

CAN PAYMENTS FOR ENVIRONMENTAL SERVICES CONTRIBUTE TO POVERTY REDUCTION? A LIVELIHOODS ANALYSIS FROM ARENAL, COSTA RICA.

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Abstract

Costa Rica's Payment for Environment Services (PES) programme compensates land owners for environmental services provided by forested land. Socio-economic impacts of the programme are explored using data from an upper catchment survey and participant interviews in the Arenal area of the northern Tilaràn range. Participation in the programme is limited due to weak programme dissemination, disputed land claims and inelastic commitment to compensation payment levels. Design of the PES programme caters little for the priorities of landowners, who report multiple livelihood constraints (transport, prices, credit, market access), which participation in the PES programme does not mitigate. Econometric analysis of landowners willingness to commit to the programme promote targeting larger livestock farms with land titles and promoting more integrative incentives for upper catchment landowners, such as road improvements. Programme recommendations include clarification of resource claims and environmental service provision rights, and simplifying programme goals to defensible biophysical and/or socio-economic criteria.

Key words: Environmental services, poverty reduction, catchment management, Costa Rica

CONTENTS

1. Introduction	p.3
2. Markets for Environmental Services	p.4
3. Poverty and development in Costa Rica	p.8
4. Research location	p.9
4.1 Research context	p.9
4.2 Drivers of land use change	p.12
4.3 Research methodology	p.14
5. Livelihoods analysis	p.15
5.1 Livelihood asset descriptive analysis	p.15
5.2 Impact of PES	p.20
5.3 Land use change analysis	p.21
5.4 Income and expenditure analysis	p.23
5.5 Factor analysis	p.25
5.6 Participant perspectives	p.28
5.7 Conjoint analysis	p.30
6. Conclusion and recommendations	p.33
References	p.38
Appendices	
1. Livelihoods survey	p.46
2. Transcript of <i>Rio Chiquito</i> interviews	p.59

1. Introduction

Environment and human development challenges in tropical and sub-tropical developing regions have contributed to increasing interest in Markets for Environmental Services (MES) as an approach to integrate economic growth, ecological integrity and poverty reduction goals. 'Environmental services' may be considered to represent the flow of goods and services derived from nature for society. The application of market mechanisms to value and allocate these services is partly derived from existing market failures, which has contributed to a reduced flow of important services (water resources, carbon storage) and higher cost man-made substitutes (Rojas and Aylward, 2003). The attraction of MES to policy makers is that environmental degradation (deforestation, soil erosion) and rural poverty (in upper watershed zones) may be mitigated in an integrated approach by appropriate use of market solutions that link downstream users' demand for these services (improved water flows, lower sediment loads) with upstream suppliers improved land use practices, moderated by market mechanisms (e.g. incentive or compensation payments).

Costa Rica has been at the forefront of the development and implementation of MES. In 1996, a Payment for Environmental Services (PES) programme was introduced by the Costa Rican government to address improved management, conservation and development of forest resources. The PES programme addressed sustainable forest management (SFM) issues through institutional reform, capacity-building and stakeholder participation (Miranda et al., 2003). Whilst the programme has served as a potential model for other developing countries, concerns have been raised as to the socio-economic impacts for rural livelihood resource user groups (Camacho et al., 2001). A global review of MES has raised a number of constraints to the development and future of a markets approach for rural poverty reduction in developing countries (Landell-Mills and Porras, 2002), which this study attempts to explore in relation to three inter-related questions:

- Who are the rural poor, and will PES release their primary development constraints?
- What have been the drivers of land use change in tropical forested areas and will MES reduce forest land conversion with pro-poor impacts?
- Should government and donors allocate funds to MES with the aim of rural poverty reduction?

This paper complements three earlier studies conducted by the International Institute for Environment and Development (IIED) (Rojas and Aylward, 2003; Landell-Mills and Porras,

2002) and specifically attempts to build on a socio-economic review of PES conducted in the Varilla watershed in Costa Rica (Miranda et al., 2003). In section 2, a brief summary of MES is provided with specific attention to the Costa Rican context. Section 3 explores poverty and development issues and indicators in Costa Rica and the wider Central American region. The research methodology is largely informed by a livelihoods approach, which is described in Section 4 with details of the study location. Section 5 presents results of the analysis. Section 6 concludes by attempting to answer the three questions above and suggest a number of recommendations based on the evidence of the research.

2. Markets for Environmental Services

From the late 1990s, MES have evolved and taken shape partly in response to international environmental policy focus on climate change (Clean Development Mechanism) and biodiversity (Convention on Biological Diversity), and the international drive to reduce poverty crystallized in the Millennium Development Goals. In particular, the relationship between forests, and changing trends in forestry around the world, and environmental services has been central to much of the thinking, funding and promotion of MES (PROFOR, 2004; Landell-Mills and Porras, 2002). Four ‘environmental services’ are commonly attributed to SFM: carbon sequestration, biodiversity conservation, watershed services (particularly, water resources) and landscape beauty (ibid). Payments and markets for environmental services have attempted to ‘close the circle’ on the ‘non-market’ goods and services provided by SFM through market-based approaches that attempt to internalize the externalities of watershed services to promote more SFM. However, the theoretical (economic) basis for MES has faced challenges in quantifying and monitoring watershed services (particularly, water resources¹) (Calder, 2004; Aylward and Echevarria, 2001; Calder, 1998; Aylward et al., 1998), establishing a viable market between buyers and sellers of environmental services, addressing uncertain or disputed property rights, defining the role of government, minimizing transaction costs in effective implementation, and evaluating the impacts of MES on rural poverty reduction (PROFOR, 2004; Rojas and Aylward, 2003; Landell-Mills and Porras, 2002). The wider role of MES in integrating SFM and pro-poor development is both constrained by and attempts to overcome the “lack of few ‘win-win’ synergies between natural forests and national poverty reduction” in tropical and sub-tropical developing countries (Wunder, 2001). This view is supported by a global review of MES, which is sanguine to the prospects of MES having wider applicability for poverty reduction in developing countries; it

¹ A ‘sister’ project (DFID FRP R7991) is modelling the hydrological impacts of pasture and tropical montane cloud forest land uses in the same study area.

notes that a lack of critical analysis promoting emerging markets for poor communities may lead to further marginalization of weaker social groups as markets may present more powerful elite groups with incentives to evict and appropriate forested lands held under insecure land tenure by poor, remote communities or individuals (Landell-Mills and Porras, 2002: 212).

Costa Rica has been at the forefront of the development and implementation of MES policies and instruments (Chomitz et al., 1999). Within the wider rubric of MES, Costa Rica has developed a specific economic instrument related to the value of conserving, protecting or managing forested land. '*Pagos por Servicios Ambientales*' or 'Payments for Environmental Services' (PES) rewards land owners for carbon, biodiversity, watershed management and landscape beauty services, which are legislated and defined in the Costa Rican Forestry Law (No. 7575) of 1996 (Miranda et al, 2003). PES policy reflects the economic rationale that underpins the MES approach and recognizes that different land uses (forest, agriculture, pasture) have different economic returns, which must inform a sustainable payment (incentive) mechanism (The Economist, 2004). A critical inquiry into the specific experiences from Costa Rica in the development of MES suggests that PES policy replaced subsidies to the commercial forestry sector, which were threatened by a World Bank structural adjustment programme (Rojas and Aylward, 2002; Camacho et al, 2000). While these, and related, concerns question the role of MES as policy instrument in wider global contexts, the specific scope of this inquiry is to attempt to provide more detailed evidence of the opportunities and constraints for PES as a rural poverty reduction mechanism from a case study analysis from one of the most hydro-economically important watersheds in Central America, the Arenal watershed (Aylward et al, 1998; see below). Whilst it would be disingenuous to claim that PES programme is principally a rural poverty reduction intervention, the Forestry Law identifies support and outreach for small and medium farmers and landowners with income and employment generation in rural areas as goals of the PES programme.

In the five years to 2001, an estimated 284,428 hectares of conservation forestry, reforestation or forest management land has been incorporated into the PES programme (Table 1). The majority of land (84%) is classified under the forest conservation modality with 4,461 *aggregate* beneficiaries. More than 80 percent of PES contracts were awarded to land parcels less than 80 hectares in size (Estado de Nacion, 2001). As such, Rojas and Aylward (2003: 94) identify limitations in the approach of the PES programme relating to:

“conservation rather than service-specific nature and the single, centralized approach to the establishment of service levels. Given the variations in soil and forest type, local land uses, downstream infrastructure, and socio-economic conditions, it would clearly be more efficient not to package all four services into a single payment which obscures the variation in individual service levels across the country and the potential variations and trade-offs between different services.”

Table 1 Land classification and beneficiaries in the Costa Rican PES programme, 1997-2001

Year	Forest conservation (ha)	Forest management (ha)	Reforestation/ plantations (ha)	Total (ha)	Beneficiaries
1997	88,829	9,324	4,629	102,784	1,531
1998	47,803	7,620	4,492	59,916	1,021
1999	55,776	5,124	3,880	64,781	925
2000	26,583	na	2,456	29,040	501
2001	20,629	3,997	3,281	27,907	483
Total	239,620	26,065	18,738	284,428	4,461

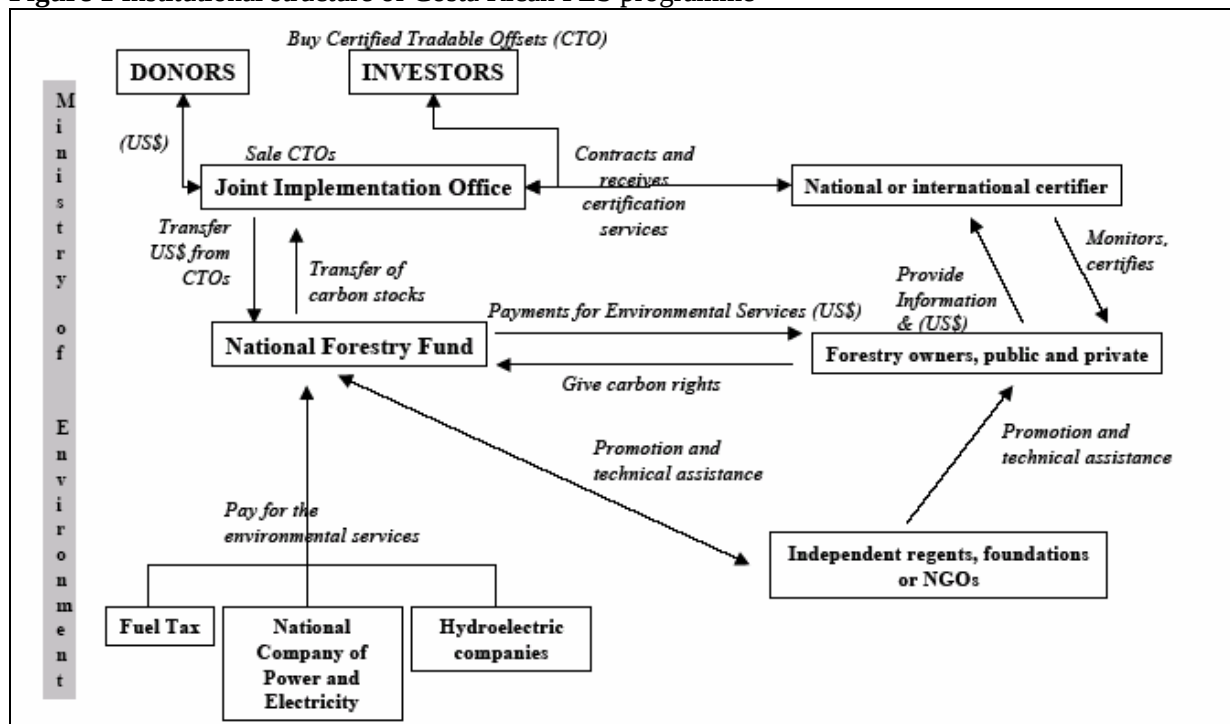
Source: MINAE (2002), quoted in Zbinden and Lee (2005: 258)

The institutional structure of the PES programme is headed by the Ministry of Environment (MINAE) through the National Forestry Finance Fund (FONAFIFO), which is responsible for disbursing payments to private forestry owners and protected (conservation) areas (Miranda et al., 2003) (Figure 1). Payments are disbursed over a five year term and vary according to activity undertaken: reforestation (US\$450 per ha), sustainable forest management (US\$320 per ha) and forest conservation (US\$200 per ha) (ibid). As such, payments may vary at an average annual of between US\$40–90 per ha per year, subject to contracted activities and administrative protocols. These figures may be compared with the 1997 rental price for pasture in Central Cordillera region of US\$20-30 per ha (Castro and Tattenbach, 1997) or an estimated economic livestock production net present value of US\$482 per ha in the Arenal area (Aylward et al., 1998).

Land owners joining the programme cede their environmental services’ rights to FONAFIFO during this period. The PES programme states that parcels of one hectare to a maximum of 300 hectares will qualify for payments (Solis, 2001), however a land size qualification threshold of 10 hectares is adopted by FONAFIFO to be consistent with the minimum legal area of a ‘forest’ as defined by the Forestry Law. Contracts have to be renewed in person each year and are only awarded (since 2003) with an approved land title deed and cadastral map of the property. The

nature of the forested land (primary or secondary tropical montane cloud forest or other forested cover) does not affect the qualification process though demand for the payments is widely reported to be significantly (by a factor of five or more) in excess of available PES funds (Y. Rodriguez, personal communication, 2003). PES funds are sourced nationally and internationally through a consumer fuel tax (3.5% from every fuel sale), the Global Environment Facility (GEF), Inter-American Development Bank and private or public companies, including electricity generation and water utility companies (Rojas and Aylward, 2003: 38). When the contracts expire, landowners are free to renegotiate their rights, or sell their rights to other parties. The prohibition on activities (consumptive or productive) in forested areas in the PES contractual arrangement is underwritten within the Forestry Law, which *de jure* expropriates land use rights on private land by forbidding land use change on any forested land (Rojas and Aylward, 2003: 94). Whilst this legislation is constrained by effective monitoring and enforcement in remote and inaccessible rural locations, PES may be thought of as a compensatory payment mechanism rather than an incentive mechanism for land use change. Independent reviews of the PES programme have identified the importance of improving cost efficiency in terms of price setting and prioritization by using a spatial approach to supply price and environmental services (Chomitz et al., 1999) and an emphasis on participation and social impacts (Camacho et al., 2000; Camacho et al., 2001).

Figure 1 Institutional structure of Costa Rican PES programme



Source: Landell-Mills and Porras (2002)

3. Poverty and development in Costa Rica

Costa Rica is ranked 45th in the UN Human Development Index (UN, 2004). This ranking and associated development indicators compare favourably with other Central American countries (Table 2). The data reveal that the average Costa Rican can expect to live longer, have a higher level of literacy, enjoy greater access to improved water sources and earn more money than any of their isthmus neighbours. Whilst these figures represent the country average, they highlight Costa Rica's higher level of aggregate welfare across a range of entitlement (water, education) and relative (income) development measures in the regional context.

