The social impacts of payments for environmental services in Costa Rica

A quantitative field survey and analysis of the Virilla watershed

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ENVIRONMENTAL ECONOMICS PROGRAMME

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Executive Summary

When Costa Rica set up its Payments for Environmental Services (PES) programme in 1995, it was widely praised for pioneering global efforts to introduce compensation systems for environmental services. The programme seeks to encourage forest protection and management by paying forest owners for four environmental services provided by their forests: carbon, biodiversity, watershed management, and landscape beauty. This programme was the result of a process of institutional capacity building initiated decades previously in which an institutional framework, with a solid legal, organisational and social base was established.

Objectives and methodology
Although the PES scheme is not a social welfare programme, from the outset the state and various social organisations assumed that it would contribute to rural poverty alleviation in Costa Rica. It became apparent that the programme was indeed having an impact on the quality of life of communities and individuals in rural areas. However, little was known about the impact on the poorer sections of the population. The aim of this study was to look at the impacts the PES programme has on poverty and other social factors, using as a basis for the analysis the *Sustainable Livelihoods Framework*, and examining the effects the programme has on financial, human, social, physical and environmental assets. The result is an analysis of the social effects of the PES in the Central Volcanic Mountain Range Conservation Area (ACCVC), with a particular focus on the Virilla watershed.

The study area
The area has been closely involved in the development of the PES programme since its commencement, and hosted the first international certifiable tradable offsets (CTO) transaction between Costa Rica and the Government of Norway in 1997. Other voluntary agreements have been signed to improve watershed conditions. These include:

- Costa Rica-Norway Reforestation and Forest Conservation AIJ Pilot Project (carbon sequestration) and CNFL Project (watershed conservation);
- Payments for watershed conservation in strategic catchments of the Florida Ice & Farm brewery project; and the
- Voluntary agreement and water use charges for watershed protection by the Empresa de Servicios Públicos de Heredia.

Information about the impact of the programme on household assets was obtained through a personal survey conducted among 35 landowners currently receiving payments and 15 landowners who are not enrolled in the scheme. Full lists of participants were obtained from the organisations involved, and landowners were then categorised by farm size in order to determine the equity implications of the Payments, as the number of small landowners in the watershed is relatively small compared with the total number of beneficiaries.

The fieldwork found that in this particular watershed, landowners were relatively wealthy and well educated, thus limiting the conclusions that the study could have in relation to poverty alleviation. Land use is highly competitive, with coffee and dairy farming among the main agricultural activities, followed closely by industry and service-oriented activities. It is worth noting that most of the landowners taking part in the survey were not dependent on their land for their livelihood; 65 per cent of them were either professionals (lawyers, engineers, etc), employed in trade or commerce, or had retired from their former professions.

According to the survey, environmental benefits in the form of protection of water sources, improvement of water quality, protection of forest for present and future generations, and improvement of degraded lands were the most important benefits obtained from the Payments for Environmental Services programme. Economic benefits, such as the Payments and tax relief, were reported by a third of the sample. Protecting the land against squatters was also seen as an important benefit of the programme. Other benefits reported included potential for new economic activities (such as ecotourism projects), education, and technical support received from FUNDECOR.

Impacts on financial assets: It is important to bear in mind that the PES scheme was not created as a "poverty reduction" strategy. However, it does have significant impacts on the household budget. According to the field study, the main financial impacts reported were:

- an average increase of approximately 15% in the household disposable income (equivalent to an average of approximately $4,200/yr per property, with a range of $880-$11,200);
- a higher level of investment in the farm (eg. signage, paths, etc) in forested sections, and investment to increase productivity in other areas of the farm (i.e. livestock);
- a variable level of job creation, mostly in relation to hiring of occasional workers (average pay $13.5 per person per day). It is possible that this has an effect on migratory labour (eg. from Nicaragua), but the survey revealed little information on this;
- high transaction costs are, but most landowners accessed PES through intermediaries and did not know what was required of them or how much it cost them to access the programme. Intermediaries could charge 12 to 18 per cent (CNFL does not charge). In general, there was little knowledge among the landowners how the PES works.

Impacts on social assets: The main impacts of the PES programme in terms of social assets include a process of institutional innovation, in order to adapt to the PES; a process of “de-bureaucratisation” to increase effectiveness of the PES - dealing more closely with intermediaries and local entities and less at the national level; promotion of voluntary agreements to improve the environment; promotion of organisational and community innovation, and fostering of inter-institutional co-ordination, among FUNDECOR, FONAFIFO, MINAE, CNFL, and other institutions such as the Ministry of Education, through the environmental education programme.

Impacts on human assets: The main impact on human assets relates to capacity building at different levels. There has been a substantial improvement in environmental education and solid waste management, involving schools, parents and civil society. Working with children and youth is an important investment for the long-term durability of the programme. Landowners benefit directly from capacity building and advice from FUNDECOR and CNFL on the planting process, fertilisation, management, design and maintenance of paths, harvesting, and minimising the risk of illegal hunting within the properties. There are also important benefits in relation to capacity building in agro-conservation and integrated management of small farms (agro-forestry, organic compost and fertilisers, wormeries, improvement of species for feeding livestock, etc.) with a holistic approach to farm management. All the above have brought ‘new knowledge’ about forestry and farm management, with important impacts on forestry research and policy on both native and

exotic species. Valuable knowledge and awareness has been gained about perceptions of and reactions to the use of natural resources.

Impacts on natural assets: The PES programme has contributed to the protection of approximately 16,500 ha of primary forest, the sustainable management of 2,000 ha of forest, and the reforestation of 1,300,000 ha. Over one million trees in nurseries provided by CNFL have been used in their environmental education programme with children and youth in public areas and gardens. These activities, together with the promotion of live fences and sustainable agriculture and livestock practices, help guarantee the protection of existing forest and have positive spin-offs for biodiversity and prevention of soil erosion by avoiding land use conversion. There have also been important benefits from parallel programmes developed by CNFL for water quality improvement.

Landowners, (especially those with existing forests) consider security against squatters to be one of the main benefits of the PES programme, and over half of the respondents believe that being part of the programme increases the value of their land.

Impacts on physical assets: No major infrastructure has been built as part of any of the PES or parallel projects. However, some of the basic infrastructure from the programme includes the establishment of nurseries, fences and paths.

Observations and recommendations

Financial aspects. The opportunity cost of land and alternative economic activities, such as dairy farming, export-oriented agriculture, and urbanisation, is high in the area. Some landowners would like forest conservation to be their main activity but they believe the payments from the programme would be insufficient to cover the opportunity cost of land. Some landowners specified that delays in payment were a serious limitation of the programme, and affected its credibility.

