0.41)
Stated need of capacity*10 days training	-	0.53 (0.39)
Stated need of capacity*15 days training	-	0.94* (0.48)
Stated need of capacity*20 days training	-	0.69** (0.34)
Depending on on-farm income*10 days training	-	-0.22 (0.32)
Depending on on-farm income*15 days training	-	0.66 (0.45)
Depending on on-farm income*20 days training	-	0.15 (0.28)
Depending on on-farm income*100,000 colones	-	0.24 (0.38)

Depending on on-farm income*150,000 colones	-	0.88***** (0.49)
Depending on on-farm income*200,000 colones	-	0.99****** (0.49)
Log-likelihood	-662.27	-639.82
Pseudo R-square	0.17	0.19
Number of respondents	165	165
Number of observations	825	825

***, **, and * means significance at the 1%, 5% and 10% levels, respectively.
[#]Because some landowners have more than one piece of land, the total land size is the sum of all land owned by the respondent

The following hypotheses were tested using a Wald chi-square test and the β parameters estimated in **Model 1**:
H_0 tested[1];
Cash payments
$\beta_{100cash} < \beta_{150cash}$ not rejected (p-value = 0.999)
$\beta_{100\text{cash}} < \beta_{200\text{cash}}$ not rejected (p-value = 0.999)
$\beta_{150\text{cash}} < \beta_{200\text{cash}}$ not rejected (p-value = 0.994)

In-kind payments
$\beta_{10days} = \beta_{15days}$ not rejected (p-value = 0.724)
$\beta_{10\text{days}} = \beta_{20\text{days}}$ not rejected (p-value = 0.327)
$\beta_{15\text{days}} = \beta_{20\text{days}}$ not rejected (p-value = 0.543)

[1] To test for inequality, a chi-square test with 1 degree of freedom can be transformed in a normal standard distribution by obtaining the square root of the Wald statistics and calculating the p-value under normal standard distribution. The p-value from the Wald chi-square test of equal parameters for the cash payments are: $\beta_{150\text{cash}} = \beta_{200\text{cash}}$ rejected (p-value = 0.012); $\beta_{100\text{cash}} = \beta_{200\text{cash}}$ rejected (p-value = 0.001); $\beta_{100cash} = \beta_{150cash}$ rejected (p-value = 0.002).

Figure 1. Choice experiment scenario read by the enumerators.

Ok, we have now reached the part of the survey where we would like to know what kind of compensation people would like to receive in exchange for reforesting or conserving the forest. That is, let's say you are offered different types of payments in the form of a contract for planting trees or protecting the forest on your property. The contract would last 5, 10, or 15 years during which you would commit to reforesting or protecting the forest. Now, having an area under a reforestation or forest protection contract means that the area has to be fenced, cattle cannot enter, there have to be clear boundary lines around the area, and no one can cut down trees or hunt in the area under contract. As a reward for this commitment, you would receive compensation in the form of cash, paid days of practical training, or both.