Table 2 Human Development Index rank and indicators for Central American countries

	HDI rank	GDP per capita*	Population below US\$2 per capita income line (%)	Without access to sustainable improved water source (%)	Life expectancy at birth (years)	Adult literacy rate (% age 15 & above)
Costa Rica	45	8, 840	10	5	78.0	95.8
El Salvador	103	4, 890	58	23	70.6	79.7
Guatemala	121	4, 080	37	8	65.7	69.9
Honduras	115	2, 600	44	12	68.8	80.0
Nicaragua	118	2, 470	80	23	69.4	76.7
Panama	61	6, 170	18	10	74.6	92.3

* Gross Domestic Product per person calculated by Purchasing Power Parity, US\$ in 2002

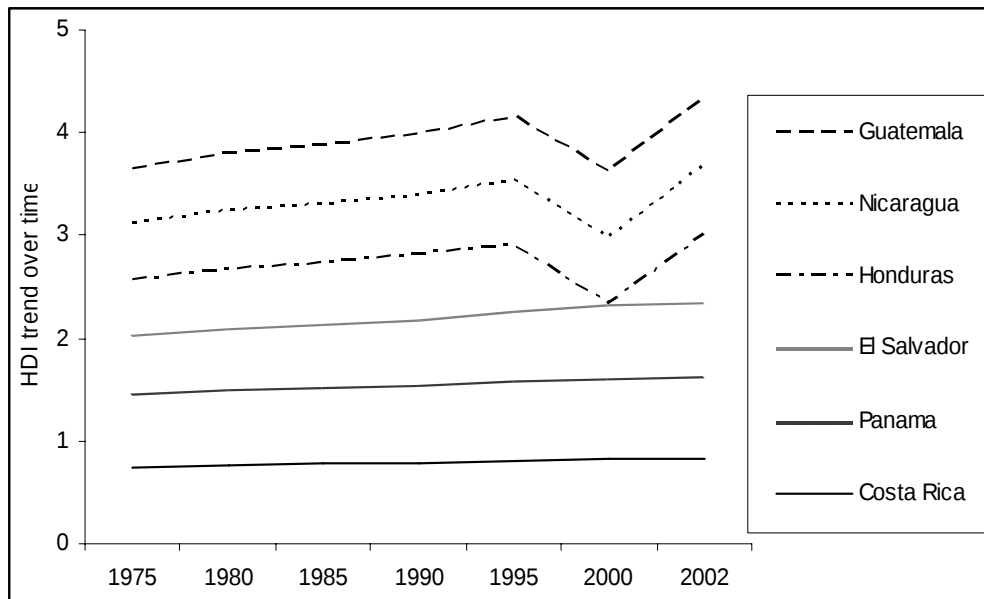
UN (2004) provide data on the trend of the aggregate HDI scores for Central American countries from 1970 to 2002² (Figure 2). The graph illustrates a steady improvement in development in Costa Rica, El Salvador and Panama over the last twenty five years. An improving development trend is also recorded for the other three countries though the impacts of Hurricane Mitch resulted in extreme hardship that is marked by a trough in 2000; the latest figures suggest the most widely affected countries have recovered well to this environmental disaster.

Poverty in Central America continues to be a predominantly rural phenomenon in contrast to the growth of urban poverty in South America (ECLAC, 2004). Costa Rica is estimated to have around 30% of rural households living below the poverty line in 1999 compared to over 65% of rural households in Guatemala, Honduras and Nicaragua living below the poverty line (ibid).

² The HDI score of Costa Rica in 1970 (0.745) has only been reached by one other country (Panama in 1985) and the other four countries still record HDI scores below this figure in 2002.

Rodriguez and Smith's (1994) logistic regression analysis of Costa Rican national census data suggest that access to land in rural areas is a less important variable to poverty reduction than the ability to switch from staple to cash crops. Whilst this finding may be expected, given an income definition of poverty, the results reveal rural-urban linkages that moderate rural development opportunities. ECLAC (2004) develops this point by identifying three stages in an idealized process of rural development as better-paid employment opportunities in the service sector (tourism), construction and government emerge to replace high-risk, poorly-paid agricultural labour or production. However, a significant constraint that limits rural development in Latin American is the lack of an efficient, reliable and workable land registry system to allow rural households to participate in market-based activities in earlier stages of agriculturally-based growth (Tejada and Peralta, 1999). It is noteworthy that Costa Rica records one of the most unequal land distribution profiles (Gini coefficient = 0.80) in Latin America (ECLAC, 2004). How land access, agriculture and development opportunities influence and contribute to rural development is central to this evaluation of the potential of MES as a rural poverty reduction mechanism.

Figure 2 Human Development Index trend in Central America (1975-2002)



Note: This figure is the HDI trend over time not the actual HDI values for each country

4. Study location

4.1 Research context

The socio-economic research selected upper catchment communities on the Pacific slope of the northern Tilaràn range (Figure 3). The Caribbean slope, where there is little to no human

settlement, receives the majority of precipitation from the north east trade winds that fall on the Caribbean slopes of the Tilaràn range (J. Calvo, personal communication, 2002) (Figure 4). The ‘rain shadow’ on the Pacific slope results in important though smaller stands of primary and secondary tropical montane cloud forest stands, whose distribution is influenced rainfall, temperature, altitude, fog deposition, wind speed and direction and distance to the ocean (see Bruijnzeel, 2001 for a discussion). The Pacific slope was selected as the location for the socio-economic research as it has been subject to significant land use change over the last fifty years. Understanding the drivers and sequence of land use change in upper catchment areas of tropical watersheds is one of the main research goals. As such, no one watershed was selected for the analysis but a configuration of upper catchment communities that had converted forested land for pasture or agriculture (see below).

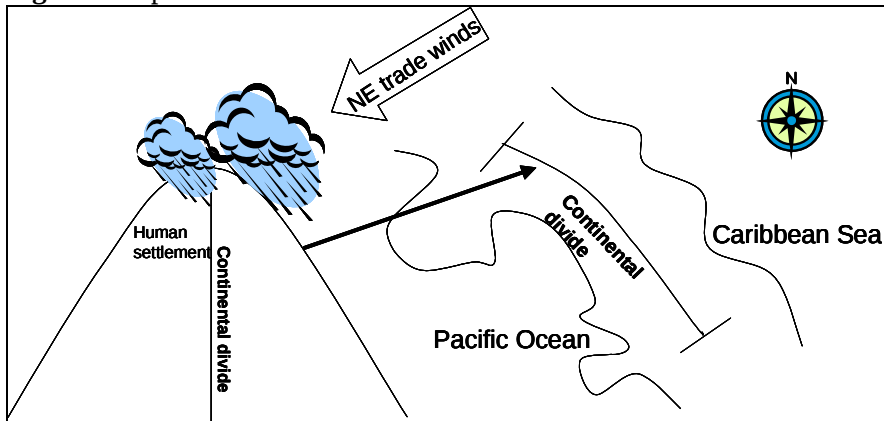
Figure 3 Project location in Costa Rica



The study location, including the Arenal watershed and its extension into the Tempisque watershed, is perhaps the most strategic watershed in Costa Rica (Figure 5). The upper part of the catchment is characterised by a large area of cloud forest, extremely rich in biodiversity, which competes with other land uses, particularly livestock (dairy and meat), and agriculture (coffee). Water is stored in the Arenal reservoir, an inter-annual artificial lake created to feed into a system of three hydroelectric plants arranged in cascade (known as the ARCOSA system), which provides

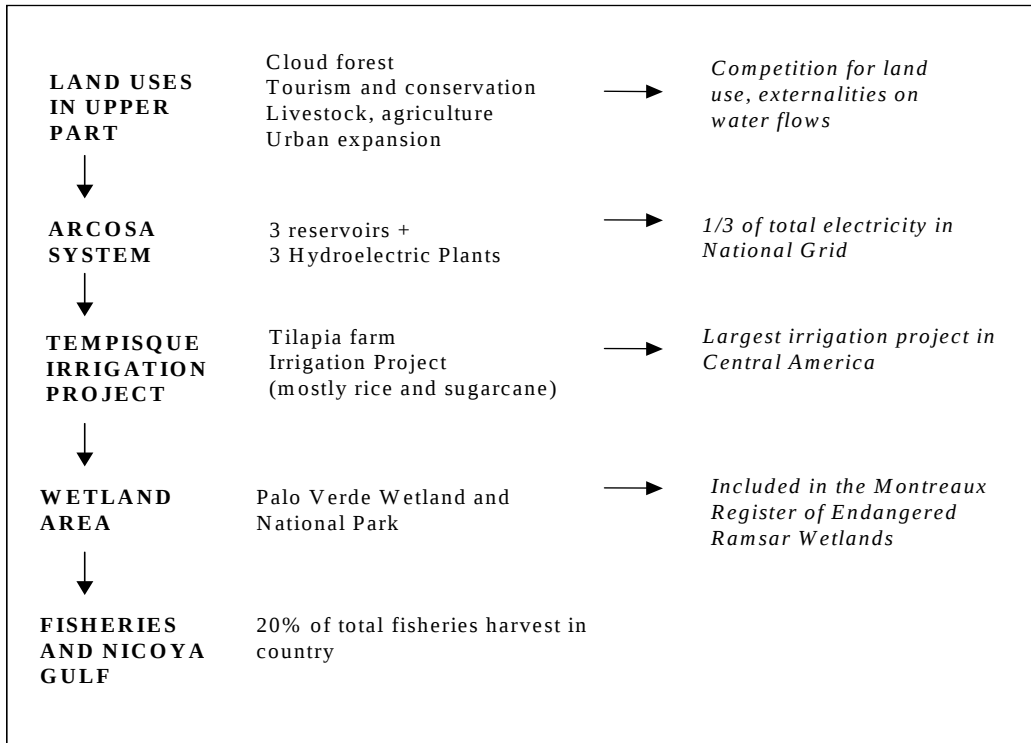
over a third of the electricity produced in the country. From the hydroelectric power system, water flows through a private fish farm (tilapia) and an area of intensively irrigated farms, mostly dedicated to rice and sugarcane plantations, before draining into the *Palo Verde* National Park, an important wetland that hosts a large population of migratory birds. The wetland serves as a filter for water that drains into the Gulf of Nicoya, one of the most productive estuary ecosystems in the world, which accounts for approximately 20 percent of the total fisheries harvest in Costa Rica (Hazell et al., 2001, Aylward et al 1998).

Figure 4 Representation of the influence of the continental divide on rainfall in Costa Rica



The upper watershed reaches 1,800 metres above sea level, receives rainfall varying between 2,000 and 6,000 mm per year and is characterized by 90% of the upper watershed having a slope greater than 25% (Aylward et al., 1998). The majority of soils in the area are deep, sandy soils of volcanic origin possessing good natural drainage and of low fertility (CCT, 1980). Average annual maximum temperatures are 28°C with mean minimum temperatures of 19°C. Average annual humidity is estimated at around 80 percent. Wind is an important climatic and agricultural factor at the northern end of the range where there is a natural saddle between the Caribbean and Pacific zones (Aylward et al., 1998: 9-10). CCT (1980) suggest that land is primarily suited to conservation forestry (58%) or protection forestry (38%). However, the historical development of local land use patterns runs contrary to biophysical analysis.

Figure 5 Inter-linkages and value of watershed environmental services in the study location



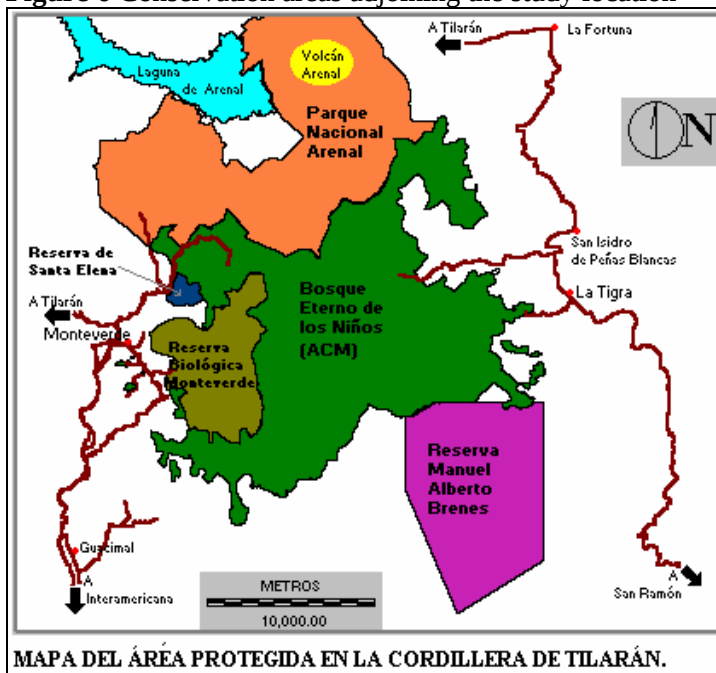
4.2 Drivers of land use change

According to Kauck and Tosi (1989, cited by Aylward et al., 1998), there have been four stages in the land use change in the study area that have resulted in socio-economic factors contributing to higher proportions of pasture and agricultural land use:

- From the 1880s to the 1950s, demographic pressure in the Central Valley, where most of the population and productive activities are located, led to the colonization of lands in more distant provinces, such as the study area, for displaced agricultural and livestock activities.
- Between the 1930s and 1970s cattle ranching recorded a major commercial expansion due to cheap production costs and laws promoting land expansion with the incentive of land ownership from making “land improvements” (often forest conversion). By the 1970s, Costa Rica was the fourth largest exporter of beef to the United States (Aylward et al, 1998).

- The construction of the Arenal Hydroelectric Project by the Costa Rican National Electricity Company (ICE), which diverts water from the Caribbean to the Pacific side of the continental divide. The power complex (known as ARCOSA) includes three hydrological plants that provide 33 percent of Costa Rica total capacity and 50 percent of its dry season capacity. Water is then passed on to the largest irrigation project in Costa Rica (Arenal-Tempisque Irrigation Project, 6,000 hectares). An impact of the dam development was the displacement of local towns and ranching activities to higher and steeper slopes of the upper areas of the watershed.
- The creation of the Arenal Forest Reserve in the 1980s (later renamed the Arenal-Monteverde Protected Zone). In late 1980s and early 1990s the Monteverde Conservation League, a local NGO for conservation, begun purchasing land in these areas, and since that period tourism has boosted in the upper part of the watershed. The creation of the Arenal National Park in 1994 provided additional protection to other areas in those micro-watersheds. Additional conservation areas in the upper watershed areas now cover approximately 70,000 ha (Figure 6).

Figure 6 Conservation areas adjoining the study location



Kauck and Tosi (1989) suggest the construction of the Arenal dam and declaration of protected conservation areas increased land colonization and land registration to capitalize on future government land purchases in the upper catchment zone. Significant land purchase has occurred in the 1980s and 1990s from foreign and local conservation groups, which has marked the increasing popularity of Costa Rica as an eco-tourism destination. In 1993, tourism became Costa Rica's single largest source of foreign exchange, and 65 percent of tourists from the USA, Canada and Europe visited national parks during their visits (Rojas and Aylward, 2003: 57).

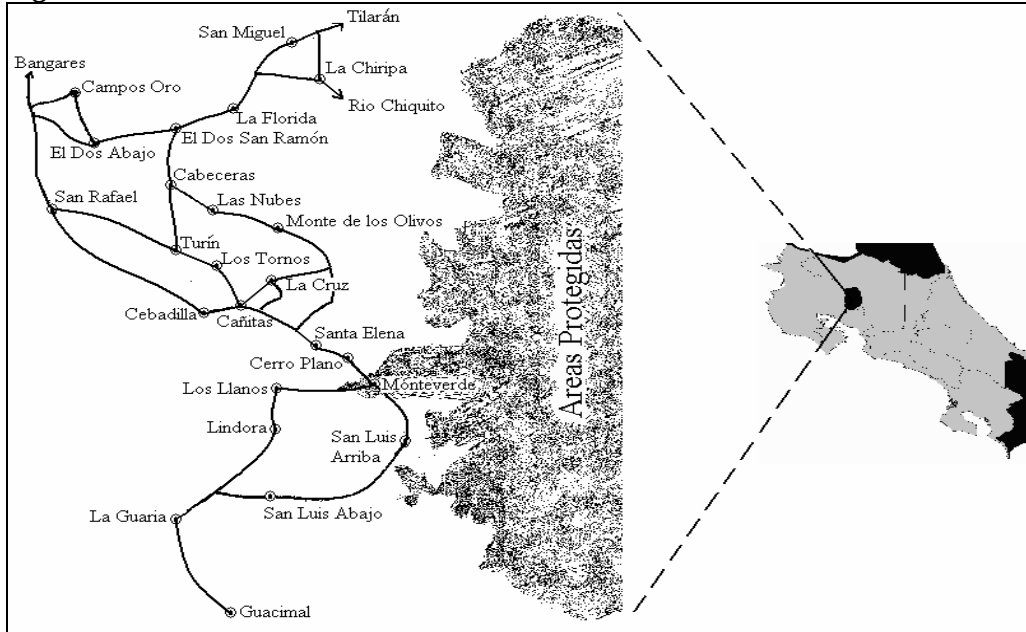
Whilst the level of forest conversion has largely abated in Costa Rica (from 16,400 ha per year in 1986/87 to 3,300 ha per year in 1997/2000 – Sanchez-Azofeifa and Calvo, 2002) the role of diminished streamflows following forest degradation and forest removal is as acute as elsewhere in Central America (Kaimowitz, 2002). Whilst rigorous hydrological and economic data to inform appropriate revegetation and reforestation activities are often weak (Aylward et al., 1998), markets and payments for environmental services are already being promoted in Central America. Equally as important, understanding the processes of land use change in the humid tropics are often descriptive and biophysically-orientated, which ignores the motivations and beliefs of the principal actors in land use change: the people.