Transaction costs in terms of waiting time are high and could prevent small landowners from participating in the reforestation scheme, as they cannot afford to leave the property idle while waiting for a decision. The programme specifies that no activity can take place between submission of the proposal and its acceptance.

According to some landowners, a larger cash payment for forest protection or reforestation could result in more people entering the programme or renewing their contracts, as it would make forest activities more competitive compared to other economic activities in the area. The economic incentive remains an important aspect, especially for changing existing land uses (for example, from livestock or pasture to reforestation), although many landowners with forests would continue to protect their forests without the payments. However, they also said that the payment was an additional incentive to continue their efforts to protect forests from other (more profitable) land uses. There were some cases of smallholders who were concerned for the future of their forests, as the low profit margin could force them to sell them in the future.

Prompt payment would be a major development for some landowners, as it would increase their confidence in the system, help them to carry out the agreed tasks, and encourage them to remain within the system. Some landowners were aware of the need to incorporate other land uses into the system, and to urge the relevant institutions to obtain more funds for this.

Education and capacity building: One of the main limitations to access was lack of information about the system. The fieldwork showed that most of the landowners not receiving PES had little or know knowledge of the system, while many of those currently under the PES scheme had little knowledge about key aspects of the programme, such as the length of the contracts, the amount of money and time needed in order to access the programme, initiation costs for reforestation projects, or commissions to intermediaries. Because FUNDECOR or the other intermediaries deal with these processes, the landowners do not know the practical, legal and organisational details of the PES programme.

For some landowners insufficient knowledge on their part, and that of their farm workers, on the best way to manage their environmental resources, has resulted in administrative errors that could leave them with a "black mark". They suggest that MINAE and FUNDECOR prepare a capacity building programme for owners and workers that deals with land management, environmental awareness, and networking between landowners to exchange opinions.

Institutional and Legal Coordination: The PES programme has evolved as a multi-institutional activity. Currently, there are four organisations involved in the process: MINAE, FUNDECOR, FONAFIFO and CNFL. Some landowners are very content with the work of FUNDECOR or CNFL, as it facilitates the process, and helps with technical assistance throughout the project. However, according to some participants there should be more coordination between the institutions with respect to visits to the farm, capacity building, and technical assistance. This would reduce costs both for the organisations and for the landowners, as it would make the procedures easier to deal with.

Inclusion of riparian areas: According to the law, forest adjacent to a river cannot be extracted, and Payments for Environmental Services for reforestation is only granted for areas that are *commercially* viable. There are many properties in the region containing rivers and degraded riparian areas, and although the owners might be willing to regenerate these areas, for non-commercial purposes, they cannot access PES because of legal restrictions. Some national institutions and local projects, landowners and downstream users might benefit if the law were amended to incorporate riparian forest.

Improving access for poorer households: Setting aside forest from other activities within the farm is not always feasible for many small landowners. This study found that many landowners also had livestock, in some cases for generations, on the farm. Many were concerned that livestock were not permitted to graze or seek shelter in the forest during storms. They argued that they had maintained and protected the forests for years before the PES scheme, combining both activities without negative consequences for the forest. It is possible that smallholders who have to keep livestock and have reduced their grazing areas to set aside forest would be adversely affected.

The field study in Virilla found that one of the main limitations for entering the PES programme is actually farm or forest size. It is very difficult for farmers to set aside forest area on the farm rather than combining forestry with other economic activities (for example, shade coffee or shelter for cattle).

While no information was collected in this field survey from poorer households, the authors conducted a parallel study in the northern region of the country to look at effects on small

producers (see Miranda et al. 2003). Three main observations were obtained from this study that illustrated that participation of poorer landowners was limited.

- Poorer households that depend on other governmental benefits such as housing benefit are not entitled to access the PES scheme.

- Smallholders who have been assigned lands under the Agrarian Development Institute (IDA) programme for small farmers are not entitled to access PES, even if their land contains forest, is suitable for forestry activities, or would provide environmental services by improving its land uses.

- Not until very recently were forest activities recognised by the National Bank System for financing (SNB), which is the main source of finance within Costa Rica and whose policies directly affect rural economies. This limited the borrowing capacity of small landowners to co-finance reforestation activities (the PES covers only a percentage of the total costs of reforestation).

Unless issues like these are tackled, it is unlikely that the PES scheme will provide means of poverty alleviation in Costa Rica.

Other pressing issues: Legislation on tree felling should be more flexible. At present, it places many unnecessary restrictions on the on-farm management of the property, increases illegal activities, and deters many people from entering the programme because of the bureaucracy.

With respect to transaction costs, participants suggested that all the requirements of the contract should be requested at the beginning of the contract and not as an on-going process (a common situation in Costa Rica). Moreover, the contract should be renewed automatically if all requirements have been met, unless the proprietor decides otherwise.

Restrictions on future sales of the property should also be examined. At present, all payments must be returned if a landowner sells his property and the new owner does not wish to continue with the PES programme. One suggestion is to eliminate this requirement, especially for forest protection, since the payment was given for services that have already been delivered, and the money has already been invested in the property (the fieldwork also found that most of the money from the PES is invested within the property to comply with the agreement or to increase productivity in other areas of the farm).

An alternative to the current PES programme is the introduction of livestock-forest production systems, as this would be more relevant to the production culture of the area, it would complement existing land use patterns, and would allow landowners to maximise the use of their resources.

Acronyms and abbreviations

ACCVC	Central Volcanic Mountain Range Conservation Area
ARESEP	Regulating Authority for Public Services
AyA	National Aqueduct and Sewerage Company
CNFL	National Power and Light Company
ESPH	Heredia Public Services Company
FONAFIFO	National Forestry Finance Fund
FSC	Forest Stewardship Council
FUNDECOR	Foundation for the Development of the Central Volcanic Range
GAM	Greater Metropolitan Area
ICE	Costa Rican Electricity Institute
IDA	Agrarian Development Institute
MINAE	Ministry of Environment and Energy
NTFP	Non-timber forest product
OCIC	Costa Rican Office of Joint Implementation
PACS	Upper Part of the Rio Segundo Micro-basin
PACV	Upper Part of the Virilla Watershed
PBCV	Lower Part of the Virilla Watershed
PES	Payments for Environmental Services
Plama-Virilla	Environmental Improvement Project for the Upper Part of the Virilla Watershed
SINAC	National System of Conservation Areas
SNB	National Banking System

1 Introduction

In the 1990s, the Costa Rican government adopted sustainable development as its economic model. As a result the country developed a range of innovative processes in its productive systems, information processes, institutional structures, social organisation, and in the design and implementation of its policies. Sustainable use of natural resources is at the core of this process, and since the 1990s the externalities of productive processes have been taken into consideration. During the mid 1990s, following participatory work involving various sectors of society, Costa Rica implemented a programme of Payments for Environmental Services (PES). Through this programme, forest and plantation owners are financially and legally acknowledged for the environmental services that their forests provide to the community, both nationally and globally.