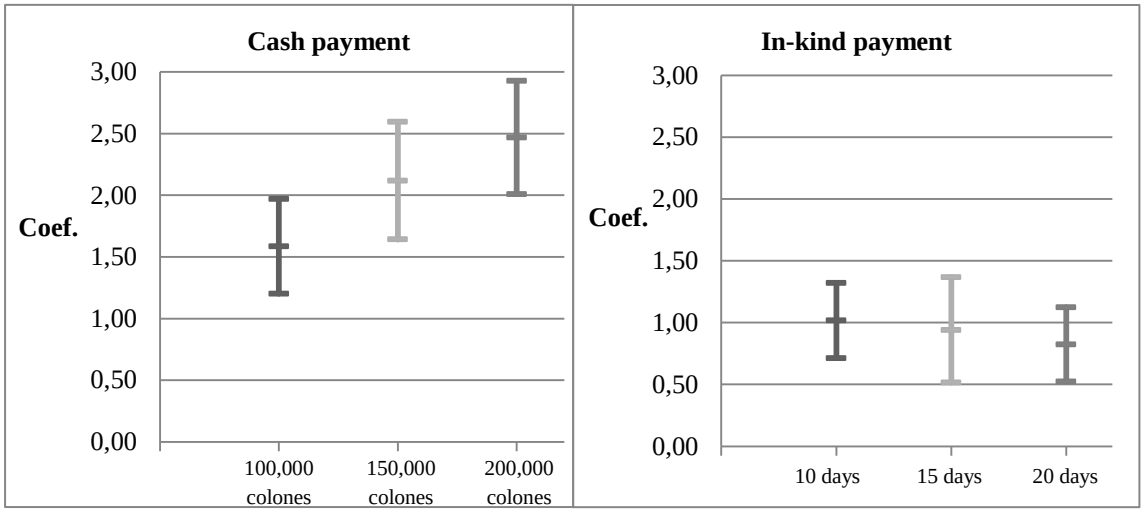
Now, paid days of practical training means that you or someone you designate would receive a number of days of practical training, free of charge, in an area of relevance for your land, such as cattle or crops improvement, tree planting, land administration or tourism management, or any other topic that you might find useful. So, now I will present 5 different situations to you, each one with three different options. For each situation, I want you to tell me which one you would choose. Before you start choosing, let's assume that we are talking about a contract for 10 hectares of land. Of course, 10 hectares is not necessarily what you have in reality, but please make your decision as if this were the case.

[Show the first situation]. As you can see here, in Contract number 1, the contract would last [read the length of the contract] and have a payment in training of [read days per year of practical training] and a cash payment of [read cash payment per year]. Net payment means the amount that would remain after covering all costs required, and in the case of reforestation, also after paying the costs of reforesting this area. This money maintains its value over time. Meanwhile, in Contract number 2, the contract would last [read the length of the contract] and have a payment in training of [read days per year of practical training] and a cash payment of [read cash payment per year]. Finally, you can always choose no contract at all. [Repeat this text for each situation].

Figure 2. Choice set as shown to the subject.

	Contract 1	Contract 2	No Contract
Duration of contract	15 years	5 years	I don't want a contract
Payment in training 	20 days per year	0 days per year	
Payment in cash 	150,000 colones net per year (in present value)	200,000 colones net per year (in present value)	
Your choice			

Figure 3. The relationship between level of payment and participation in a PES contract.



Note: This figure illustrates the relationship between level of payment and participation in a PES contract. The coefficients from the conditional logit model (Model 1) are used and the confidence intervals of 95% are shown.