4.3 Research methodology

The survey instrument was designed to generate a representative sample of the three main livelihood activities in the study area, which could have external validity for similar montane forest and livelihood activities in other upper watershed zones in Central America. A project public forum (August 2002) and key informants contributed to the generation of a list of coffee (N=75), livestock (N=149) and tourism (N=99) concerns in the study area. Local enumerators were recruited with experience in social research methods and a purposive sampling strategy was developed that utilized their personal contacts in communities or sectors in a sequential sampling approach. This reflected the difficulties of reaching farmers in isolated locations (often unavailable in daylight hours) or tourism managers living permanently away from their business. Further, extensive research in the study area has resulted in 'respondent fatigue', which is compounded by distrust of external 'extractive' research, particularly related to financial issues (see below). Eight of the sixteen communities that are located in the upper catchment zone were included in a purposive sample (Figure 7). 36% of the total sample (n=116) were successfully interviewed: coffee (n=38); livestock (n=46) and tourism (n=32). Data were weighted by a simple

inverse probability of selection ($W_i = N_i/n_i$) in the statistical analysis: coffee (weight = 1.97); livestock (weight = 3.24) and tourism (weight = 3.09).

Figure 7 Arenal communities, Guanacaste Province, Costa Rica



The survey instrument was developed from findings of a complementary qualitative study (Porrás and Miranda, in press), national statistical data (INEC, 2003) and wider Central American social research (ECLAC, 2004). The survey instrument included a specifically designed Conjoint Analysis that investigated different PES scenarios and alternative policy interventions (electricity price changes, road improvement, welfare grants) to evaluate the stated response preferences of the sample (Porrás and Hope, in press). The purpose of the Conjoint Analysis is to permit improved understanding of the impacts of the PES policy on land allocation decisions amongst the three identified livelihood classes and its impact on reducing poverty amongst the different livelihood groups in the study area.

Qualitative data of participant experiences of the programme were captured in two smaller catchments draining into Lake Arenal. An in-depth life-history interview was conducted in July 2003 with a livestock farmer in the sparsely populated *Caño Negro* catchment and six purposive, structured questionnaires were conducted in February 2005 in the *Rio Chiquito* catchment where there has been significant forest conversion to pasture (Aylward et al., 1998; see below). Qualitative data add texture to survey analysis, which is the primary research tool.

5. Results

5.1 Livelihood assets descriptive analysis

Human capital assets are estimated by household composition and adult education achievement (Table 3). There is little difference between the compositional structure of the three livelihood groups with overall household size, which closely estimates to the national rural estimate of four people (INEC, 2003). An implication from this finding is that more intensive labour activities associated with coffee production or livestock farming are either externally-sourced at harvest time or have been mechanized. Flores et al. (2002) report that coffee production provides 28% of rural employment in Costa Rica with relatively high wage rates (US\$7.6 per day) attracting seasonal migration (November to February) from Nicaragua. The recent plummet in global prices to a 30 year low (Oxfam, 2002) is thought likely to have significant repercussions on both the estimated 200,000 producers in Costa Rica and the 1.6 million deriving income benefits in the wider Central American region (Varangis et al., 2003).

Table 3 Human and social capital assets

	Coffee	Livestock	Tourism
Children less than 5 years	0.38 (0.67)	0.32 (0.55)	0.41 (0.66)
Children between 5 and 15 years	0.97 (1.00)	0.71 (0.90)	0.81 (0.88)
Total adults	2.49 (0.89)	2.79 (1.23)	2.50 (1.20)
Mean adult education (years)	6.63 (3.10)	6.72 (2.87)	7.57 (2.83)
Member of agricultural association (%)	97	55	6
Member of tourism association (%)	16	2	19
Member of community association (%)	54	14	31
Member of development association (%)	54	26	19

Note: Mean values, standard deviations in brackets (all tables).

Alternatively, milk production amongst livestock farmers has become increasingly mechanized in the study area. Griffith et al. (2000) chart growing investment costs and reduced profits in dairy production since the 1950s, which has encouraged diversification both into coffee farming and tourism. A recent and substantial investment cost that dairy farmers have borne is the investment in chilled storage to deliver milk to the dominant cheese factory (Productores de Monteverde), which is reflected in the financial data below (M. Mendez, personal communication, 2003).

Proxy measures of social capital are captured by reported membership to one of a range of local associations. The data suggest that coffee farmers are most strongly involved in local community organizations that span their specific agricultural activities through to more collective bodies that

respond to broader social and welfare issues that affect the community. An example of the collective collaboration of coffee farmers is the Santa Elena coffee co-operative (COOPESANTA ELENA RL), which represents 78 coffee producers farming 110 ha in the upper watershed zone. A key feature of the co-operative is the high level of organizational development, which has contributed to a long-term business partnership with a US coffee importer (*Coffee Traders*), which exclusively buys the majority of the 3,000 *fanegas* (or *quintales*, equivalent to 100 lb) harvested annually. The high quality *arabica* species that is grown under ecologically-friendly conditions (known as *café de sombra*) receives a premium price of US\$62.5 per fanega (equivalent to gross US\$1,700 per ha, July 2003). This price is 40% higher than the higher production but lower quality coffee (*robusta*) produced by the *El Dos* coffee cooperative on the lower slopes.

Victor Torres is a farmer, who responded to the challenges of increasing dairy costs and the opportunities of coffee farming in the mid 1990s. With the financial support of the agricultural cooperative and the physical support of his four sons, Victor converted 3.5 ha of his 35 ha farm into coffee terraces. This land intensification process faces new challenges with his sons having their own families, to which Victor has promoted 'agro-tourism' on his farm. He considers coffee a more profitable land use than milk production due to lower investment costs. Adjusting a gross cash flow estimate for dairy farming by a 10% inflation factor, Aylward et al.'s (1998) estimate (US\$ 1,081 ha per year) would equate well with the gross coffee returns of US\$1,700 per ha in 2003. Whilst coffee has less financial investments than livestock, it faces other challenges: initial land conversion investment, price volatility, pest damage and labour costs. Victor reports that agro-tourism has the potential to off-set the local dilemma of coffee harvesting clashing with the peak tourist period, when well-paid jobs are more abundant in the tourist hub of Santa Elena (see Figure 7).

Livestock farmers record less active involvement in community associations than coffee farmers though more than tourism enterprises. Whilst Victor Torres reflects the increased interest by livestock farmers to capitalize on the tourism growth in the area, this appears to be an individual rather than collective response given the low level of membership to tourism associations (2%). Finally, the tourism sector records more involvement in general community affairs (31% membership) compared to active membership of their sectoral association (19%). This may be understood to partly reflect the highly diversified profile of tourism concerns that, unlike coffee and livestock farmers, represent a cross-section of local, national and international owners, who are generally recent arrivals (see below) to the area and who compete actively for the same

market. The shared interests and challenges of the fairly homogeneous, well-established and local population of the agricultural sector contributes to their stronger involvement in community organizations that span common interests in welfare, education, health, roads, administration, planning, governance, credit and business development.

Physical capital assets are presented across a range of basic services (water, energy, communications) and consumer goods (Table 4). Access to improved water services is high for all three livelihood groups, which reflects the national profile (UN, 2004). Sanitation provision is largely by septic tanks, which reflects the rural and scattered nature of the settlements. Electricity connections are high, as given by the proxy of use of a fridge for food storage. Communications is a major issue in the study area (see below) and here the uneven distribution of access to a telephone landline (mobile coverage is limited due to the topography) illustrates access for 2 in 5 coffee farmers. This figure is partly explained by no connections to San Luis community. Livestock farmers fair better (68%) with the tourism sector enjoying the highest level of access (81%), though this still is below the universal coverage anticipated for a business dependent on client contact. A corollary of telephone access is the distribution of access to internet services and computers. Coffee and livestock have a minimal level of internet access, 3% and 6% respectively, compared to 25% of tourism concerns. The higher level of adult education in the tourism sector, plus an increased client demand for such services, is likely to contribute to these sectoral differences. Additionally, the need for private transport is highlighted by the majority of respondents owning a vehicle.

Table 4 Physical assets (percent)

	Coffee	Livestock	Tourism
Drinking water supplied to the home	100	100	94
Use river water for non-drinking purposes	60	47	0
Septic tank*	97	68	97
Use fuelwood to cook	19	6	0
Fixed telephone landline	43	68	81
Electric fridge	87	96	91
Computer	8	19	28
Internet access	3	6	25
Private vehicle	62	83	72

* Remainder have access to a sewage system.

Consumptive use of the natural resource base (river water and wood) is also reported amongst coffee and livestock farmers. River water use for non-drinking purposes is high amongst coffee farmers (60%) and livestock farmers (47%). One in five coffee farmers also report using locally collected fuelwood for cooking purposes. The dependency and use of water and forest resources for productive purposes by the agricultural sector is in contrast to the consumptive demand for such services from the tourism sector. However, the impacts of unregulated growth in tourism concerns in the Santa Elena area, plus point source pollution from the cheese factory, has contributed to increased pollution in river flows and a perceived reduction in the quality of water quality (reported in stakeholder forum, 2002).

Natural resource capital is captured by data on land resource status and land use by livelihood groups (Table 5). Livestock farmers record the highest mean land holdings (31 ha), followed by coffee (7 ha) and tourism (0.5 ha). Median holdings illustrated a similar but lower level of holdings by group: 21 ha, 5 ha and 0 ha, respectively. Whilst livestock is the most extensive land use across the groups, land holdings reported are lower than the mean (52 ha) and median (28 ha) figures reported by Aylward et al. (1998: 15) in the Rio Chiquito micro-watershed study (n = 120). This is believed to be partly explained by the lower elevation and corresponding more even topography of the earlier study location into livestock production. Land title ownership is concentrated in the livestock group (72%) with coffee and tourism reporting less than one third of properties possessing a land title.

Table 5 Land resource status and use by livelihood groups

	Coffee	Livestock	Tourism
Mean land area (ha)	7.47 (9.04)	31.24 (32.30)	0.49 (1.19)
Median land area (ha)	5.00	21.00	0.04
Land title (%)	32	72	31
Land use profiles			
Annual crops (%)	86	27	6
Annual crops (years)	17.41 (18.04)	6.61 (14.24)	1.06 (4.13)
Perennial crops (%)	100	21	3
Perennial crops (years)	17.57 (16.09)	4.53 (11.92)	0.50 (2.79)
Pasture (%)	65	100	12
Pasture (years)	15.14 (18.05)	24.59 (13.42)	.91 (3.54)
Tourism (%)	19	0	100
Tourism (years)	1.16 (2.57)	0	3.41 (7.75)

Forested land (%)	84	91	16
Forestry (years)	17.78 (18.06)	21.89 (15.35)	2.91 (6.94)

Current land use was captured for each livelihood group, which is compared to original land use allocation at the time of settlement. Annual cropping (mainly food crops) is a long-term activity (17 years) in the majority of coffee holdings (86%). One in four livestock holdings report annual crops for a shorter period (7 years). The tourism sector records low adoption of any of the productive activities listed, which is attributed to the limited land holdings of this sector. Perennial crops (here, mainly coffee) is clearly associated with coffee farmers, who record universal adoption of the activity over a mean period of 18 years. Livestock farmers have diversified into this productive land use in the last five years in one in five holdings. This is consistent with the earlier evidence of increasing dairy production costs and the attractive returns that can be generated from coffee. Pasture activities are reported by 65% of coffee farmers, who have been involved in the activity for a mean period of 15 years. The high level of variability in reported years reflects the multiple land uses common across the coffee and livestock sectors. Pasture is a universal land use for livestock farmers, who record a mean period of 25 years dedicated to this activity. One in three livestock farmers have been dedicated to this activity for at least 30 years with one respondent recording 58 years in livestock activities, i.e. original settlement in 1945.

Tourism is, on average, a recent phenomenon in the study area. The increased presence of tourism concerns is illustrated by the average period of just over 3 years activity that the tourism group record. Coffee farmers are diversifying into this area slowly with one in five sample properties reporting an average of just over one season's involvement in this expanding sector. Livestock farmers appear to be lagging behind though farmers like Victor Torres, and others, report interest and a desire to diversify their land holdings into this sector.

5.2 Impact of PES on livelihood groups

The impact of the PES on livelihoods is evaluated across a range of qualitative responses to respondents' knowledge and perceptions of the policy (Table 6). Less than half of each of the three livelihood groups were aware of the PES policy. Coffee farmers reported the highest level of awareness (46%), followed by livestock farmers (34%) and then tourism (22%). Only one percent of livestock farmers had applied for the payment and this farmer (n=1) had been unsuccessful in receiving the payment. Open-ended questions in the survey instrument generated

a range of responses to why respondents had not applied for the PES. Four categories emerged from the responses: information, low returns (US\$ per ha), land title and commitment. ‘Lack of information’ was the dominant reason (61%) why livestock farmers had not applied for the payments. One in three coffee farmers cited this reason, whilst a similar proportion (32%) identified the low returns of the payment level. The opportunity cost of payments compared to other productive land uses is identified as a constraint to wider adoption of PES policy in the Varilla watershed in Costa Rica (Miranda et al., 2003). Livestock farmers also identified ‘low returns’ but given that the majority of the sample knew little to nothing of the PES policy this proportionately lower percentage of responses to a second-order constraint is consistent with their lack of information. Coffee farmers’ increased knowledge of the qualification criteria for PES stated that lack of a title deed to the property was a another limitation (28% of responses) to uptake of the policy. 7 percent of livestock farmers recorded title deed ownership as a constraint, also. Finally, there was a lower proportion of respondents who described a reluctance to enter into land contracts with the government. Though this represents a minority of responses here (9% of coffee and 13% of livestock), this theme surfaced regularly in discussions with farmers based on widespread ‘distrust’ of government land management (see below).

Table 6 Awareness of Payment for Environmental Services (valid percent)

	Coffee	Livestock	Tourism
Awareness of PES	46	34	22
Applied for PES	0	1	0
Receive PES	0	0	0
Main reason for not applying for PES			
a) Lack of information	30	61	n/a*
b) Low return (US\$/ha)	32	17	n/a
c) No title deed	28	7	n/a
d) Not prepared to commit	9	13	n/a

* Most respondents for the tourism group felt unable to answer these questions.

5.3 Land use change analysis

Land use change is estimated from the proportional average change in initial land allocation by sector (coffee, livestock, forest) compare to current land allocations (Appendix 1, Q.29). Tourism data are not presented as the sector represents minor land use (< 1 ha), though the sector is reliant on non-consumptive forestry land use in conservation areas. It is noted that forestry represents a

non-productive land allocation, which is increasingly being associated with multiple land uses for the growing number of farmers that are offering tourism facilities on their properties (see below). Average values are presented for the number of years of land use in each sector. Whilst high levels of variance are recorded across both land allocation and years of land use, the data illustrate patterns and junctures in changing land use in the study area. The descriptive data are presented from primary land use allocation to tertiary land use allocation that is determined by area of allocation (Table 7).