The PES programme is the product of an active participatory debate between the various sectors about the use of natural resources, and the state of Costa Rica's forests. Among the new legislation passed were Biodiversity Law No. 7788 (1998) and Forestry Law No. 7575 (1996). The latter integrates national forest development with protection of natural resources and the recuperation of degraded land, through the use of new economic incentives for sustainable forest production, reforestation, protection of forest ecosystems, and the recuperation of degraded land. The programme resulted from a process of institutional capacity building initiated decades ago in Costa Rica, which enabled the establishment of an institutional framework, with a solid legal, organisational and social base.

Although the PES is not a social welfare programme, from the outset the state and various social organisations assumed that it would contribute to rural poverty alleviation in Costa Rica. In political terms the PES could be considered as an innovative instrument to diversify economic activities in rural areas. It became apparent that the programme contributed to improving the quality of life of communities and individuals. Through the new legislation, particularly the Forestry Law (article 46), the National Forestry Finance Fund (FONAFIFO) was created to promote forest development in Costa Rica by financing small and medium producers.

Several studies have looked at the evolution of the PES in Costa Rica and at lessons for other countries. However, little is known about the actual socio-economic effects of markets for environmental services, neither in Costa Rica nor in MES initiatives in other countries (Landell-Mills and Porras 2002). Thus, this study attempts to determine what the impacts on poverty and other social factors of the PES programme are. It examines the social effects of this innovative programme from a holistic perspective, using the *Sustainable Livelihoods Framework* as a basis for the analysis, and looks at the effects the programme has on financial, human, social, physical and environmental capital. The study focuses on the social impact of PES in the Central Volcanic Mountain Range Conservation Area (ACCVC), in particular the Virilla watershed. Initially the study sought to analyse the impacts of PES on the poor. However, fieldwork showed that living standards of landowners receiving payments in this area were relatively high. It is important to bear in mind that, given the specific characteristics of this region, care must be taken in the way these results are interpreted for the rest of the country. Nevertheless, the study provides valuable experience relating to conservation areas located on land close to significant population centres and where opportunity cost is high.

The Upper Part of the Río Virilla Watershed (PACV) and the Upper Part of the Río Segundo Micro-basin (PACS) have characteristics that are significant for this study: i) the PES programme was initiated several years ago in the PACV, while the programme is just starting in the PACS; ii) they are both vital water sources for a number of communities; and iii) several institutions have created programmes for recuperation, conservation y maintenance of these sub-watersheds, thus enabling valuable information to be gathered for this study.

In the case of the PACV the analysis is based on the area under the Environmental Improvement Project for the Upper Part of the Río Virilla Watershed (Plama-Virilla), which the National Power and Light Company (CNFL) has been developing. For the PACS, the analysis is based on information generated from the Recuperation Project for the Upper Part of the Río Segundo Micro-basin (a project of the National University of Costa Rica's School of Biological Sciences).

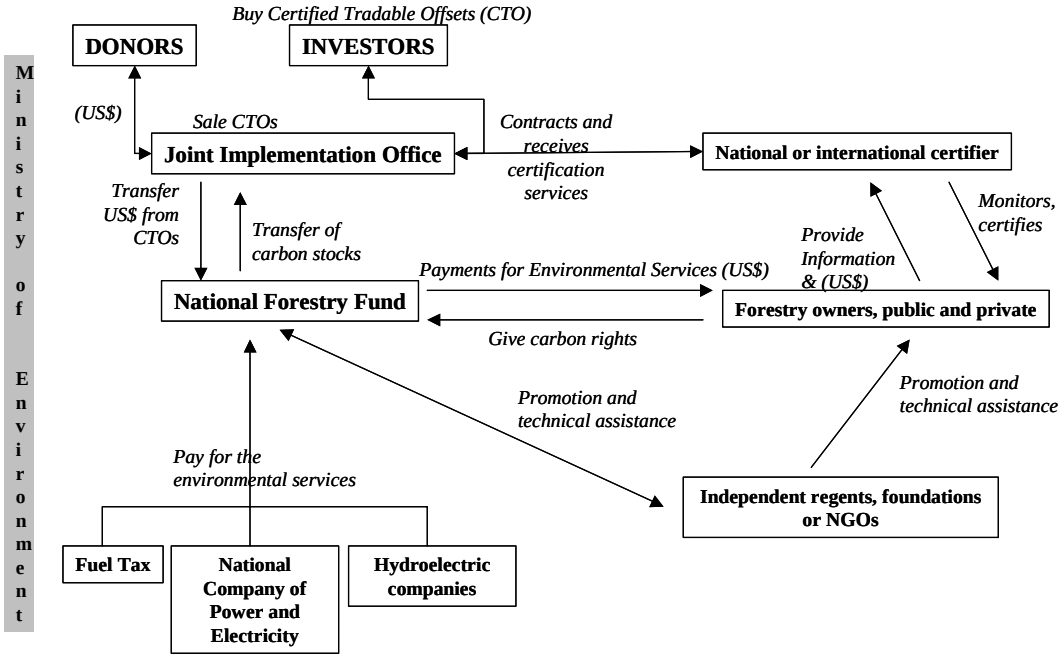
2 Social, spatial, environmental and economic characteristics

2.1 The national context

When Costa Rica set up its Payments for Environmental Services programme in 1995, it was widely praised for pioneering global efforts to introduce compensation systems for environmental services. The programme seeks to encourage forest protection and management by paying forest owners for four environmental services provided by their forests: carbon, biodiversity, watershed management, and landscape beauty.

An overview of how the programme works is presented in Figure 2.1. Briefly, the Ministry of Environment (MINAE), through the National Forestry Finance Fund (FONAFIFO), is charged with channelling government payments to private forestry owners and protected areas. Payments vary according to the activity undertaken: reforestation (approximately US$450/ha), sustainable forest management (approximately US$320/ha), and forest conservation (approximately US$200/ha). Payments are made over a five-year period. In return landholders cede their environmental service rights to FONAFIFO for this period. When the contracts expire, landowners are free to renegotiate prices, or sell the rights to other parties. Their obligation is recorded in the public land register and applies to future purchasers of the land.