Footnotes

[1] In the beginning of the 2000s, there were nearly 200 payment for ecosystem services (PES) programs in place (Landell-Mills and Porras 2002) and since then the number has increased even more (Pattanayak et al. 2010).
[2] See further examples in case study profiles available at http://www.watershadmarkets.org
[3] An exception is the Chinese SLCP, where some involuntary enrollment has been reported (Bennett 2008). Sommerville et al. (2009: 2) argue that, although participation in a PES scheme is voluntary, "service providers do not necessarily have the choice whether or not to provide the service, such as in cases where land-use change is illegal." However, such restrictions are seldom (if ever) perfectly enforced, and landowners may choose to deforest, even if such an action is illegal.
[4] In contrast to tree seedlings and grain, which are goods that can be sold on a market and turned into cash, capacity building cannot be sold. In the former case, the in-kind payment might as well be treated as cash (Currie and Gahvari 2008).
[5] Individuals have been shown to have preferences for immediate utility over delayed utility (for an overview, see Frederick et al. 2002, and see Cardenas and Carpenter 2008, for an overview of results from developing countries). Further, self-control issues, i.e., the individual's ability to control his/her behavior in order to obtain some reward later (for a theoretical model, see Thaler and Shefrin 1981), may result in cash payments being spent on less desirable commodities (e.g., alcohol and tobacco) with no long-term investment properties. To avoid this, it has been argued that people constrain themselves in some way to make sure that they don't have immediate access to their cash (e.g., put it in the bank). There are also studies showing that some institutions in developing countries — such as "rotating saving" — exist because they help people manage self-control problems through commitment devices (e.g., Gugerty 2007).
[6] However, there is considerable heterogeneity in their results, where the leakage is considerably more severe in the poorest quartile than in the wealthiest.
[7] Because most PES arrangements are voluntary, providing payments as in-kind would be an example of libertarian paternalism (Sunstein and Thaler 2003), where institutions (both private and public) steer participants (who have volunteered) in directions to promote their and others' welfare by ensuring investments to secure the provision of ecosystem services (see also Camerer et al. 2003).
[8] Thus far, most of the evaluations of the program have focused on the environmental outcome and found the PSA program to have a low impact in terms of increased forest conservation (Daniels et al. 2010, Pattanayak et al. 2010).
[9] The original scenario in Spanish is available upon request.
[10] Literacy (defined as those in the population 15 years or older who can read and write) is almost 95% in Costa Rica (CIA 2012 Aug.). However, to make sure that all respondents received the same information, the scenario was always read to the respondents by well-trained enumerators.
[11] The organizations included the program for livestock and ecosystem management (grupo Ganadería y Manejo del Medio Ambiente – GAMMA) and forest and forest management in Central America (FINFOR) at the Tropical Agricultural Research and Higher Education Center (Centro Agronomico Trópical de Investigación y Enseñanza (CATIE)) and also the National Institute of Learning (Instituto Naciónal de Aprendisaje (INA)).
[12] We conducted two focus groups with landowners and officials of the PSA program, as well as interviews with educational institutions, where the relevant attributes and attribute levels were defined. In the pilot studies, the respondents were asked follow-up questions regarding their understanding and the importance of the attributes in the choice experiment. We ran a total of five pilot studies; the attribute levels and descriptions of the attributes were improved according to the outcomes.
[13] In 2012, forest conservation contracts were extended to last for 10 years. The yearly payment remained at the 2011 level of US $64 per hectare.
[14] One such example is protection of endangered species, where the respondents' monetary value has been shown to be insensitive to the number of individuals of a species that are saved (for further discussions regarding insensitivity of magnitude, see, for example, Foster and Mourato 2003, and Goldberg and Roosen 2007).
[15] 500 colones = US $1 (November 2011).
[16] The cost was calculated in collaboration with the National Institute for Learning (INA) in Costa Rica, one of the main suppliers of training courses for agriculture and forestry in Costa Rica. The cost of a course depends on group size, the need for material, and travel costs for leaders and teachers.

[17] From the full factorial design, twelve alternatives were created in a fractional factorial design procedure using the SAS 9.3 software. When creating the fractional factorial outcome, the possibility of having the same attribute level for cash and in-kind payment was eliminated. Further, according to results of the pilot studies, two of the choice sets had or were expected to have an alternative that was never chosen. Therefore, these choice sets were excluded in the final questionnaire.

[18] For comparison, the estimates of the random parameter logit (RPL) model (McFadden and Train 2000) are reported in Table A2 in the Appendix. We used a PRL model where the panel properties are taken into account, i.e., the same respondent is making repeated choices. The results regarding the relationship between participation and the type of payment are similar to the result of the conditional standard logit model. Thus, we will concentrate our analysis on the conditional logit model.

[9] FONAFIFO receives most applications in February and March of each year. For forest conservation, the application process ends at the end of March, but the other categories are open until the end of December in the same year. In this study, the dataset included all applications up to April 2011.

[20] The region of Limón was used for the pilot studies. This region is similar to the other regions used for the main study.