Table 7 Land use change by primary allocation on property

	Coffee (n=16)	Livestock (n=63)	Forestry (n=9)
Initial allocation (ha)	1.04 (1.31)	14.45 (20.32)	19.33 (52.78)
Current allocation (ha)	1.47 (1.10)	19.15 (22.24)	16.01 (37.68)
Total land holding (ha)	2.11 (7.21)	24.04 (24.35)	23.34 (51.77)
Years of land use	8.63 (7.21)	24.38 (14.70)	27.89 (17.42)
Incremental land use change	+ 21%	+ 20%	- 14%

Note: Mean values, standard deviations in brackets. Proportional land use change values calculated from mean values. Data are non-weighted.

Primary land allocation data show that coffee as a primary land use is both a relatively new productive sector in the study area (9 years) and there has been an increased allocation equivalent to 21% of the original land use. However, coffee holdings are relatively small concerns with respondents reporting coffee as the primary land use having an average total holding of 2 ha. Alternatively, pasture is characterized by much larger holdings with a longer settlement in the area. Land conversion to pasture (4.6 ha) is associated with forestry loss (3.3 ha) within a comparable time-frame.

Respondents that report coffee as secondary land allocations have increased the allocation by 5% or an average of 0.6 ha (Table 8). This livelihood group appear to correspond well to properties with pasture as a primary land allocation, which indicates there has been a diversification from pasture into coffee facilitated by large properties. Pasture land use as a secondary land allocation fits well with forestry as the primary land allocation. Here, there has been a 26% increase in land allocated to pasture at an average of 4 ha more per holding over the last 18 years. Forestry as a secondary land use is thought to be associated with pasture as the primary land use due to the size of holding, number in the sample and years in the area. The data indicate that land has remained stable or been converted back to forestry over the last 20 years though the proportional land allocation to forestry is a fraction of the total holding.

Coffee as a tertiary land allocation has recorded a 3% increase equivalent to 0.6 ha over the last 16 years (Table 9). Forestry records a 12% fall in land holding over the last 25 years, which is equivalent to 1.7 ha per average holding. Tertiary land use allocation appears to reflect holdings that have diversified from pasture into coffee but still retain a reduced stand of forest whether it be for wind-breaks, aesthetic purposes or inability to convert forest on steep slopes for productive use.

Table 8 Land use change by secondary allocation on property

	Coffee (n=16)	Livestock (n=11)	Forestry (n=54)
Initial allocation (ha)	0.86 (0.97)	1.41 (2.49)	3.67 (4.53)
Current allocation (ha)	1.43 (0.93)	5.31 (11.71)	4.30 (4.29)
Total land holding (ha)	13.43 (21.76)	20.65 (47.13)	22.71 (23.17)
Years involved in activity	27.50 (18.92)	17.91 (17.60)	20.17 (14.94)
Incremental land use change	+ 5%	+ 26%	+ 3%

Table 9 Land use change by tertiary allocation on property

	Coffee (n=18)	Livestock (n=2) ¹	Forestry (n=15)
Initial allocation (ha)	1.07 (1.34)	n/a	3.28 (7.16)
Current allocation (ha)	1.65 (1.54)	n/a	1.57 (1.95)
Total land holding (ha)	24.92 (35.53)	n/a	13.42 (22.67)
Years involved in activity	15.83 (16.54)	n/a	25.53 (18.55)
Incremental land use change	+ 3%	n/a	- 12%

¹ Only cell sizes greater than five are evaluated.

The picture emerging from these data illustrate initial settlement in the area by livestock farmers (meat, milk) with significant land holdings (> 20 ha). Following the initial land conversion from forestry, the next development phase appears to have approximately ten years ago when coffee farming became an increasingly popular land use due to increasing costs of livestock production and higher returns from exporting premium coffee. Coffee attracted both new farmers to the area with small holdings dedicated to this activity alone and resulted in existing pasture holdings converting some of their land to coffee. Due to the investment and labour constraints in coffee farming, these holdings are generally small (< 2 ha). The impact on forestry has been a reduction in the existing stands on farms both for increased pasture and the development of coffee farming.

5.4 Income and expenditure analysis

Complementing socio-demographic descriptive analysis of household access to basic services and other development indicators (education, household composition), relative poverty measures of national and rural income poverty lines are compared to the sample population to evaluate the poverty profile of livelihoods groups. The Costa Rican National Statistics Office (INEC) estimate basic food expenditure in rural areas at US\$345 per capita per pa (INEC, 2003). In addition, the national minimum salary is set at US\$2,820 per capita per year (ibid). Given the short time lag between these poverty estimates and survey implementation, the relative measures are considered the best available to compare survey findings with national and rural poverty estimates. Survey data are disaggregated by dominant livelihood strategies and appropriate units (adults, all household members) are compared to the consumption and income thresholds (Table 10).

Table 10 Basic food expenditure and adult income for livelihood groups (weighted data)

	Coffee (n=38)	Livestock (n=46)	Tourism (n=32)
Mean food expenditure (US\$/capita/pa)	355 (176)	349 (263)	455 (253)
Median food expenditure (US\$/capita/pa)	306	306	438
Mean income (US\$/adult/pa)	2,012 (1,462)	2,508 (2,403)	2,263 (1,736)
Median income (US\$/adult/pa)	1,300	1,875	1,950

Note: Mean values with standard deviations in brackets. All economic calculations use an exchange rate of US\$1 = 400 Colones (July, 2003).

Average and median values are presented due to significant variation in the sample data. Findings indicate that, on average, all livelihood groups spend more than the rural basic food consumption estimate though the median values for coffee and pasture households fall below the threshold. This is mitigated by 86% of coffee farmers reporting growing annual crops for own-consumption and 27% of pasture households conducting similar expenditure-saving activities. This is in contrast to the tourism sector where 6% of the weighted sample report growing food crops, which is indicative of their low access to land resources and general requirement to lodge in the property (hotel, guest-house). Livelihoods dependent on tourism spend on average proportionately more of their income on food (20%) compared to coffee (18%) and pasture (14%).

All three livelihood groups record mean and median adult income below the national minimum wage threshold. These results should be interpreted cautiously for the coffee and pasture sectors as difficulties were encountered in accurately recording sensitive and seasonally-complex income

and expenditure data. Further, no attempt was made in this study to conduct a comprehensive economic analysis of land use values per sector. Aylward et al. (1998) provide the most detailed study available in the study area for livestock production (meat, milk) with an estimated private opportunity cost of US\$247 per ha. Adjusting this figure by a Consumer Price Index of 10% would raise this estimate of US\$398 per ha in 2003 prices, all things being equal. Given that pasture as primary land use records an average holding of just over 14 ha (Table 7), a rough estimate would suggest around US\$5,500 per property per year. This figure is similar to reported estimated annual household income (all sources) for pasture (Table 11). Livestock households incur daily living expenses (education, health, transport, bills) equivalent to the tourism sector, which is almost 50% more than the coffee livelihood group. Livestock properties report the highest average expenditure on property maintenance, which, as mentioned earlier, is largely derived from the recent cheese factory policy of chilled milk delivery. This significant investment for dairy producers is reflected in the high level of variability amongst this livelihood sector (US\$3,642).

Table 11 Disaggregated consumption analysis by livelihood groups (weighted data)

	Coffee	Livestock	Tourism
Daily living expenses (US\$/HH/month)	136 (93)	199 (142)	200 (149)
Property maintenance (US\$/HH/pa)	136 (243)	787 (3,642)	433 (667)
Household income (US\$/pa)	4,546 (3,050)	6,623 (8,238)	5,147 (3,712)

The data reveal that the coffee livelihood group are the most economical in (market) expenditure on living expenses and property maintenance compared to the other two groups. This is mirrored by their reported higher dependency on river water and fuelwood for cooking (Table 4) compared to the other two groups. This behaviour may partly be explained by the lowest reported mean household income and the diversified nature of their livelihoods into tourism and own-consumption food production.

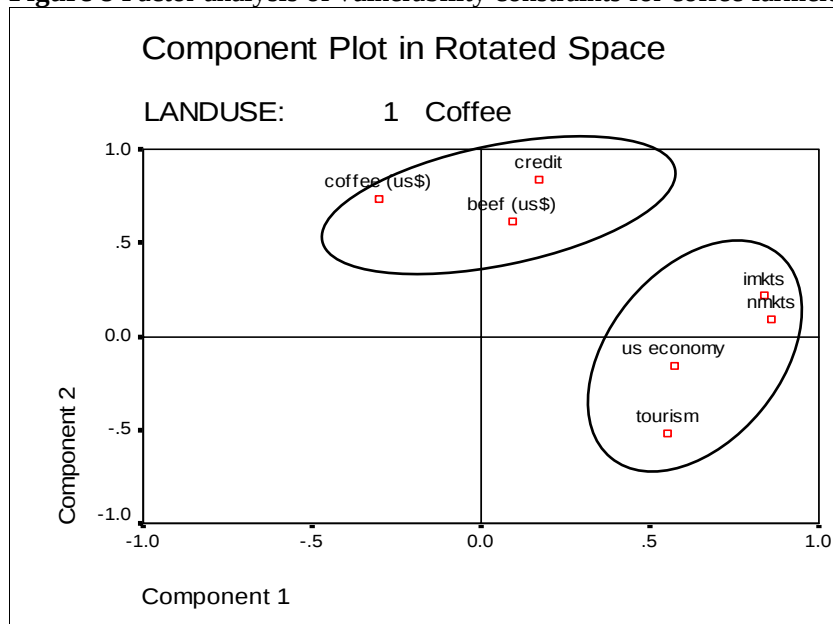
5.5 Factor analysis of livelihood vulnerability constraints

The survey instrument posed a generic question ‘stem’ (Appendix 1, Q.44) to the impact of a range of ‘leaf’ variables on the daily life of the household in the last year. The variables spanned environmental factors (surface runoff), local institutional issues (roads, transport, local prices), national economic policy (prices, subsidies, credit, markets, PES) and international factors (exchange rates, prices, USA economy). Responses were charted on a simple five-point Likert

scale ('very positive' through to 'very negative') and results analysed using SPSS factor analysis with a varimax rotation for each of the three livelihood groups. The aim of the vulnerability analysis was to isolate groups of variables across disaggregated livelihood groups to identify commonalities and differences to the opportunities and constraints to improve livelihoods. All three factor analyses passed a range of relevant statistical tests, which are reported below each figure.

Seven variables mapped onto two factors for the coffee livelihood group (Figure 8). The first factor (ringed on the y-axis) includes international coffee prices, international beef prices and access to credit. These variables may be characterized as a 'risk-reward' factor that corresponds to the vulnerability of the diversified production system of farmer livelihoods to exogenous price shifts and the commonly reported difficulty in securing credit, often attributed to unclear property rights in the study area. The second factor (ringed on the x-axis) may be considered to be a 'market opportunity' factor that is moderated by the level of access to markets (nationally and internationally) and, as a corollary, the state of the US economy (the most important export market for the study area and the source of the majority of tourists (academic, eco-tourists, students)). Market opportunities and prices would appear to be central to the livelihoods of coffee farmers, which suggests PES would be of interest to this group (as respondents reported earlier) if the design and implementation of the PES policy were made more attractive (US\$ per ha) and accessible (information, qualification criteria) to coffee farmers.

Figure 8 Factor analysis of vulnerability constraints for coffee farmers

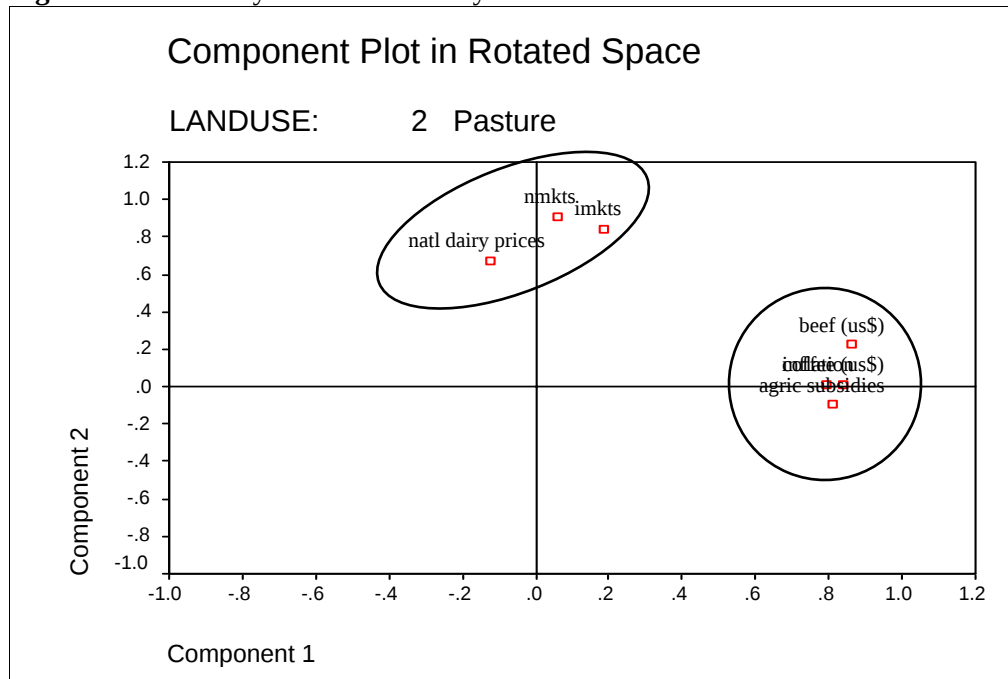


Legend: imkts = international markets; nmkts = national markets; coffee (US\$) = international coffee prices; beef (US\$) = international beef prices; us economy = condition of US economy; tourism = tourist revenue; credit = access to finance.

Statistical tests: Determinant=0.171 ; KMO=0.645 ; Bartlett's test of sphericity=58.07, df = 21, $p < 0.001$.

Livestock farmers identify three grouped variables on the y-axis, which broadly correspond to the coffee farmers 'market opportunity' factor, though tourism and US economy are replaced by national dairy prices (Figure 9). This is consistent with earlier findings of livestock farmers limited involvement in tourism-related activities. The factor also highlights the vulnerability of dairy farmers to national milk prices, which contributes to investment difficulties due to the 'lumpy' nature of investments (refrigeration infrastructure) but the dynamic nature of market prices. Four variables map onto a factor located on the x-axis: inflation, coffee prices (US\$), beef prices (US\$) and agricultural subsidies. This suggests an expected commonality with the coffee farmers, who share a 'risk-reward' vulnerability to the movement of international commodity prices. In addition, livestock farmers include two different variables that reflect the increased financial investment required in dairy farming (inflation) and the historical nature of subsidies that promoted the expansion of livestock farming to its peak in the 1970s (Aylward et al., 1998) but have since been progressively withdrawn leading to stagnating or declining dairy profits (Griffith et al., 2000).