Figure 2.1 The Costa Rican PES Programme



Source: Landell-Mills and Porras (2002)

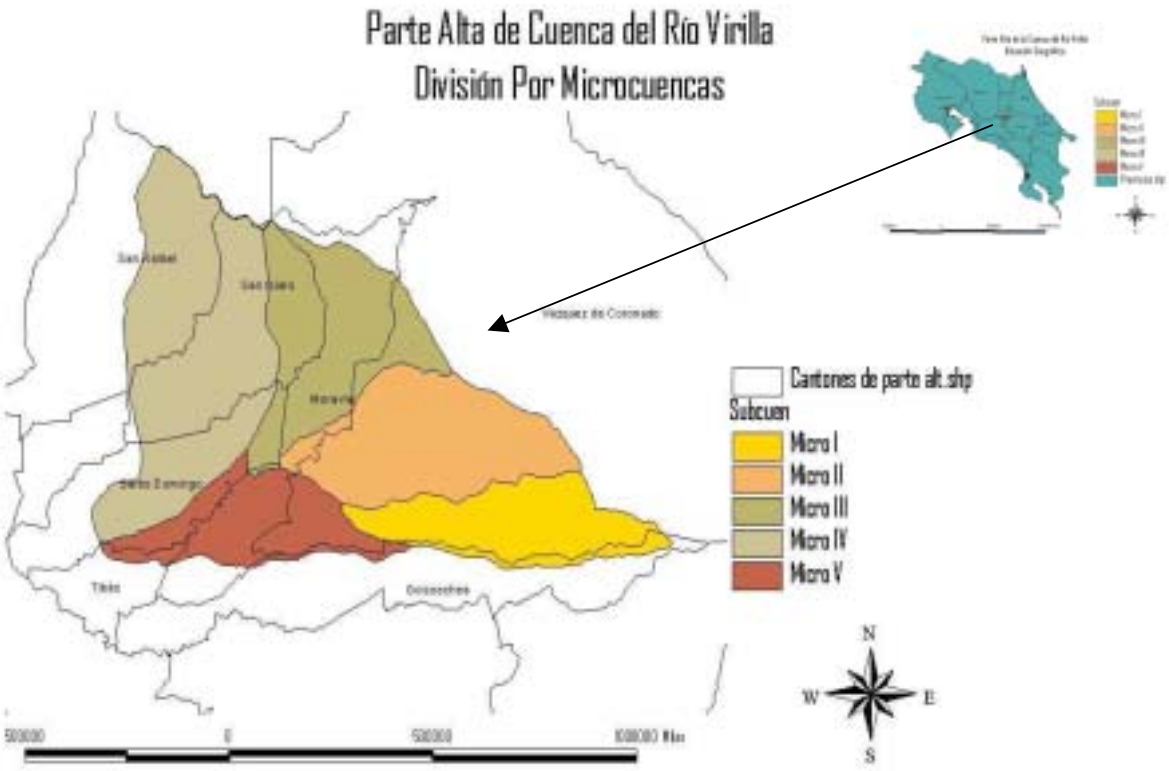
Having purchased rights to clearly identified environmental services, FONAFIFO proceeds to sell them to local, national and international buyers. Local buyers to date include hydroelectricity companies (eg., CNFL) who are interested in watershed services, and

tourism agencies, for example, rafting companies, interested in landscape beauty. At the international level, FONAFIFO has developed a system to transfer carbon sequestration rights as Certifiable Tradable Offsets (CTOs) to buyers via a newly created Costa Rican Office for Joint Implementation (OCIC). The Office for Joint Implementation negotiates with international investors and donors. These CTOs can be purchased attached to a particular project, or as a standardised credit which is drawn from a pool of investments. In addition to income from sales of particular environmental service rights, FONAFIFO receives regular income from a share of fuel tax revenues. For more information about the PES programme in Costa Rica see Rojas and Aylward (2003).

2.2 Characteristics of the study area

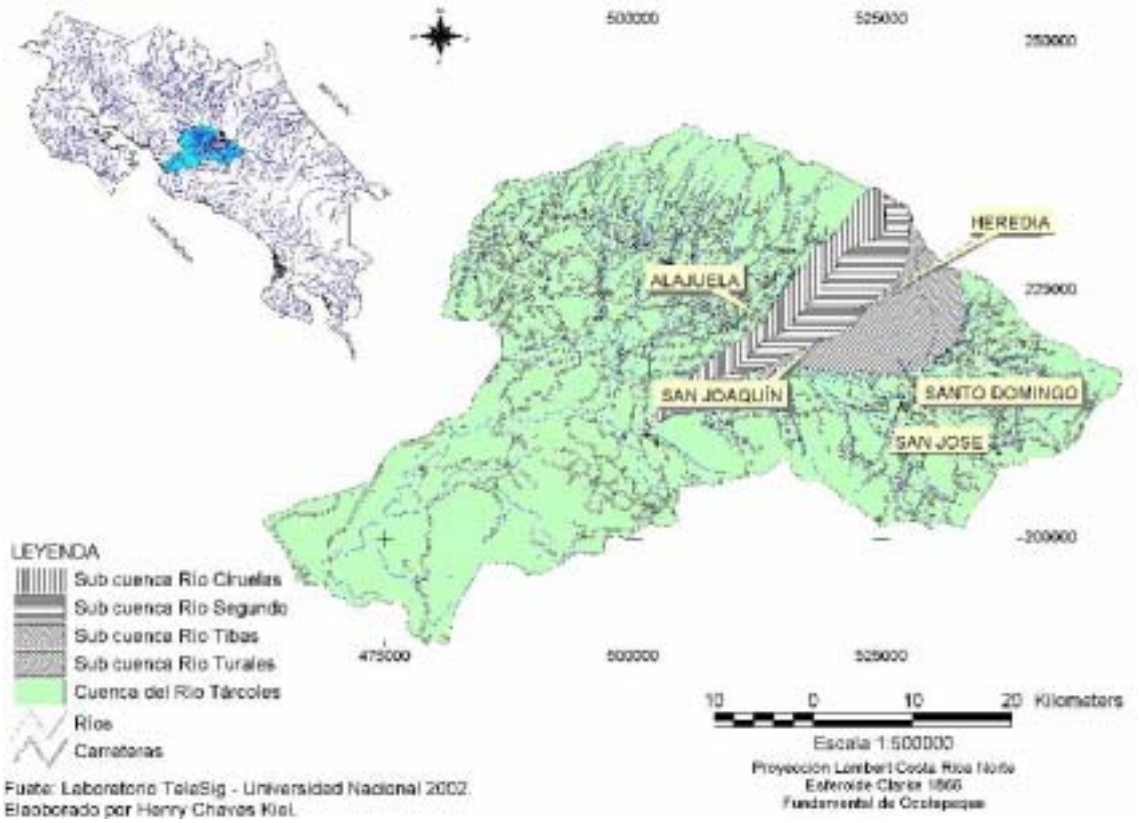
The Upper Part of the Watershed (PACV) is situated in the central region of Costa Rica at the north eastern end of the Río Grande de Tárcoles watershed (see Figure 2.2). It comprises the cantons of Goicoechea, Tibás, Moravia and Coronado in the province of San José, and Santo Domingo, San Rafael and San Isidro in the province of Heredia. It stretches from the source of the river Virilla to its confluence with the river Tibás and has an area of 142 km^2. The PACV comprises several micro-basins: Río Virilla-Río Durazno; Río Macho-Río Virilla; Río Para-Río Paracito; Río Tibas-Río Virilla; and Río Virilla-Río Ipis.