[21] Telecommunication is extensive in Costa Rica with around 60% of the rural households connected to a fixed phone line (World Telecommunication and ICT Development Report 2010). In 2011, Costa Rica had over 4 million mobile cellular telephone subscribers (the total population in Costa Rica was calculated to around 4.6 million people the same year) (CIA August 2012).

[22] Unfortunately, detailed socioeconomic information regarding non-respondents is not available.

[23] The comprehensive study consisted of questions regarding socio-economic variables, land characteristics, and knowledge of PES, as well as specific questions regarding the PES contract if the respondent was participating. A natural field experiment was also connected to the study. Alpízar et al. (2013) and a report by Alpízar et al. (2012) are connected to the data collected.

[24] Two respondents did not answer all five choice sets and were therefore excluded.

[25] Fifteen respondents answered this question.

[26] To account for unobservable taste heterogeneity, the random parameter estimates of Model 1 are also estimated. The results are provided in Table A2 in the Appendix. The heterogeneity in preferences in duration seems to be the sole driver of the improvement in estimation in the random parameter model, according to a log-likelihood test. The results regarding the relationship between participation and the type of payment are basically the same compared with the conditional logit model, hence the advantage of using a random parameter model is rather limited.

[27] To get a sense of the magnitude of the effect on participation of a one level (marginal) increase in the cash payment or the payment in days of training, the mean marginal effects are estimated. For instance, an increase from 0 to 10 days of training increases the utility of participating by 0.25, while increasing the cash payment from 0 to 100,000 colones increases the same utility by 0.39.

[28] We also estimated two separate probit models to explore the individual characteristics that may explain the likelihood of being on-farm income dependent or in need of capacity building. The results, shown in Table A5 in the Appendix, show that younger individuals, women, those with higher education, and applicants to the current PSA program are less likely to be dependent on on-farm income, while those who have experienced capacity building seem more likely to be on-farm income dependent. The probability of stating a need for capacity building is significantly increased with experience of capacity building.

[29] We tested interaction terms between the levels of payments and the dummy variable for applicant to the current PSA program and they were insignificant, which suggests that landowners' preferences for the level of cash and in-kind payment did not differ between applicants and non-applicants.

[30] The following Stata command is used: *khb probit trade farm || applied, concomitant (age gender edu housemem size needcap) summary*.

[31] To test for inequality, a chi-square with 1 degree of freedom can be transformed in a normal standard distribution by obtaining the square root of the Wald statistics and calculating the p-value under normal standard distribution. The p-values from the Wald chi-square test of equal parameters for the cash payments are: $\beta_{100cash} + \delta_{\text{Depending on on-farm income}*100{,}000\text{ colones}} = \beta_{150cash} + \delta_{\text{Depending on on-farm income}*150{,}000\text{ colones}}$ rejected (p-value=0.001);

$\beta_{100cash} + \delta_{\text{Depending on on-farm income}*100{,}000 \text{ colones}} = \beta_{200cash} + \delta_{\text{Depending on on-farm income}*200{,}000 \text{ colones}}$ rejected (p-value=0.001);
$\beta_{150cash} + \delta_{\text{Depending on on-farm income}*150{,}000 \text{ colones}} = \beta_{200cash} + \delta_{\text{Depending on on-farm income}*200{,}000 \text{ colones}}$ rejected (p-value=0.054).

[32] The p-values from the Wald chi-square test of equal parameters for the cash payments are: $\beta_{100cash} = \beta_{150cash}$ not rejected (p-value=0.201); $\beta_{100cash} = \beta_{200cash}$ rejected (p-value=0.016); and $\beta_{150cash} = \beta_{200cash}$ not rejected (p-value=0.130).

[33] The p-values from the Wald chi-square test of equal parameters for the cash payments are: $\beta_{100cash} = \beta_{150cash}$ not rejected (p-value=0.201); $\beta_{100cash} = \beta_{200cash}$ rejected (p-value=0.016); and $\beta_{150cash} = \beta_{200cash}$ not rejected (p-value=0.130).