Figure 9 Factor analysis of vulnerability constraints for livestock farmers

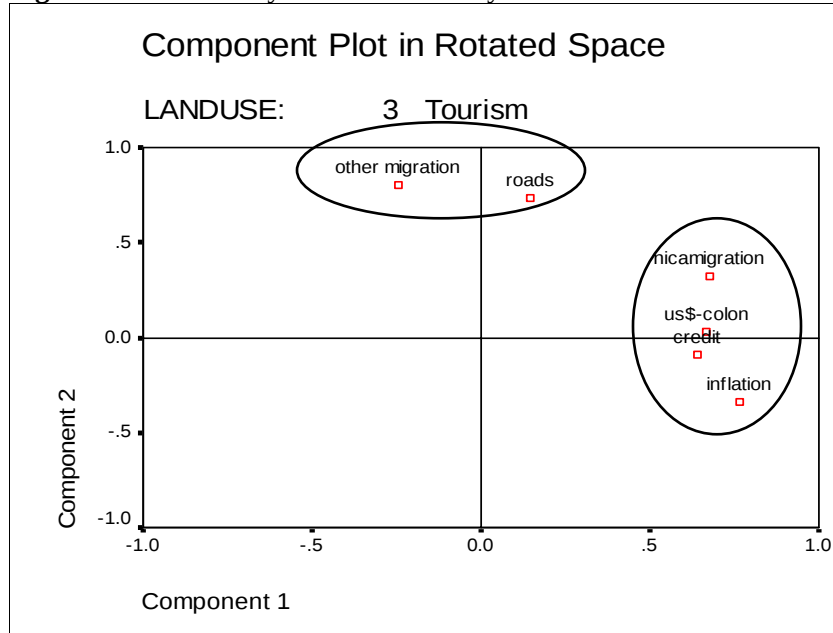


Note: Inflation and coffee (US\$) map on top of each other for the x-axis factor.

Statistical tests: Determinant=0.053 ; KMO=0.701 ; Bartlett's test of sphericity=125.64, df = 21, $p < 0.001$.

Variables of statistical significance from tourism respondents map a different range of variables on to two factors (Figure 10). The y-axis factor locates the state of the roads and bridges with the immigration of non-Nicaraguans. The latter variable is constructed to isolate ‘economic migrancy’ (predominantly from Nicaragua) from short-term eco-tourists or the healthy community of North American researchers resident in the Santa Elena area. The popular interpretation of the treacherous state of the roads benefiting tourism concerns by laying visitors ‘hostage’ for at least one night, though prejudicing the commercial efficiency of productive land uses (coffee, livestock), seems to be supported by the results. Though caution should be exercised in over-interpretation of the findings, the conjunction of these two variables is suggestive of a ‘high spend-low traffic’ factor. Alternatively, the y-axis variables include Nicaraguan migrants, inflation, credit and the US dollar to Costa Rican Colon exchange rate. The configuration of these four factors centre around the financial viability of tourism: wage labour rates, credit access, interest payments and the importance of exchange rate fluctuations promoting or dampening US tourism. Nicaraguan migrants not only seek seasonal agricultural labour (coffee) in Costa Rica but also more formal positions in less physically-demanding and dependable employment (tourism), which is partly driven by the skewed distribution of welfare and development opportunities in each country (ECLAC, 2004; UN, 2004).

Figure 10 Factor analysis of vulnerability constraints for tourism sector

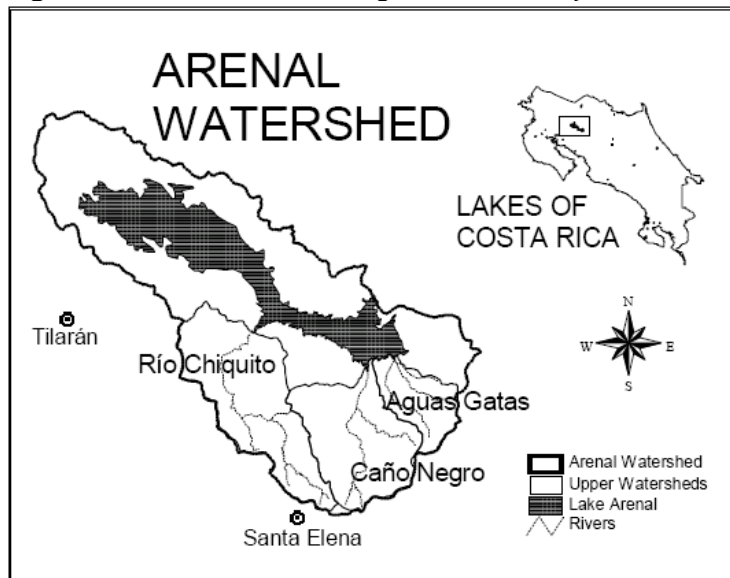


Legend: ‘us\$-colon’ indicates foreign exchange rate; ‘nicamigration’ is immigration of Nicaraguans; ‘roads’ includes the condition of the roads and bridges; ‘other migration’ is all non-Nicaraguan immigrants.
Statistical tests: Determinant = 0.369; KMO = 0.469 ; Bartlett’s test of sphericity = 28.11, df = 15, p<0.05.

5.6 Participant perspectives

In the period 1997-2001, 4,461 landholders benefited from the PES programme with a total area of 284,000 hectares submitted to the programme, equivalent to over 5% of Costa Rica's national territory (Zbinden and Lee, 2005). What these aggregate figures do not illustrate are the perspectives, experiences and profile of participating landholders. The survey instrument randomly selected only one beneficiary from coverage of 33% of landholders in the study area. To compensate for non-capture of PES participants, purposive interviews with six landholders currently participating in the PES programme and occupying upland catchment zones in the study area were conducted based on data supplied by FONAFIFO. The aim was to explore beneficiaries' perceptions and views of the programme in order to better understand the motivation for participating, their views on the functioning of the programme³ (Appendix 2). Also, a life-history interview was conducted with a livestock farmer in the relatively unpopulated *Caño Negro* micro-watershed in addition to five shorter interviews in the upper zone of the *Rio Chiquito* watershed; both watersheds drain into Lake Arenal (Figure 10). In addition, a forest engineer actively involved in PES programme in the study area was interviewed to offer a perspective based on a wider understanding of the local opportunities and constraints for farmers.

Figure 10 Location of *Caño Negro* and *Rio Chiquito* watersheds



³ One in-depth interview was conducted in July 2003 with five shorter interviews conducted in February 2004. The transcripts of the latter, including questions, are in Appendix 2.

5.6.1 The long view from *Caño Negro*

Mr Quetzal (pseudonym) has managed a 76 hectare farm for over 25 years in an isolated zone of the *Caño Negro* micro-watershed, which is only accessible by foot or horse-back. The land consists of 60 hectares of primary and secondary cloud forest with 16 hectares cleared for rearing livestock. His father-in-law converted the forest to pasture in the 1950s. Over the last ten years Mr Quetzal's farming activities have come under increasing scrutiny as the area was declared part of the 40,000 hectare Arenal National Park in 1977. Increasing controversy over water resources draining from the Caño Negro River to Lake Arenal has heightened the debate over appropriate land use practices in the upper catchment area. Mr. Quetzal is one of some 20 livestock farmers based in the micro-watershed with estimated total pasture area of 1,000 hectares.

Mr. Quetzal successfully applied for PES in 1998 and received US\$42 for each hectare of forested land. The five year contract for forested land prohibited any productive uses. Each year full documentation had to be submitted to the *Liberia* office (Guanacaste Province) of FONAFIFO, which created additional transaction costs (e.g. time, travel, paperwork, accommodation, expenses). Whilst payments have benefited Mr. Quetzal, he prefers to sell his farm as he believes this is the only practical resolution to the prohibition for productive forest land uses and state conservation interests. Mr. Quetzal believes the programme is not a flexible instrument as reforesting pasture would effectively return the land to its original state *permanently* as costs to re-convert the land back to pasture, if the contract was not renewed, would be prohibitive. Mr Quetzal considers that the programme only functions for land owners already pursuing a conservation or productive forest use policy such as the private nature reserves and commercial forestry companies. Productive land owners have no financial incentive to change their current land use strategies (coffee, milk, beef) in preference to the lower returns offered by PES. Further, Mr Quetzal, and other informants, report a contentious history of disputed land transfers from *de facto* land owners to government control following preliminary interest in selling private holdings. This 'oral' record has undermined many informants' trust in the motivations and intentions of government agencies promoting land agreements with private individuals with uncertain land rights.

Like many settler families, Mr. Quetzal lacks a land title, which undermines his ability to legally sell the land. In the last decade, three neighbouring farms have been bought by MINAE without wider consultation to other interested land owners or any subsequent purchases. Mr Quetzal is prepared to sell his land as he is frustrated with the futility of continuing an activity that the

institutional environment has deemed unacceptable. For example, Mr. Quetzal applied to renew his PES contract with FONAFIFO in 2003 but it was rejected as a new clause requires participants to possess land titles. This change in PES administration has angered Mr. Quetzal, who has been willing to cooperate and support the programme. Land titles are rarely held in the area by nature reserves, private individuals or commercial interests partly due to initial unplanned settlement and latterly disputed conservation and development issues. Political tensions stymies resolution of insecure tenure status. This leaves Mr. Quetzal angry and frustrated as he has no legal productive land use alternatives and has the choice to remain without compensation or abandon his property to conform to land use policy that conflicts with farmers' interests.

5.6.2 Participant perspectives from *Rio Chiquito*

Rio Chiquito is the most heavily populated micro-watershed draining into Lake Arenal with an estimated 120 livestock holdings with an average of 60 hectares each (Aylward et al., 1998). Economic analysis in the *Rio Chiquito* reveal synergies between livestock production and hydrological services with positive externalities from existing livestock land uses in comparison to losses from reforestation or forest protection alternatives (Aylward and Echevarria, 2001). Given these findings, purposive, structured interviews explored the views of five participating farmers in the programme (Table 12).

The majority of the sample was drawn from livestock farmers with land holdings ranging from 75-100 hectares. This is consistent with the main productive land use activity in this catchment (Aylward et al., 1998). Only Farmer 4 identified coffee as the main land use activity, which is reflected by the smaller holding of 7 hectares, and the agro-forestry modality promoted by the forest engineer facilitating programme participation. Livestock farmers committed roughly three quarters of their holdings to the programme, though Farmer 5 reports reducing the second contract by 50% (to 36% of total land). Reasons for participation identified income generation and conservation. Priority, and the sequential modifications, in participating amongst respondents is difficult to determine though those receiving the highest proportion of total income from PES payments associated participation most clearly with water or general conservation programme principles: "landholders should be compensated for forest services." Alternatively, restricted forest land use legislation, led one respondent to identify the opportunity cost of non-productive land uses as grounds on which: "government must pay for forested land conservation or allow productive uses."

Table 12 Participant experiences with PES programme

Question/ interview no.	Farmer 1	Farmer 2	Farmer 3	Farmer 4	Farmer 5
Main land use activity	Livestock	Livestock	Livestock	Coffee	Livestock
Total land (ha)	75	80	76	7	100
% land under PES contract	69%	81%	79%	2,000 trees	1 st contract: 71%; 2 nd contract: 36%
Why participate?	Water conservation	Income	Conservation	Income	Income
How did you learn of the programme?	Forest engineer after word-of-mouth.	Other local landholders	Livestock cooperative	Forest engineer; livestock cooperative.	Livestock cooperative
Can the programme be improved?	Reduce transaction costs; advance and higher payments.	Reduce transaction costs and 'paper' walls. Accept land use trade-offs.	Reduce transaction costs and 'paper' walls; higher payments.	Speed up payments; reduce transaction costs.	Clarify land/resource rights; information; increase confidence.
Household income share from PES?	50%	Awaiting first payment	20%	Awaiting first payment.	10%

Dissemination of the programme came from word-of-mouth sources, a local (*EL Dos*) livestock cooperative and a locally-based forest engineer. The latter two most strongly facilitated learning about the programme and submitting the relevant documentation to FONAFIFO. In particular, a forest engineer appears pivotal in assisting participants navigate through the administrative requirements for qualification and understand land use implications. This supports survey findings (Section 5.2) and conclusions from a quantitative participation analysis to the PES programme in the northern lowlands of Costa Rica, which reports: “targeted information provided by ... forest engineers and forest organizations was shown to be a key element in influencing participation” (Zbinden and Lee, 2005: 270).

Programme design and payment qualification criteria were identified with a number of weaknesses: high transaction costs; low payments relative to opportunity costs of alternative land uses; ‘paper walls’ of qualification criteria, particularly possession of a land title; and, poor public access to information contributing to low confidence in the programme. These weaknesses are recognised more widely and, in particular, the significant constraint for wider participation by land title holders, who are found to be associated with better educated, non-residents with greater dependence on off-farm (land) income sources (Zbinden and Lee, 2005; Miranda et al., 2003). This compromises the programme goal of supporting small and medium landowners and contributing to income and rural employment generation. Income support to farmers appears

significant for two farmers gaining 20% and 50% of income from payments, though estimates are inconsistent with detailed economic estimates of average returns from livestock holdings of US\$500 per hectare in net present value terms (Aylward et al., 1998), one magnitude of difference greater than PES payments. Farmer 5's estimate of 10% income contribution from PES with a significant stand of forestry would appear a more realistic estimate.

A local forest engineer's perspective provided alternative views of the programme:

- PES contributes to soil conservation and increases milk production from wind-breaks;
- PES has high transaction costs, particularly land title ownership, and a falling budget contributes to a smaller land allocation and less participants;
- An agro-forestry modality of planting native species is attractive due to estimated returns of US\$1 per tree and the opportunity to diversify into eco-tourism;
- People are strongly in favour of conserving good water quality associated with forest cover.

Biophysical benefits of the programme were identified in relation to forests complementing livestock production (wind-breaks), soil conservation, planting native trees to promote eco-tourism and water quality benefits from protecting springs. No unprompted water quantity benefit was identified by the engineer. The engineer supported participant complaints that "the most restrictive legal requirement for PES qualification is to have a land title." This requirement was juxtaposed with opportunity costs for forested land and farmers' imperative to find income-generating alternatives for land on their holdings. In this respect, the PES programme provided the only legal alternative for farmers to receive some income other than eco-tourism. Like most small-scale economic agents, farmers prioritize activities that offer the highest returns from allocation of their asset base. The engineer believed the programme provides a welcome government intervention for farmers in recognition of this situation though the wider legislative environment leaves farmers with few options but to engage in the programme on increasingly demanding terms.

5.7 Conjoint Analysis

Conjoint analysis (CA) is a stated choice method that elicits respondent preferences for multiple attribute goods or services that may already exist or are planned or predicted in future scenarios.

It is a technique commonly used in marketing, environmental valuation and psychological studies. The value of the approach is that exploratory experimentation of planned policy scenarios can be evaluated and estimated prior to actual implementation. This allows a legitimate and statistically rigorous understanding of the preferences and likely behaviour of the intended beneficiaries (here, upper catchment land users) to postulated policy initiatives (here, PES). The methodological justification and technical specifications of the modelling approaches applied to this CA study are reported by Porras and Hope (in press), results presented here provide key findings.

The CA explored the likelihood of livelihood groups willingness-to-commit to the PES programme based on their existing distribution of forested land and traded-off against attributes that influence livelihood opportunities and constraints in the area: conservation payment levels, reforestation payment levels, length of PES contracts, electricity costs (to be linked with downstream willingness-to-pay study at the Arenal dam), condition of roads and bridges and access to government welfare programmes (Table 12). Data collected earlier in the questionnaire (Appendix 1, question 29) established the area of forested land on the property across three classifications: less than 25%, 25-75% and greater than 75% forest. Accordingly, the CA cards (Figure 11) were designed in three batches with colour-coded cards (to help enumerators) shown to the appropriate respondent group. This process was necessary in order for the respondents to be able to realistically commit to increase forest cover subject to the existing distribution of forested land, for example a farmer with over 75% forested land could not commit to increasing forest cover to 50%. The purpose of the study had to be consistent with the PES programme and wider national policy of forest conservation or protection and thus present land use scenarios that maintain or increase forest cover but not reduce forest cover.