Figure 2.2 Map of Virilla watershed



The Río Segundo basin, also situated in the central region of Costa Rica (see Figure 2.3), has an area de 512.25 km^2 and is 17 km long. Its widest point is 6.9m and its narrowest is 0.45 km. Its highest point is 2,800 metres above sea level. This watershed is situated beside the Central Volcanic Mountain Range, to the south of the Barva volcano. The river system is on the Pacific-facing slope and flows into the Virilla watershed, which is a tributary of the Río Grande de Tárcoles (Chavarría 1998). The PACS is located within the province of Heredia, where the Río Segundo passes through the cantons of Central, Barva, San Rafael, Belén, and Flores (Chavarría 1998).

Figure 2.3 Map of the Río Segundo Basin



The study area is located in the central region of the country, where most of the country's population is concentrated. The upper part of the watershed is rich in water sources, including a vast number of creeks, rivers and aquifer recharge areas that supply water for domestic use and hydroelectricity production. It comprises seven cantons with a total of over 1.5 million inhabitants, and provides approximately 54 per cent of the total water supply for the Metropolitan Area (approximately 48 million m^3 for 900 thousand inhabitants (AyA 2002).

2.2.1 Physical and environmental description

Despite its importance for supplying water, the area is highly susceptible to land use change. The opportunity cost of land is very high, and deforestation has denuded large areas of the upper slopes to make way for dairy farms, ornamental plant production, coffee plantations, residential areas and industry.

Climate

The highest point of the PACV is 2,950 metres above sea level and its lowest point is 1,100 metres above sea level. More than 40 per cent of the area is between 1,300 and 1,500 metres above sea level. Average altitude is 1,490 metres above sea level. The main rivers are the Virilla, the Macho, the Pará, the Tibás, the Tranqueras and the Tures (CNFL 1998).

The highest point of the PACS is 2,800 metres above sea level. At this altitude trade winds have a significant effect on the variation in temperature and rainfall (Chavarría 1998). The two sub-watersheds are located on the Pacific slope, which has a clearly defined dry season from December to April and a rainy season from May to November. Lowest rainfall is in the month of July, known as the *veranillo*. The zone with the highest rainfall is the upper part towards the north/north west. Rainfall varies from 1,800 mm/year (in the lower part) to 3,400 mm/year (in the north) (CNFL 1998).

It has a tropical dry and rainy climate, and has a pronounced dry season during the Northern winter; the highest rainfall occurs between September and October; average annual temperature is 17.6° C, the minimum being 16.5° and the maximum being 18.4° C (CNFL 1998).

Land Use

According to the Ministry of Agriculture and Livestock, 37 per cent of the land within the central region of Costa Rica is unsuitable for agriculture or forestry. However, it is valuable for conservation of flora and fauna, water collection and scenic beauty. Eighteen per cent of the soil is at risk from degradation, and exploitation of products derived from its natural vegetation is controlled through forest management. Another 18 per cent of the soil has to be used for permanent and semi permanent vegetation due to restrictions placed on the development of clean crops and the robust soil management and conservation practices (MIDEPLAN 1992). According to a study carried out by the Ministry of Agriculture and Livestock, 36.3 per cent of the central zone is utilised appropriately, 35 per cent is under-utilised and 28 per cent is over-utilised (MAG 1997). The soil in the la PACV is basically limey, and is sufficiently permeable to allow circulation and storage of groundwater.

Land use varies little, the three main uses being pasture (semi-intensive dairy farming), forestry, and coffee growing. Cattle farming and coffee growing were introduced at the beginning of the twentieth century, and in many cases they combine with domestic use. Land in the area is under pressure from urbanisation from the south and west where significant urbanisation and industrialisation is taking place (CNFL 1998).

Table 2.1 Land use in the Upper Part of the Virilla Watershed

Land Use	Area (ha)	Percentage (%)
Forestry	4,016.19	28.54
Jaúl	680.69	4.84
Pasture	4,383.13	31.15
Coffee	2,148.81	15.27
Urban Settlement	445.81	17.38
Cloud	21.13	1.57
Shade	144.31	1.02
Greenhouse	19.50	0.15
Degraded soil	10.00	0.08
TOTAL	**14,069.57**	**100.00**

Source: CNFL (1998)

In the PACS, land use is divided between coffee growing, cultivation of other crops such as maize, forestry, and urban settlement. Coffee growing has traditionally been one of the main land uses, but in recent years there has been an increase in urbanisation.

Water Resources

Availability. The rivers in the PACV (the Virilla, the Durazno, the Macho, the Pará, the Paracito, the Tibas, the Tranqueras, the Tures and the Ipís) are important sources of water for the local communities.

The river Virilla is a recharge area for the Colima Aquifer, which is an important source of water for the Metropolitan Area. Echandi (1981) divided the Colima formation into three parts: Belén; Ignimbrita de Puente Mulas; and Linda Vista. There is another large aquifer located in San Isidro de Coronado (part of the study area) (CNFL 1998).

The following rivers are located in the PACS: the Segundo, the Mancarrón, the Zanjón, the Ciruelas, the Pacayas and the Guaran. The canton of San Rafael is an important supplier of water for the south of the province of Heredia and is also a recharge area for the agricultural and forestry zone of the canton (Villavicencio et al. 1998). There are five water sources in this zone (Las Flores, La Hoja, Las Pérez, Fuentes de Paso Llano, Bajo Brealey) that provide water to several localities in Heredia.

Water collection and water use. There are 33 wells in the river Virilla zone; four downstream - Fuentes, La Libertad, Pozos de la Valencia y Puente de Mulas, and two low production wells in Zapote. In total 2,475 litres of water is extracted per second, which makes up 54 per cent of the Metropolitan Area's total supply. The water is extracted from the Colima aquifer which runs to the south of the provinces of Heredia and Alajuela. This aquifer receives significant recharge from the rivers Tibás and Virilla (CNFL 1998).

According to a field study carried out by Chavarría in 1998 in the PACS watershed, there are three dams that collect water. In the first dam the water is clean, and the water level of the river decreases by approximately 80 per cent in the dry season. The second dam leaves the riverbed dry in summer, and supplies water to the communities of Montecitos, upper Getsemaní and some nearby urban settlements. The river continues its course through the dairy farms. The third dam is close to the entrance to Monte de la Cruz and provides water

for the communities of the district of Los Angeles. In Getsemaní the river is held again by a dam, which supplies the water for the populations of central Heredia, San Rafael, and lower Getsemaní. The river becomes contaminated when it reaches San Pablo (Chavarría 1998).

Forest Resources

The upper parts of the watersheds are located within the Forest Reserve of the Central Volcanic Mountain Range, the Braulio Carrillo National Park, and the Chompipe Biological Reserve in San Rafael, Heredia.

Primary forest is found between 1,200 and 2,906 metres above sea level. From 2,000 to 2,400 metres above sea level there are areas of forest with some degree of human activity, situated at the edge of virgin forest, on the banks of rivers and streams. Primary forests in these zones are approximately 25 to 30 metres high. Included among the common tree species are various species of oak, *lloró, danto carne, cirrí, ira, aguacatillo, quizarrá* and *copey* (Chaverri and Matamoros 1998). Most of these forests are protected as national parks or forest reserves within the Braulio Carrillo National Park and the Forest Reserve of the Central Volcanic Mountain Range (CNFL 1998).

Secondary forest is forest on which the original vegetation has been partially or almost totally destroyed by human activity or through natural causes but where there are still seeds or spores or material capable of being reproduced. Small patches of secondary forest can be found by roadsides and riverbanks and on abandoned fields, at a height of between 1,250 and 1,800 metres above sea level. Included among the common tree species are *tuetes*, various species of *lengua de vaca, ratoncillos, guabas, huelenoche, lloró, cirrí,* and *guarumo* (Chaverri and Matamoros 1998).

Forest plantations are found between 1,300 and 2,150 metres above sea level in the study area. They are usually less than one hectare in area, with the exception of a few large cypress plantations in San José de la Montaña. In general, they are mature plantations of more than 15 years of age (Chaverri y Matamoros 1998). The most common species found on plantations are: cypress, eucalyptus, *jaúl*, pine and *casuarina*. In recent years there has been an increasing interest in planting native species such as oak, *lloró* and *duraznillo* (Chaverri and Matamoros 1998).

2.2.2 Socio-economic characteristics

The main socio-economic characteristics of the watersheds are presented in Table 2.2.

Table 2.2. Socio-Economic characteristics of selected watersheds

Activities	Upper Part of Virilla Watershed	Upper part of Segundo Micro-basin
Economic Aspects	Dairy farming, forests, coffee. Increasing activities of *jaúl* plantation, urban development, and greenhouses.	Largest economic activity in Barva and San Rafael cantons are tertiary [(b)], followed by the secondary or industrial sector[(c)].
Livestock	Extensive livestock[(a)]. Small scale of pig and poultry	

Activities	Upper Part of Virilla Watershed	Upper part of Segundo Micro-basin
	farming and honey production.	
Farming	Coffee is the main crop in the zone covering 15,3% of land.	Predominantly coffee. Vegetables such as beans, tomatoes, *chayote*, carrots, runner beans, coriander and sweet chillies are grown mostly in small vegetable gardens. Fruit trees are also grown in residential areas and in small mixed farming operations (e.g., citrus plantations), some as shades for other crops. Non-traditional crops such as asparagus, ferns, ornamental plants and medicinal plants
Industry	Sawmills, coffee processing plants, concrete products, electrical equipment, stationery, medicine, sandstone, and woven fabrics.	Services: education centres, service cooperatives, supermarkets, local stores, grocers, greengrocers, beauty salons, hotels, stalls, and professional services. Industry: Factories, coffee processing, cabinet making, furniture stores, workshops, dairies, and nurseries (Alfaro and Mora 1994).
Social Aspects	Surrounded in the southwest by urban areas (17.38%). Urban projects are expanding.	The upper part of the watershed is sparsely populated but becomes more densely populated lower down.

[(a)] According to the Farming Census of 1984, there were 858 livestock operations in the watershed, 53 per cent located in the Cantón de Vásquez de Coronado. There were 19,599 head of cattle in these operations of which 86 per cent was dedicated to milk production, 4 per cent to meat production, 6 per cent to both milk and meat, and 1.4 per cent were bulls for service production (CNFL 1998). [(b)] Includes educational centres, cooperatives, grocery shops, hotels and other services. [(c)] Includes industry, coffee processing factories, woodwork, dairy farms, and greenhouses (Alfaro and Mora 1994).

2.2.3 Main environmental problems

Upper Part of the Virilla Watershed

The PACV provides 54 per cent of the Greater Metropolitan Area's (GAM) potable water. The population of the GAM is almost 1.5 million, or 50 per cent of the population of the country (CNFL 1998).

Among the environmental problems encountered in this watershed are:

- imbalances in land use giving rise to erosion;
- increased urbanisation;
- disposal of solid waste into the river (due, among other things, to the municipality's inadequate waste disposal system), from domestic and industrial waters;
- lack of control of contamination from the different rivers of the watershed (CNFL 1998).

Upper Part of the Segundo Micro-basin

From the literature and the experts consulted three problems emerged as contributing to the deterioration of the basin:

- water scarcity: almost all of the water is collected to supply the population centres, leaving the riverbed dry in certain parts of its course (Chavarría 1998);
- deforestation;
- contamination: problems, due to inadequate control of the different activities being developed in this area, related to refuse, solid waste, deforestation, erosion, inadequate planning for urban development, water scarcity, use of chemicals in ornamental plant cultivation, dairy farms, poultry farms, piggeries, and coffee production and processing (Vega and Segura 1998).

A study carried out in 1998 in the upper and middle part of the watershed, where Barva and Getsemaní are situated, found that the quantity and variety of solid wastes increase as the river descends. Plastic, metal and fabric waste was found. A study of liquids in the collection and distribution tanks of education and business institutions, carried out in the same year by Lic. Miguel Angel Rodríguez, found high concentrations of faecal bacteria. Chemical contamination is produced by fumigation and use of chemical fertilisers on crops within the area. For example, toxic pesticides are used on ornamental plants (Chavarría 1998). Other rivers within the watershed, such as the Porrosati, also have serious contamination problems because of the dairy farms and fern plantations.

2.3 Markets for environmental services within the site

The Watershed is located within the catchment area of the Central Volcanic Mountain Range Conservation Area (ACCVC), one of the administrative divisions of the National System for Conservation Areas (SINAC). The area has been closely involved in the development of the PES programme since its commencement, and hosted the first international certifiable tradable offsets (CTO) transaction – that between Costa Rica and the government of Norway in 1997. The main PES projects in this area are presented below.

2.3.1 Costa Rica-Norway Reforestation and Forest Conservation AIJ Pilot Project (carbon sequestration) and CNFL Project (watershed conservation) [1]

The project seeks to conserve and rehabilitate 4,000 ha of forest (1,000 ha for reforestation, 2,000 ha for conservation of existing primary forests, and 1,000 ha for conservation of existing secondary forest), with the aim of reducing atmospheric greenhouse gas (GHG) emissions through biomass growth and prevention of future emissions. CTOs are transferred by the Costa Rican Joint Implementation Office (OCIC) to the Norwegian investors in return for their financial contribution to the project. The implementation period will be ten years in successive and overlapping stages covering the micro-basins in the zone. The active life of the project is estimated to be ten years.