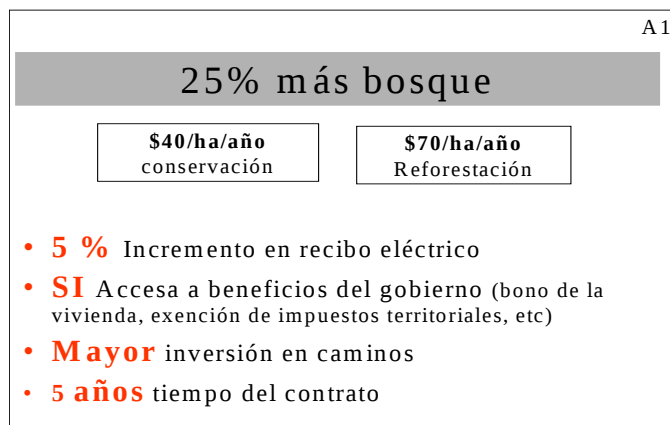
The purpose of the CA experiment was carefully explained to respondents with 'crib sheets' for enumerators to provide consistent and relevant details of the purpose of the exercise (Appendix 1, Section I). 32 sets of orthogonally-designed main effects profiles were generated from the attributes, which were classified into three groups by existing forest cover: Group A with less than 25% forest cover could choose from the full 32 card set, Group B with 25-75% forest cover could choose from a restricted 24 card set and Group C with greater than 75% forest cover from a restricted 16 card set. On explanation of the experimental design, the respondents had to rate their level of commitment to their existing (status quo) land use allocation. A simple 0-10 scale was used, with '10' indicating 'definite commitment', '5' indicating 'indifference' and '0' indicating

‘definitely no commitment’. Following the ‘status quo’ rating, respondents were randomly shown three cards from the relevant forest cover card set that pertained to their land use. A total sample of 87 households were analysed with properties of less than one hectare excluded. Thus, a total of 261 observations were analysed.

Table 12 Attributes and levels in conjoint analysis experiment

Attribute	Levels	Description	Units	Expected effect
PES for conservation (US\$ per ha per year)	\$10, \$25, \$50, \$75	Compensation for watershed services from natural forests	\$/ha/yr	Positive
PES for reforestation (US\$ per ha per year)	\$50, \$75, \$100, \$150	Compensation for watershed services from forest regeneration	\$/ha/yr	Positive
Length of PES contracts (years)	3, 5, 10	Length of PES contracts	Nominal	Negative
% increase in electricity bill	0%, 10%, 15%	Internalising cost of ES measure	Adapted to US\$	Negative
Access to state benefits	Yes/no	Compensation from state benefits (not permitted if receive PES)	Binary	Positive
Investment in roads/bridges	None, same, more	Compensation through public investment in roads	Categorical	Positive

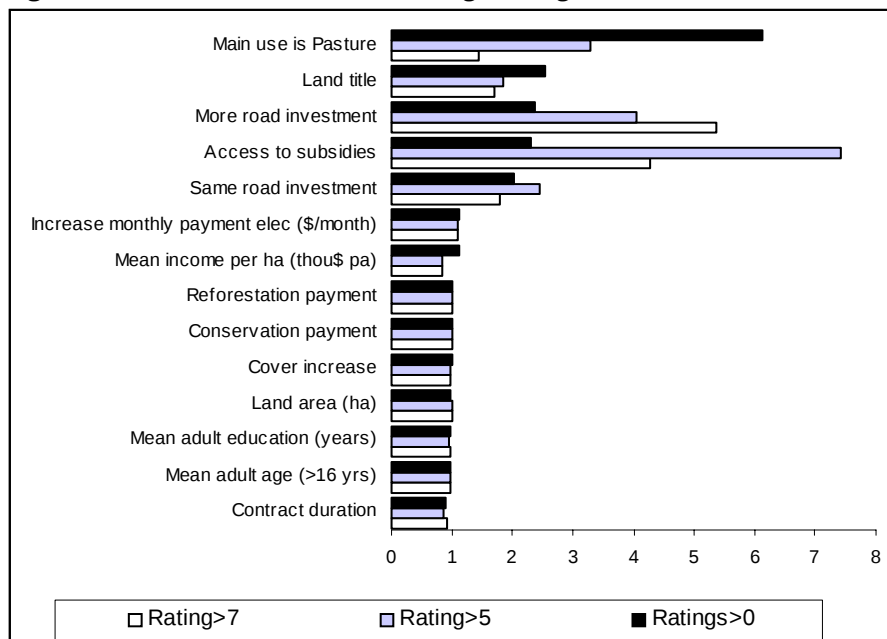
Figure 11 Example of conjoint card



Results revealed that roughly 20 percent of respondents rated their current situation at ‘0’ with just over 50 per cent rating a score above ‘5’ and 17 percent rated a score of ‘10’ (mean=5.23, standard deviation=3.65). Alternatively, the results for the alternative scenarios presented to the

respondents revealed over 40 percent of the sample reporting they would ‘definitely not commit’ to any land use change scenario presented regardless of the levels of the attribute variables (mean=2.66; standard deviation=3.07). Various models analysed the data with broadly similar findings (see Porras and Hope, in press). A logistic regression model specification is presented here based on variable rating levels, which permits insights into which attributes are more likely to influence adoption of the PES programme (Figure 12). An odds ratio above one indicates an increased likelihood of adoption. As such, four attributes appear significant in increasing commitment to land use change: pasture as the main land use, possession of a land title, access to other government transfers and improvement in road conditions. These results complement analysis of the profile of PES participant in the northern lowlands, in particular, the conclusion that livestock farmers with land titles represent the most likely participant group (Zbinden and Lee, 2005). Of equal importance to this study is the result that programme commitment (conservation or reforestation) is inelastic to payment levels. This strongly suggests that wider adoption of the PES programme will require more integrative negotiation to gain the support and uptake by smallholder livelihood land users.

Figure 12 Odds ratio estimates from logistic regression model across different rating levels



Note: Rating scale is 0-10 with ‘10’ definite commitment and ‘0’ rejection.

6. Conclusion and recommendations

This paper has investigated how the PES programme may contribute to poverty reduction for small-scale land owners in the upper water catchment area of a tropical montane cloud forest in

the northern Tilaràn range of Costa Rica. Findings suggest that programme design and impacts may be improved by clarification of resource claims and environmental service provision rights, and simplifying programme goals to defensible biophysical and/or socio-economic criteria. Multiple programme goals within an ambitious integrated environment and development scope extend the financial resources for, and biophysical evidence of, programme implementation to dilute or question defensible socio-economic impacts from participation due to restrictive qualification criteria and uncertain provision of environmental services, particularly increased water flows, to downstream users.

While there are differences in the distribution of income, asset and entitlement profiles across the three livelihood groups, no group can be classified as ‘poor’ by measures which correspond to global income (US\$1 or US\$2 per day) or basic human needs (water, sanitation) indicators. However, in relative terms, nationally, all three groups may be considered to represent a ‘vulnerable’ group of households and individuals to relative national income thresholds. Livelihood vulnerability is illustrated by the significance of markets and prices for the two productive land use groups (coffee, livestock) and the configuration of financial and input variables for the tourism sector. No group viewed PES as a significant factor, which is consistent with the majority of landowners having no knowledge of the programme. Weak dissemination of the PES programme to farmer groups is compounded by respondents, who are aware of the policy, identifying ‘low land returns’ and ‘land tenure status’ as two constraints for wider uptake. This suggests that wider publicity will not improve uptake, which is already over-subscribed, until these constraints are addressed. For example, estimates of land use productivity for coffee and livestock suggest higher returns per hectare from productive land uses compared to PES payments from FONAFIFO of US\$42 per hectare (Y. Rodriguez, personal communication, 2003). Aylward et al’s (1998) estimated private opportunity costs for livestock (US\$484 per hectare in 1998 prices) is significantly higher than the highest reforestation payment of US\$90 per hectare per year. Alternatively, the major conservation areas (including, the Monteverde Reserve and the Monteverde Conservation League) report they hold land titles for a fraction of their land though sufficient to receive payments for ‘conservation’ services for the maximum threshold of 300 hectares.

Land title data reveal that only the livestock group have a majority of households holding land titles (72%), which is associated with large land holdings (average 31 hectares). As such, livestock farmers represent a potential group to be targeted by the PES programme on land title

and land size criteria, though they are also characterized by the highest level of annual household income of the three groups. Coffee farmers report only one in three households with land titles and average land holdings less than 10 hectares. Conjoint Analysis results highlight low willingness to commit to permutations of PES and other government development interventions that suggests little promise of future adoption of PES by livelihood groups. Beyond the statistical evidence of weak commitment to the PES programme, informant testimony identified to a lack of 'trust' of engaging in land contracts with the government, particularly where there was existing uncertainty or contested land claims. Clarifying land rights is a significant challenge for Central American governments and a pressing requirement for wider adoption of the PES programme by small-scale poor farmers. Until land rights and land titles are secured, it is difficult to envisage a more inclusive and 'pro-poor' uptake of PES policies in Costa Rica.

Historical drivers of land use change in the study area illustrate coffee and livestock farmers' response to changing price signals from new opportunities from productive land uses, which suggests PES could be adopted more widely if land and payment constraints were released. The driver of forest conversion has been to expand and diversify revenue streams for farmers. Forest conversion to coffee has been relatively small (< 1ha) with larger forest losses associated with increased pasture (*circa.* 4 ha). Forest conversion to coffee is also associated with more labour-intensive, seasonal work that largely benefits poor, Nicaraguan immigrants. Inelastic labour supply locally, partly explains this phenomenon as do regional differences in wage rates and relative development profiles (ECLAC, 2004). Tourism is another rural labour absorption sector that promotes conservation of forest resources. Alternatively, livestock is a largely mechanized and extensive land use practice in the study area with limited rural labour absorption rates.

Beyond the uncertain benefits (particularly, hydrological) of upper catchment land use change or improved land management practices (Aylward and Echevarria, 2001; Bruijnzeel, 2001), a critical issue in Costa Rican legislation, and the wider applicability of PES, is who actually has the legal right to derive benefits from upper watershed 'services', the individual or the state? The PES programme implicitly invests land ownership with water resource ownership. As the Costa Rican PES programme is structured, it creates a market distortion that promotes land speculation in upper watershed areas in strategic areas (above hydro-power reservoirs), which the construction of the Arenal dam is suggested to have promoted (Kauck and Tosi, 1989). The logic of the PES programme is structured not as an 'incentive' to improve land management practices but as 'compensation' for benefits deferred. Given the inequitable distribution of existing land

resources and income in Costa Rica, and many other developing countries, promoting policies that generate increased competition for land in tropical forests is unlikely to improve the livelihoods or welfare of the rural poor (Wunder, 2001). There is justifiable concern that such policies will lead to land evictions of the poor as wealthier elites are provided with incentives to gain control of land resources (Landell-Mills and Porras, 2002). Whilst this may lead to conservation ‘gains’, it may contribute to increased vulnerability and hardship for the forest-dependent poor and poor, upper catchment farmers with disputed land tenure.

Government and donors reviewing the potential of MES need to establish whether promoting a non-productive land use helps the poor. Payments may benefit the poor if they are greater than the private opportunity cost of current land use (including, labour and inputs), contracts are secure and, critically, if the poor are land owners as opposed to paid labourers, though the latter will indirectly benefit from labour-intensive (productive) land uses. Further, the geographical distribution of poverty is important to establish if the poor live in upper or lower watershed areas. It appears both inequitable and dubious that the downstream poor will be willing, or able, to pay for environmental services from upper watershed land owners (rich or poor) that are currently shrouded in beliefs rather than science (Calder, 2004), and where the establishment of functioning watershed markets is found in a handful of micro-watershed cases globally (Landell-Mills and Porras, 2002), whose institutional structures are more common to industrial, developed countries⁴ rather than dispersed, unorganized and weak rural multitudes common to the extensive catchments and floodplains of Sub-Saharan Africa and South Asia, where the majority of the world’s poor live (UN, 2004). Government and donors might well ponder such uncertainties and potentially perverse outcomes of promoting MES for ‘pro-poor’ development.

The evidence from this study suggests some approaches for policy makers to balance management of environmental services with poverty reduction. First, legislation should determine water resources rights to clarify ‘services’ provided by private land owners living in upper watershed areas. The benefits and services provided by national water resources should accrue to and be distributed amongst all citizens. This may be particularly cogent to the growing proportion of urban poor in the major conurbations of South America (ECLAC, 2004). Second, land tenure remains a significant constraint to rural development and land management in Costa Rica. Disputed and uncertain land tenure promotes a higher discount rate and shorter time-frame in land use decisions, which often promotes resource ‘mining’ rather sustainable resource use (Clark,

⁴ Such as Sulphur Dioxide trading in the United States (PROFOR, 2004).

1973). These issues are well-known in Central America (Perez-Brignoli, 1989) but multiple land claims stagnate progress. In the study area, forest conversion has effectively halted through a mixture of topographical constraints, government enforcement and a new culture of sustainable management promoted by the long-standing conservation activists in the area. The latter is a significant source of new employment and business opportunities for upper watershed residents as the area has significant ecological importance regionally and globally; plus is a favourite, and close destination, of US tourists and researchers. The latter is not the case in other tropical montane zones in Latin America, Africa or Asia. Identification of key zones in strategic national catchments and government-supported initiatives to promote land tenure for *de facto*, long term residents with local institutional capacity-building may contribute to improved land management with pro-poor impacts.

Third, land-intensive, labour-intensive and ecologically-benign land use options, such as ‘*café de sombra*’, are rural development initiatives, which promote labour absorption of the rural poor. Whilst the international coffee market is in a precarious state (Oxfam, 2002), there appears pro-poor grounds to support such rural enterprises in favour of more extensive and mechanized alternatives. Fourth, interventions that promote greater rent-sharing from conservation areas need to be explored. The Economist (2004: 11) argues that if the global community wants to conserve tropical forests “it should put its money where its mouth is” and compensate developing countries, which forego foreign exchange revenues and social development opportunities from productive uses of tropical forests. Such advocacy is based on evidence of the few synergies between tropical forests and poverty alleviation globally (Wunder, 2001), which may be uncomfortable reading for many policy makers that instinctively lean towards pro-forestry interventions. More importantly, it questions wider applicability of MES as a sustainable approach for integrated watershed (and forestry) management until three critical challenges are overcome: robust scientific evidence of the provision of environmental services, the existence of markets for such environmental services and wider inclusion of, and positive impacts for, the rural poor. Until these critical issues are resolved a ‘market’ approach for environmental services seems a thin cloak for a forest subsidy that will contribute little to rural poverty reduction.

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APPENDIX 1 – Livelihoods survey (July 2003)

Livelihoods Survey Arenal, July 2003

We are conducting a household survey looking at the way in which economic activities in this area affect the quality of life of the local people. The survey is a part of wider international research and all information collected is completely confidential.

The overall objective of the research is to be able to clearly understand how to manage a catchment in an integrated manner that increases the well-being of the people living in the upper catchment area and the quality of the water resources in the lower catchment area.

Your opinion is the basis on which any policy recommendation is made and is greatly valued.

Thank you very much.