This project is a catalyst for the development of local infrastructure and institutions dealing with the marketing of carbon services (such as the Foundation for the Development of the Volcanic Mountain Chain (FUNDECOR) and OCIC). At the same time, forestry activities are expected to improve the existing hydrological resources of the watershed, which will be of benefit to the various hydroelectric projects located on the Virilla river (see Table 2.3). The CNFL (a private company majority-owned by the Costa Rican Institute of Electricity (ICE), the state utility,) has been closely involved in the project in order to maximise the benefits provided by watershed protection. One of the problems encountered by these hydroelectric projects is the accumulation of sediment and other solid waste such as branches, bottles, plastic bags, etc. in the area (CNFL 1998).

Table 2.3. Gross power generation by hydroelectric plants in the Virilla watershed, CNFL (MWh)

Plant	Gross Power (MWh)
Ventanas	8,863
Belen	72,703
Electriona	33,758
Brasil	n/a
Nuestro Amo	41,165
Total	**156,489**

Source: CNFL 1997

The total cost of the project is US$ 4.4 million. The investment capital contribution from the Norwegian partners, equivalent to 200,000 metric tons of carbon, is US$2 million, and national matching funds of $1.39 million are provided by CNFL.

2.3.2 Florida Ice & Farm Brewery Project (watershed protection)

Florida Ice & Farm, owners of Cervecería Costa Rica (CCR), the largest brewery in the country, uses groundwater in the production of beer, bottled water, and fruit juices. However, there has been concern that groundwater sources in the Central Valley, where CCR is located, are being affected by reduction in the recharge zone caused by land conversion and pollution. In October 2001 CCR signed an agreement with FONAFIFO to promote forest conservation and regeneration through the PES scheme. The goal is to promote activities in the recharge areas of the aquifer used by CCR. Among the key features of the deal are that:

[1] Also known as Proyecto Plama-Virilla

- CCR will pay FONAFIFO a total of $225,000 over seven years, equivalent to US$45/ha/yr for landowners located in an area of 1,000 ha in the upper part of Rio Segundo Micro-basin. Landowners will receive the full amount of $45/ha/yr, except in the cases where FUNDECOR acts as intermediary and charges 12 per cent of the payments;
- landowners will sign contracts with FONAFIFO for five years, after which their contracts may be extended depending on availability of funds, satisfaction with previous contracts, and whether or not the area falls within the prevailing priorities for allocation of national funds;
- CCR will pay FONAFIFO US$1,500/month for 12 months to contract FUNDECOR as the intermediary and programme promoter;
- CCR will pay FONAFIFO a sum of US$15 for each new hectare added to the project to be used by FUNDECOR for technical and legal advice for the proprietors;
- CCR will pay FONAFIFO a sum of US$14 for each new hectare added to the project, to be used to cover administrative expenses by FONAFIFO;
- Total funds for the project are approximately US$270,000 (equivalent to 90 million colones).

2.3.3 Empresa de Servicios Públicos de Heredia and water use charges (watershed protection)

The Empresa de Servicios Públicos de Heredia (ESPH) is a utility owned by three municipalities in the province of Heredia, where it provides electricity, potable water, public lighting and sewerage services. In 1999 ESPH submitted a proposal to the Regulating Authority for Public Services (ARESEP) to raise the potable water tariff in order to compensate forest owners for the services their land use provides to water users. ARESEP approved a tariff increase of ¢1.90/m3 in 1999 to cover the environmental services component. ESPH has been collecting the funds (see table below) and has developed a project, Procuencas, to implement the environmental services component in the watersheds of the Ciruelas, Segundo, Bermudez, and Tibas rivers. The objective is to ensure forest conservation where forests already exist, and to restore forest cover through reforestation or natural regeneration in some denuded areas.

Table 2.4 ESPH water fee collections to date (US dollars)

	2000	**2001**	**Mar-02**	**Cum. to date**
Domestic	55,377	114,818	124,314	294,509
Productive	7,997	15,967	17,134	41,098
Ordinary	4,023	8,812	9,714	22,550
Preferential	2,703	5,427	5,837	13,968
Government	1,410	3,497	3,546	8,453
Total	71,510	148,521	160,546	380,577
	$/colones =300	$/colones =330	$/colones =350	

3 Methodology of analysis

3.1 Main objective and purpose of the study

The objective of this research is to provide information in order to determine what the socio-economic effects of the Payment for Environmental Services Programme in Costa Rica are. The study concentrates on the Virilla watershed, located in the Central Valley, comparing landholders that are currently under the PES scheme with those who have not accessed the scheme.

The project seeks to develop and test a methodology in order to analyse the socio-economic impacts of the Payments for Environmental Services (PES) scheme in Costa Rica. To this end, the project aims:

1. to define the social, spatial, environmental and economic characteristics of the Virilla watershed;
2. to identify the different forestry activities (i.e. in relation to carbon sequestration and watershed protection services) implemented under the PES scheme;
3. to analyse the socio-economic effects of PES in the selected site (for watershed protection and carbon sequestration services); and
4. to distil lessons as a basis for making a preliminary assessment of key determinants of these impacts.

3.2 The Sustainable Livelihoods Approach as a framework

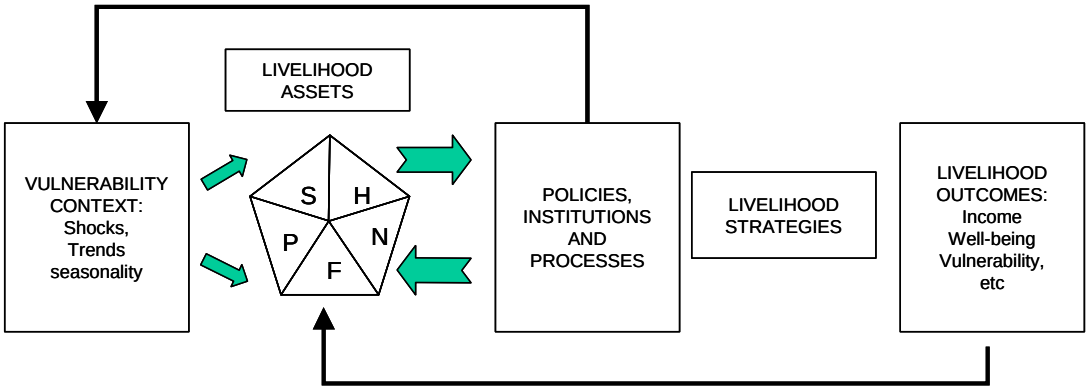
The impact of the PES scheme in the communities will be addressed by looking at the impacts on the financial, human, natural, social, political and physical assets held by these communities, loosely based on the Sustainable Livelihoods Approach (SLA).