A. BASIC INFORMATION

1. LOCATION		
Province	Address:	Name of interviewee:
Ward		Head of household code (see, p.12):
District		Home husband (Husband, father, single); ☐ (01)
Telephone		Holiday husband (returning migrant worker) ☐ (02)
		Female (Single, abandoned, widow etc.) ☐ (03)
		Pensioner; ☐ (04)
		Other ☐ (05)
Date: ___ / ___ / 2003 (day / month/ year)		Interview code: ___ (A/G/F) (day) (number)

2. SURVEY OUTCOME		
Occupied household	Completed..... 01	Incomplete 02
	Survey complete..... 03	Refuse to give information..... 05
	Survey incomplete..... 04	Absent..... 06
		Difficult access..... 07
		Language or illness difficulties..... 08
Household empty	For rent or sale..... 09	Abandoned..... 11
	Under construction..... 10	Other..... 12

3. HOUSEHOLD MEMBERS				
Sex/Age	Less than 5 years	5-15 years or more	15 years or more	Total
Male				
Female				
Total				

4. HOUSEHOLD TYPE	
Detached	☐ 01
Semi-detached	☐ 02
Apartment/flat	☐ 03
Shack	☐ 04
Other	☐ 05

5. This household...	
...is totally paid for?	☐ 01
...is mortgaged?	☐ 02 monthly(C)
...is rented?	☐ 03 monthly..... (C)
....is under ownership dispute?	☐ 04
Other (loaned, concession)	☐ 05

6. The household's drinking water supply is ...	
...reticulation within the household?	☐ 01
...reticulation outside the household but within the lot/general property?	☐ 02
...reticulation outside the property?	☐ 03
No reticulation	☐ 04

7. Non-drinking water is provided by...	
...the A and A aqueduct?	☐ 01
...a rural or municipal aqueduct?	☐ 02
...a well?	☐ 03
...a river, stream or spring?	☐ 04
...rain or other?	☐ 05

8. What type of sanitation do you have?	
Sealed sewage system	☐ 01
Septic tank	☐ 02
Latrine	☐ 03
Another system	☐ 04
None	☐ 05

9. Household lighting is provided by...	
...the national grid?	☐ 01
...a private electricity company?	☐ 02
...by kerosene?	☐ 03
Other? _____ (specify)	☐ 04

10. What do you cook with?		
Electricity		☐ 01
Gas		☐ 02
Fuelwood		☐ 03
Other	(specify)	☐ 04
None		☐ 05

11. How many bedrooms does the house have?
No. bedrooms.....

12. Does the household have any of the following...		
	Yes	No
...telephone land-line?	☐ (01)	☐ (02)
...fridge?	☐ (01)	☐ (02)
...microwave?	☐ (01)	☐ (02)
...hot water shower?	☐ (01)	☐ (02)
...hot water tank?	☐ (01)	☐ (02)
...washing machine?	☐ (01)	☐ (02)
...water storage tank?	☐ (01)	☐ (02)
...computer?	☐ (01)	☐ (02)
...internet access?	☐ (01)	☐ (02)
...hi-fi?	☐ (01)	☐ (02)
...video recorder?	☐ (01)	☐ (02)
...colour television?	☐ (01)	☐ (02)
...private vehicle?	☐ (01)	☐ (02)

Notes:

B. SOCIO-DEMOGRAPHIC DATA

Line number	13. Name	14. Gender	15. Edad	16. Place of birth	17. Year of arrival	18. Residency 5 yrs ago	19. Occupation	20. Education
Circle the name of the interviewee.	Note the names of all the household members over 15 years. Begin with the head of the household. {*See the definition below of residency}	¿Is male (01) or female (02)?	¿How old is (person 1, etc.)?	When (name) was born where was his/her mother living? This ward? (01) Another ward? (02) Another country? (03) {Note name of country}	¿When did (person 1 etc.) start living in Costa Rica? Before 1993 (01) After 1993 (02) (Note year of arrival)	¿Where was.... (person 1, etc.) living in July 1998? This ward? (01) Another ward? (02) Another country? (03)	¿What is the principle occupation of (person 1, etc.)? Livestock (01) Agriculture (02) Tourism (03) Research/teaching (04) Government (05) Forestry (06) Other (07)	¿How many years of completed education has each adult? Calculate years passed in full Example: Primary (6 years); Secondary (5-6 years); Uni (4 years); Other (years?).
1.	Household head:							
2.								
3.								
4.								
5.								
6.								
7.								
8.								
9.								
10.								

***Household resident:** A person, who usually lives in the same home, and when the person is not absent for a period of six months. However, if the person has less than six months permanent residency, does not live anywhere else, and intends to continue living there, he/she should be considered a household resident. (Source: Costa Rican National Statistics Office, INEC).

C. REMITTANCES

21. Has any household resident moved to live outside the Monteverde area?

Yes ☐ 01 No ☐ 02
(GO TO No. 25)

Where?

This ward (01)
Another ward (02)
Another country (03)

Men		
Women		
Total		

22. Have as anyone left the country in the last five years (1998-2003)?

Yes ☐ 01

No ☐ 02

Men		
Women		
Total		

23. Does any household member regularly receive economic support from family or friends living outside of Monteverde?

Yes ☐ 01

No ☐ 02
(GO TO No. 25)

24. How much money does the household regularly receive (month, quarter, year, etc.)?

----- Colones per -----

D. HOUSEHOLD LAND AREA

25. Are you the owner of any land?

Yes ☐ (01) No ☐ (02)

26. How much land do you own?

----- ☐ (ha) ☐ (manzanas) ☐ (m²)

27 Do you have a title deed for the land?

Yes ☐ (01) No ☐ (02)

28 Do you use the land for the following uses...

Land use	Yes	No	When did you start using the land for this purpose (E.g. 1994.)?
...temporary crops?	☐ (01)	☐ (02)	
...permanent crops?	☐ (01)	☐ (02)	
...pasture (livestock)?	☐ (01)	☐ (02)	
...tourism?	☐ (01)	☐ (02)	
...forestry (natural/plantation)?	☐ (01)	☐ (02)	
...Other?.....(specify)	☐ (01)	☐ (02)	

29. Which are the three most important land uses for the household?			
	Forestry (01); Agriculture (02); Pasture (03); Tourism (04); Other (05, specify).	What is the current size?	What was the size when you started?
		Indicate: ha/manzana/m ²	Indicate: ha/manzana/m ²
1.			
2.			
3.			
Calculate the percentage of forestry Current forestry = forestry area/ total		Total:	GROUP A <25% forestry ☐ (01) GROUP B 25% - 75% forestry ☐ (02) GROUP C >75% forestry ☐ (03)

30. Do you think that there are benefits from forestry?	
Yes ☐ 01	No ☐ 02

31. What are the benefits that forestry offers?		
	DON'T PROMPT	
POSSIBLE BENEFITS	Yes	No
1. Biodiversity, environment, conservation, tourism, etc.	☐ (01)	☐ (02)
2. Water resources	☐ (01)	☐ (02)
3. Carbon sequestration?	☐ (01)	☐ (02)
4. Flood/drought protection?	☐ (01)	☐ (02)
5. Other (specify) _____	☐ (01)	☐ (02)

32. Do you know about the Costa Rican government's policy of Payment for Environmental Services?	
Yes ☐ 01	No ☐ 02

33. Do you receive payments from the Payment for Environmental Services policy?	
Yes ☐ 01	No ☐ 02 (GO TO No. 35)

34. Since when have received these payments?	
Year: _____	

35. Which are the three main reasons why you participate in Payment for Environmental Services? DON'T PROMPT		
REASONS	Yes	No
...cash payments (supplement family income)	☐	☐
...technical assistance	☐	☐
...improve the land value	☐	☐
...property title	☐	☐
...strengthen property rights (against land invasions)	☐	☐
...protect property rights for future generations	☐	☐
...increase the value of forestry products	☐	☐
...encouragement by a third party	☐	☐
...public relations	☐	☐
...other (specify) _____	☐	☐

36. Have you applied for the Payment for Environmental Services before?	
Si ☐ 01	No ☐ 02

37. Which are the three main reasons why you do not participate in the Payment for Environmental Services? (specify and explain briefly)	
REASON	SPECIFY/EXPLAIN
1.	
2.	
3.	

Notes:



E. EXPENDITURE ANALYSIS

i) BASIC FOOD BASKET

38. Can you estimate how many Colons your family spends on the following foods on a weekly or monthly basis?			
MAIN GROUPS	NOTES	Colons (weekly 01; monthly 02)	
a) Sugar			
b) Cereals	Maize, flour, bread, rice, spaghetti, etc.		
c) Fat-based spreads	Margarine, butter etc.		
d) Meat, preserved meats and fish	Fresh or frozen, including chicken		
e) Beans	Black, red, etc.		
f) Dairy products	Milk (fresh, powder), cheese, cream, etc..		
g) Fresh fruit and vegetables	Banana, papaya, oranges, tomatoes, yuca, etc.		
h) Eggs			
i) Root and tuber crops	Potato, carrot, onion, etc.		
j) Others	Tobacco, coffee, carbonated drinks, beer/alcohol, condiments, biscuits, etc.		

ii) DAILY LIVING EXPENSES

39. Can you estimate how many Colons your family spends in an average month on the following items?		
CATEGORY	NOTES	Colons
1. Education and training	School (excluding clothes, see below), training in any form (college, business etc.)	
2. Health	Medicines, social security, hospita/clinicl expenses, gym, etc..	
3. Clothes	Shirts, shoes, etc., including school and work clothes etc.	
4. Transport	Tickets, petrol, vehicle repairs, tyres, etc.	
5. Gas, electricity, telephone, water etc.	Include all the private and public utilities that the house uses.	
5a. Electricity alone	Estimate the monthly electricity bill separate from the rest. .	

iii) HOME MAINTENANCE EXPENSES

40. Can you estimate how many Colons the family spent in the last year on the following items?		
Categoría	Notas	Colones
1. Vivienda	Reparación, mano de obra, tanques etc.	
2. Inversión en la finca	Vehículos, peones, materiales, etc.	
3. Ahorro	Cualquier cuenta o inversión bancaria	
4. Empleada doméstica(o)		

F. INCOME ANALYSIS

41. How many people in the household received a salary or income payment (average annual monthly income for coffee or milk production) in the last month?

Person	Gender	Age	Employment location	Monthly Colons
	Male (01); Female (02).		This ward (01); Other ward (02); Other country (03).	<i>Don't know (99); Refuse (88).</i>
1.				
2.				
3.				

42. In the last month, did anyone in the household receive...?

	Yes	No	How many people?	Month	Annual	Monthly Colons <i>Don't know (99); Refuse (88).</i>
...rental income (property, vehicle, etc.)?	☐ (01)	☐ (02)		☐ (01)	☐ (02)	
...education grant?	☐ (01)	☐ (02)		☐ (01)	☐ (02)	
...food grant?	☐ (01)	☐ (02)		☐ (01)	☐ (02)	
...housing grant?	☐ (01)	☐ (02)		☐ (01)	☐ (02)	
...government subsidy?	☐ (01)	☐ (02)		☐ (01)	☐ (02)	
...state pension?	☐ (01)	☐ (02)		☐ (01)	☐ (02)	
...private pension?	☐ (01)	☐ (02)		☐ (01)	☐ (02)	
...remittance from Costa Rica?	☐ (01)	☐ (02)		☐ (01)	☐ (02)	
...remittance from another country?	☐ (01)	☐ (02)		☐ (01)	☐ (02)	
...other? (specify) _____	☐ (01)	☐ (02)		☐ (01)	☐ (02)	

SOURCES OF NON-MARKET INCOME (OWN HOUSEHOLD PRODUCTION OR NATURAL RESOURCE HARVESTING)

43. In the last year, did the household conduct any of the following activities...

ACTIVITY	Example:	Solely for sale	Solely for household consumption	Both sale and own use	No
...grow or harvest temporary crops?	<i>Maize, beans, yuca, etc.</i>	☐ (01)	☐ (02)	☐ (03)	☐ (04)
...grow or harvest permanent crops?	<i>Tree crops, coffee, etc.</i>	☐ (01)	☐ (02)	☐ (03)	☐ (04)
...reared or cared for livestock, poultry or other animals?	<i>Cattle, chicken, pigs, etc.</i>	☐ (01)	☐ (02)	☐ (03)	☐ (04)
...harvested forestry products?	<i>Honey, fuelwood, hunting, eggs etc.</i>	☐ (01)	☐ (02)	☐ (03)	☐ (04)

G. VULNERABILITY CONTEXT

44. How would you rate the impact of the following variables on the daily life of the household over the last year?

VARIABLE	Very positive	Positive	Neutral	Negative	Very negative	(Explain if necessary)
...quality of surface water/runoff	☐ (01)	☐ (02)	☐ (03)	☐ (04)	☐ (05)	
...public transport	☐ (01)	☐ (02)	☐ (03)	☐ (04)	☐ (05)	
...economic immigration of Nicaraguans	☐ (01)	☐ (02)	☐ (03)	☐ (04)	☐ (05)	
...immigration of other foreigners	☐ (01)	☐ (02)	☐ (03)	☐ (04)	☐ (05)	
...condition of roads and bridges	☐ (01)	☐ (02)	☐ (03)	☐ (04)	☐ (05)	
...policy of the Cheese Factory	☐ (01)	☐ (02)	☐ (03)	☐ (04)	☐ (05)	
...input costs for agricultural	☐ (01)	☐ (02)	☐ (03)	☐ (04)	☐ (05)	
...access to national markets	☐ (01)	☐ (02)	☐ (03)	☐ (04)	☐ (05)	
...access to international markets	☐ (01)	☐ (02)	☐ (03)	☐ (04)	☐ (05)	
...government agricultural subsidies	☐ (01)	☐ (02)	☐ (03)	☐ (04)	☐ (05)	
...Payment for Environmental Services	☐ (01)	☐ (02)	☐ (03)	☐ (04)	☐ (05)	
...Colón:Dólar exchange rate	☐ (01)	☐ (02)	☐ (03)	☐ (04)	☐ (05)	
...USA economy	☐ (01)	☐ (02)	☐ (03)	☐ (04)	☐ (05)	
...international meat price	☐ (01)	☐ (02)	☐ (03)	☐ (04)	☐ (05)	
...international coffee price	☐ (01)	☐ (02)	☐ (03)	☐ (04)	☐ (05)	
...national dairy prices	☐ (01)	☐ (02)	☐ (03)	☐ (04)	☐ (05)	
...access to finance and loans	☐ (01)	☐ (02)	☐ (03)	☐ (04)	☐ (05)	
...tourist revenue	☐ (01)	☐ (02)	☐ (03)	☐ (04)	☐ (05)	
...extension services and technical assistance	☐ (01)	☐ (02)	☐ (03)	☐ (04)	☐ (05)	
...other (specify) _____	☐ (01)	☐ (02)	☐ (03)	☐ (04)	☐ (05)	

45. From the previous list, which are the **three** factors that most affect your household and how have you responded?

	FACTOR	RESPONSE
1.		
2.		
3.		

H. SOCIAL CAPITAL

46. Is anyone in the household a member of any of the following associations or cooperatives...

	Si	No
...agricultural, livestock or coffee cooperative?	☐ (01)	☐ (02)
...tourism or conservation association?	☐ (01)	☐ (02)
...community association?	☐ (01)	☐ (02)
...development association (e.g. women, youth, etc.)?	☐ (01)	☐ (02)
...another association? (specify) _____	☐ (01)	☐ (02)

47. From the previous list, how would you rate the impact of each association on your household?

	Muy positivo	Positivo	Neutral	Negativo	Muy negativo
... agricultural, livestock or coffee cooperative	☐ (01)	☐ (02)	☐ (03)	☐ (04)	☐ (05)
... tourism or conservation association	☐ (01)	☐ (02)	☐ (03)	☐ (04)	☐ (05)
... community association	☐ (01)	☐ (02)	☐ (03)	☐ (04)	☐ (05)
... development association (e.g. women, youth, etc.)	☐ (01)	☐ (02)	☐ (03)	☐ (04)	☐ (05)
...other association	☐ (01)	☐ (02)	☐ (03)	☐ (04)	☐ (05)

Notas:

I. CONJOINT VALUATION ANALYSIS

Note for enumerators: *It is not necessary to read this introduction to the respondent. The enumerator must familiarise himself/herself with the methodology of the Conjoint Analysis and explain the exercise in language suitable for each type of respondent. However, it is important that the following phrases are included in the general and individualized explanations: compensation and associated costs. Later, explain to the respondent the process involved in showing the sequence of four cards..*

"Integrated catchment management involves improved use of land in the upper catchment area in order to maximize the private benefits of the quantity and quality of water resources for property owners and inhabitants in the lower catchment area. **In some cases, this is achieved through a payment mechanism, or compensation, that the water users in the lower area pay to the property owners in the upper area for the environmental services that improved land management provides.** Although this seems fair it also involves a cost. In this case, an improved land use could benefit not only the owner of the farm but also ICE (National Institute for Communications and Electricity) and the PRAT irrigation scheme. In the case of ICE, the internalization of environmental costs from improved catchment management could result in an increase in electricity tariffs."

The following four land use options for your property include the option of maintaining the current land use situation plus a combination of policy options that include different levels of payment for environmental services with an associated contractual obligation in years, increases in the electricity tariff, investment in road infrastructure, and access to government subsidies. For each alternative we request you to choose between 0 and 10 how likely you are to commit to this land use option fully.

The information you provide is extremely valuable in order to determine the viability of a market for environmental services in the Monteverde area.

Methodology:

- (1) Referring to the forestry land cover from question # 29 determine the household's relevant determine the household' classification (A: <25% forestry, B: between 25-75% forestry, or C: >75% forestry).
- (2) Take the cards that correspond to the household's land use category: A/yellow; B/violet; C/grey.
- (3) Introduce the trade-off scenarios to the respondent.
- (4) Show the cards in the following order:
 - a) ALWAYS show the 'Status Quo' card first (blue card) and obtain a rating score.
 - b) Next, present in numerical order three cards from the category group. Show the first card, mark the rating, and then place it at the back of the back. Follow this card drawing sequence for all the subsequent households.

"In the following forestry cover option for your property (be it conserving indigenous forest or forest regeneration) for improved catchment management, would you be prepared to commit to the programme if it included the following options (SHOW CARD):

- 0: Definitely will **NOT COMMIT** to the scenario
 10: Definitely will **COMMIT** to the scenario
 5: Neutral reaction to the scenario

Note the results below and the card (e.g.: A1, B4, C6.)		Values										Notes
		0	1	2	3	4	5	6	7	8	9	
0	Uso Actual											
1												
2												
3												

Notes:**Section A, number 1.**

- i) Household head code: If the head is male/female and pensioner, classify as a pensioner.
- ii) 'Holiday husband' refers to a person who works outside of the Monteverde area and no eats/sleeps there each day but returns regularly (weekend, monthly, holidays, etc.).
- iii) Survey code: 'A' refers to Agriculture (coffee); 'G' to livestock (milk/beef); 'F' to forestry/tourism. Due to the diversified base of most land-owning households, here a household with coffee production is classified as 'A' even though it may have greater livestock land holdings. The number refers to the number of completed interviews on a daily basis, i.e. '1' is first survey of 18/07; '2' is the second survey of 18/07 etc.

Section D, number 29.

- i) It is very important to calculate the percentage of forested land and classify the household into one of the three groups:
 - Group A <25% forest;
 - Group B 25-75% forest;
 - Group C >75% forest.

This information determines which cards should be shown in the final section I.

Appendix 2 Transcripts of *Rio Chiquito* interviews (February 2005)

Question template:

1. Por qué participa Usted en el Programa de Pago por Servicios Ambientales?
Why do you participate in the PES programme?
2. Cómo se informó del PSA?
How did you find out about the programme?
3. Por qué cree Usted que algunas personas se interesen en el PSA y otras no?
Why are only some people interested in the programme?
4. Por qué hay propietarios que están en contra del PSA?
Why are some property owners not in favour of the programme?
5. Ha considerado la opción de renovar su contrato con FONAFIFO? Por qué?
Are you considering re-newing your contract and, if so, why?
6. Cree Usted que el PSA debería cambiar en algún sentido? En qué?
Do you think the programme could be improved?
7. Qué otras actividades económicas desarrolla Usted en su propiedad?
What are other income sources do you have from your land?
8. Cuánto representa del ingreso total familiar lo que recibe en PSA?
What is the total amount you receive from the programme?
9. Qué tamaño tiene su propiedad?
How many hectares do you have?
10. De esa propiedad cuánto tiene bajo contrato de PSA?
How much of your land is contracted to the programme?

Entrevistas a beneficiarios de PSA o interesados
MONTEVERDE, Costa Rica
3 de febrero, 2005

Ubicación de la propiedad San Gerardo, Cuenca alta río Chiquito

1. Hipólito Quesada

Teléfono: 645-5656, 645-5930

Por qué participa Usted en el Programa de Pago por Servicios Ambientales?

Le interesa el PSA porque desea conservar el bosque, especialmente debido a que dentro de su propiedad están las principales nacientes que abastecen el río arenal. Quiere seguir manteniendo la montaña porque la montaña es vida.

Cómo se informó del PSA?

Hace como diez años le comentaron unos Señores de San Carlos de la posibilidad de que le compensaran por proteger el bosque, posteriormente un Ingeniero forestal de Monteverde le ofreció mayor detalle del trámite y lo motivó para realizarlo.

Por qué cree Usted que algunas personas se interesen en el PSA y otras no?

Considera que en Monteverde a todos los propietarios de fincas les interesa este programa. Sin embargo, les desmotiva la inversión que hay que hacer para lograr accederlo. Por ejemplo, hay que presentar planos catastrados, declaraciones juradas, presentarse en las oficinas, lo que implica altos costos sin que eso asegure que van a recibir la compensación efectivamente. Además, los trámites son lentos y difíciles para su nivel de preparación.

Ha considerado la opción de renovar su contrato con FONAFIFO?

Si, actualmente está realizando los trámites para renovarlo pues están en el límite de vencimiento.

Por qué?

Necesita esos recursos para seguir sosteniendo la finca y pagando a los que trabajan para darle mantenimiento.

Cree Usted que el PSA debería cambiar en algún sentido? En qué?

Considera que los pagos deberían de realizarlos por anticipado, especialmente porque el dinero que reciben es muy limitado. Eliminar tanto proceso –papeleo- para que le paguen. Además que los trámites deberían ser más ágiles y eficientes.

Qué otras actividades económicas desarrolla Usted en su propiedad?

Ganadería

Cuánto representa del ingreso total familiar lo que recibe en PSA?

PSA representa el 50% de los ingresos que percibe.

Qué tamaño su propiedad?.

75 hectáreas

De esa propiedad cuánto tiene bajo contrato de PSA?
52 hectáreas.

2. Rodolfo Quesada
San Gerardo, Tilarán
645-5626

Por qué participa Usted en el Programa de Pago por Servicios Ambientales?
Desea conservar el bosque, considera que la otra alternativa sería talarlo para la ganadería o venderlo.

Cómo se informó del PSA?
Ha escuchado a otros propietarios relacionarse al tema.

Por qué cree Usted que algunas personas se interesen en el PSA y otras no?
Considera que en general a todos les interesa, que se tiene muy buena apreciación del Programa.

Ha considerado la opción de renovar su contrato con FONAFIFO?
El ha estado realizando los trámites para acceder al PSA pero no lo ha logrado por no tener la escritura. El cuenta con el plano catastrado y otros requisitos pero no son suficientes, teme que después de que incurra en gastos no logre obtener los recursos y pierda lo invertido. Además,

Por qué?
Necesita recursos financieros.

Cree Usted que el PSA debería cambiar en algún sentido? En qué?
Buscar la forma en que aunque no se cuente con escritura los poseedores de las fincas puedan obtener recursos, que al final van a ser reinvertidos en el cuidado y mantenimiento de ésta. Además, considera que el Estado debe ser conciente que si no pueden obtener los derechos de propiedad por tratarse de áreas protegidas debe ya sea pagar por las tierras o permitirles la generación de ingresos para su mantenimiento.

Qué otras actividades económicas desarrolla Usted en su propiedad?
Ganadería

Cuánto representa del ingreso total familiar lo que recibe en PSA?
Aun no ha tenido ingresos.

Qué tamaño su propiedad?
80 hectáreas.

De esa propiedad cuánto tiene bajo contrato de PSA?
65 hectáreas.

3. Evelio Chavarría A.
San Gerardo, Cuenca alta Río Chiquito
Teléfono: 645-5659, 645-5026 (hermano)

Por qué participa Usted en el Programa de Pago por Servicios Ambientales?

Por su alto interés en la conservación. Considera el PSA como una buena alternativa debido a que no hay acceso a créditos bancarios que les permita cubrir los costos de mantenimiento de la finca u otras obligaciones.

Cómo se informó del PSA?

Por medio de COOPE EL DOS.

Por qué cree Usted que algunas personas se interesen en el PSA y otras no?

A todos los propietarios de bosque les interesa, varias personas que él conoce que tienen bosque están con PSA. Quienes no lo tienen es porque no asimilan tener que realizar tantos trámites y completar la documentación expresa en los requisitos.

Ha considerado la opción de renovar su contrato con FONAFIFO?

Está realizando los trámites solo que no está satisfecho con los resultados. FONAFIFO le ha denegado la posibilidad debido a que no cuenta con la información posesoria de su propiedad. Aunque tiene más de 20 años de tenerla no cuenta con la escritura y, por lo tanto, no puede lograr renovar su contrato. Esta muy desmotivado pues considera que el Estado debería pagarle la finca o permitirle protegerla, pero que para eso requiere recursos financieros, la mano de obra para el cuidado es muy costosa y necesita recursos para pagar.

Considera que lo que FONAFIFO les paga no es lo adecuado. Pues se ha informado que la tarifa por hectárea es US\$80/ha/año, sin embargo, lo que les están ofreciendo actualmente es ¢17.000/ha/año, y hasta el año pasado era ¢14.000.00/ha/año.

Por qué?

Necesita recursos para sostener su propiedad y para atender sus responsabilidades familiares.

Cree Usted que el PSA debería cambiar en algún sentido? En qué?

Considera que el monto es muy bajo, debería ser al menos ¢50.000/ha/año. Además, reducir la cantidad de trámites y de documentación, así como agilizar el proceso. Eliminar el requisito de posesión de finca o dar excepción a propietarios de ciertas zonas o con cierto número de años de tener la propiedad.

Qué otras actividades económicas desarrolla Usted en su propiedad?

Ganadería

Cuánto representa del ingreso total familiar lo que recibe en PSA?

El 20% de su ingreso.

Qué tamaño su propiedad?.

76 hectáreas.

De esa propiedad cuánto tiene bajo contrato de PSA?

60 hectáreas.

4. Albino Carranza
Teléfono 693-8046
Calendaria de Abangares

Por qué participa Usted en el Programa de Pago por Servicios Ambientales?

Participa en el Programa de PSA debido a que le permite generar recursos financieros. Ha ejercido mucha influencia que el Ingeniero de COOPE EL DOS lo asesore y lo motive a la siembra de árboles para el acceso a PSA en la modalidad de agroforestal. El productor asocia su siembra con los servicios ambientales de belleza escénica y protección de suelos mediante barreras “tapa vientos”.

Cómo se informó del PSA?

Es integrante de una Asociación de Desarrollo Comunal y MINAE les informó a través del COOPE EL DOS.

Por qué cree Usted que algunas personas se interesen en el PSA y otras no?

Considera que la comunidad conoce del PSA que más la limitante es el presupuesto que destina FONAFIFO para esa zona. Lo que hace que propietarios de bosques o agricultores interesados no puedan acceder dicho sistema.

Ha considerado la opción de renovar su contrato con FONAFIFO? Por qué?

Si, es una buena alternativa de sembrar árboles, embellecer el paisaje y generar ingresos. Considera que participar en este programa también le ha permitido concienciar en la importancia de conservar y reforestar.

Cree Usted que el PSA debería cambiar en algún sentido? En qué?

El trámite de pago es lento, aunque la Cooperativa le ha ayudado con lo trámites de manera ágil aún no ha recibido su pago, que estaba presupuestando para diciembre.

Qué otras actividades económicas desarrolla Usted en su propiedad?

Producción de café.

Cuánto representa del ingreso total familiar lo que recibe en PSA?

Aún no sabe.

Qué tamaño su propiedad?.

7 hectáreas

De esa propiedad cuánto tiene bajo contrato de PSA?

2000 árboles.

5. Alexis Torres
645-5146
San Gerardo

Por qué participa Usted en el Programa de Pago por Servicios Ambientales?

Por medio de la Cooperativa COOPE EL DOS ha logrado conservar y generar recursos. Considera que es justo que los propietarios que están en la cuenca alta del Arenal debieran ser compensados económicamente por los servicios que ofrecen sus bosques.

Cómo se informó del PSA?

Por qué cree Usted que algunas personas se interesen en el PSA y otras no?

Por qué hay propietarios que están en contra del PSA?

Algunos tienen la idea que el Gobierno se deja los recursos y no los transfiere al propietario del bosque adecuadamente, lo cual les resulta molesto y les genera desconfianza para participar en el programa.

Ha considerado la opción de renovar su contrato con FONAFIFO? Por qué?

Sí, porque lo percibe como una alternativa de generación de recursos, es una ayuda al productor pues con las leyes el MINAE les restringe el uso de sus tierras. Ha participado en dos ocasiones, actualmente tiene dos años sin renovarlo pero piensa hacerlo pronto. Considera interesante que inicialmente se tenía el conocimiento erróneo en la comunidad que solo ciertas organizaciones tenían acceso a esos recursos pero que quiere hacer los trámites de manera independiente, sin intermediación.

Cree Usted que el PSA debería cambiar en algún sentido? En qué?

Dar más información y fortalecer la confianza.

Qué otras actividades económicas desarrolla Usted en su propiedad?

Ganadería y está planeando desarrollar un proyecto ecoturístico, debido a que su finca tiene muchísimo atractivos como cataratas, variedad de especies de aves. Planea sembrar árboles para proteger y ofrecer alimento a los animales y tener a futuro un zoológico o espacio de rescate de fauna.

Cuánto representa del ingreso total familiar lo que recibe en PSA?

10%.

Qué tamaño su propiedad?.

140 hectáreas.

De esa propiedad cuánto tiene bajo contrato de PSA?

100 hectáreas la primera vez y 50 la segunda vez. Tiene dos años sin renovar sin embargo espera hacerlo pronto, más ahora que él conoce que lo puede hacer haciendo él mismo la tramitología y que no depende de una organización para realizar los trámites. Quiere sustituir la ganadería por proyecto ecoturístico.

6 . Ing. Forestal Juan Ulloa

Asesor de productores

Coope El Dos

Considera que los finqueros están muy interesados en participar del PSA, especialmente porque las leyes han restringido el uso del suelo y necesitan alternativas de generación de ingresos. Sin embargo, la limitación más importante radica en la modificación de ley que ha establecido como requisito tener información posesoria de la propiedad. Esta situación ha frenado la renovación de

los contratos. Otra limitante ha sido el presupuesto que ha establecido FONAFIFO para el área, el número de hectáreas por modalidad ha bajado.

El PSA es una excelente alternativa para que los finqueros tomen la decisión de conservar el bosque y con ello conservan la biodiversidad y el suelo. En ésta área el bosque es muy importante porque abriga a los suelos del viento que es muy fuerte, consecuentemente erosiona mucho los terrenos. El programa de reforestación como rompevientos que se inició hace como 15 años ha favorecido mucho a los campesinos porque les mejoró mucho los suelos y la producción de leche. La reforestación comercial en los alrededores de Monteverde no interesa mucho por el costo de oportunidad de la tierra. Todos prefieren dejar enmontar con especies nativas porque ven una oportunidad futura con el ecoturismo que se ha desarrollado en la zona.

La mayoría de los propietarios combina el PSA con la ganadería y el café. Actualmente, la alternativa de los sistemas agroforestales ha sido una muy buena opción para los propietarios. Sin embargo, exige desde un inicio que las fincas estén inscritas. Esta modalidad les resulta muy atractivas debido a que con la siembra de 3000 árboles genera alrededor de \$500.000 el año 1, \$200.000 el año 2 y \$80.000 el año 3, el pago por árbol es cercana a \$352..

A la gente también le interesa mucho conservar las fuentes de agua. Ahora saben que para el turismo es fundamental conservar el agua, si no hay agua de buena calidad el turismo no llegaría. Por ello la gente pelea⁵ tanto por el agua.

⁵ A finales del mes de febrero los vecinos de Monteverde se tiraron a las calles, cerraron el paso a la comunidad para protestar por la concesión de agua que se había dado a una compañía privada para que desviara para irrigación dos quebradas en la zona. Por presión de la comunidad, el estado se vio obligado a eliminar la concesión.