The Sustainable Livelihoods framework was developed by the UK's Department for International Development (DFID) in the late 1990s as a diagnostic tool to analyse projects oriented towards poverty alleviation (DFID 2001). It is based on the recognition that livelihood strategies include multiple components in the form of access (or lack thereof) to financial, human, natural, social and physical assets.

- *Financial assets:* the financial resources available to people that provide them with different livelihood options. Examples include cash flows, savings, credit supply, or regular remittances or pensions;
- *Human assets* (or human capital): includes the skills, knowledge, ability to work and good health that enable individuals to pursue different livelihood strategies;
- *Natural assets*: the natural resource stocks from which resource flows useful for livelihoods are derived (i.e. land, water, wildlife, biodiversity, and wider environmental resource values);
- *Social assets* or the social resources upon which people draw in pursuit of livelihoods (e.g. networks, membership of groups, relationships of trust, access to wider institutions of society) and political assets, that determine the ability to influence decision-making;

- *Physical assets*: basic infrastructure (transport, shelter, water, energy and communications) and means of production and equipment that enable people to pursue their livelihoods.

Figure 3.1 The Sustainable Livelihoods Approach



Source: based on DFID (2001) and Landell-Mills and Porras (2002)

The framework integrates the individual or household's vulnerability to the environment, such as shocks, trends and seasonal issues, within a wider political and institutional context. The latter includes the different government organisations and levels, the private sector, laws, culture, policies and institutions, all of which affect the livelihood strategies adopted and influence livelihood outcomes.

While this framework is useful to provide a graphic illustration of the relationship between livelihoods and their context, it is not intended to be comprehensive, and varies depending on the situation. In many cases the division between the different assets is more theoretical than practical, with substantial overlaps occurring. Furthermore, the benefits derived from one type of asset will potentially be affected by the way they are combined with other assets (e.g. machinery and skilled labour). Table 3.1 presents a list of questions that this study attempts to address, categorised according to the particular asset on which they focus.

Table 3.1. Adapting the SLA assets as a 'checklist' for the Costa Rican study

Type of Asset	Relevant questions:
Financial assets	• Is the PES scheme a source of employment for rural communities? • How has the PES scheme affected agricultural wages and/or income generally? • What are the impacts on the distribution of income? i.e. who has access to funds from PES?
Human assets	• Has PES led to investment in education and skills development? • Have recipients received technical assistance? • Has the PES affected labour markets?
Natural assets	• Have there been any (predicted/unpredicted) shifts in land use patterns? (including technology changes in agriculture practices and production methods, etc) • What are the impacts on land prices?

Type of Asset	Relevant questions:
	• Has the value of participants' forest assets increased? • What are the impacts on other natural resources, eg. biodiversity?
Social and Political assets	• What are the effects on ability to cooperate and network? • What are the effects on property rights (security of tenure)? • Have locals gained greater access to decision-making powers through the PES scheme?
Physical assets	i. Has the PES scheme stimulated investment in local infrastructure (i.e. communications, transport, electricity)?

Source: Adapted from Landell-Mills and Porras (2002)

3.3 Identification of stakeholders

The main stakeholders involved in the PES Programme in the Virilla watershed presented in Figure 3.2, are listed below. **On the supply side**, environmental services are either supplied by private landholders (through reforestation and conservation projects), or through the public sector - in this case, the Braulio Carrillo National Park.

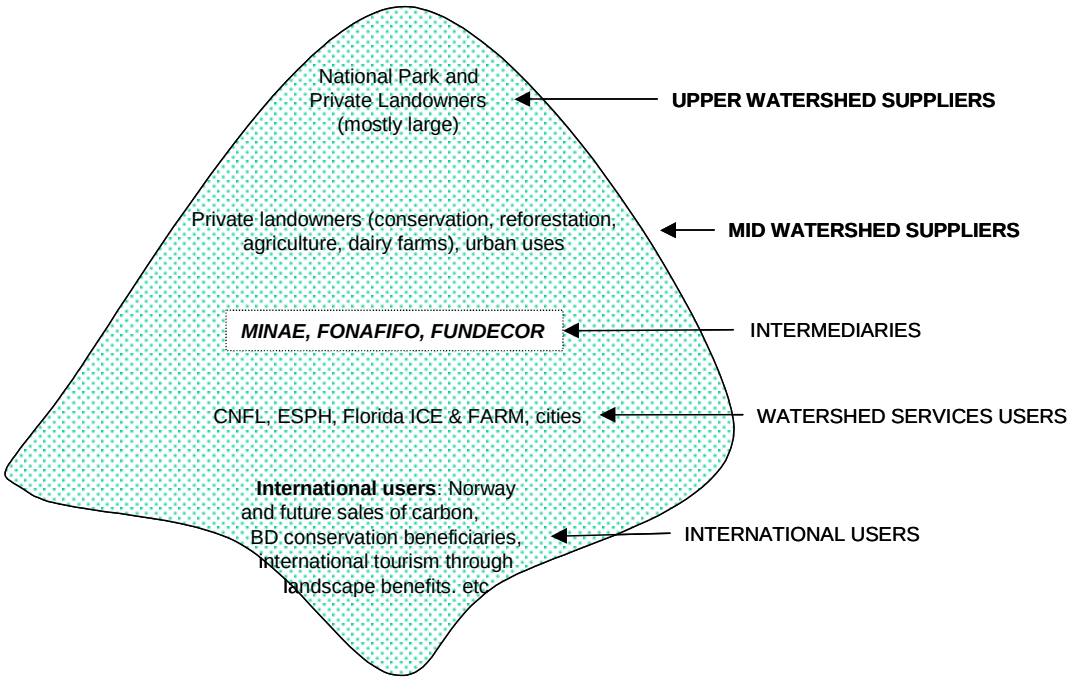
On the demand side, environmental services benefit local, national or international "consumers" as follows:

- local consumers (within the watershed) include the national utilities CNFL and ESPH, and the brewery project (Florida Ice & Farm);
- national consumers include the Government of Costa Rica (which complements local watershed payments with payments for biodiversity and landscape beauty);
- international consumers include the Norwegian Government through the purchase of CTOs.

There are also a number of intermediaries in the area. Payments are administered at national level through FONAFIFO, which is responsible for signing contracts with landowners. Landowners can apply on their own, or through a particular local intermediary, such as the Foundation for the Development of the Central Volcanic Mountain Range (FUNDECOR),[2] which provides them with support and deals with most of the administrative details for a fee. Payments made by the government under the PES scheme also stipulate that the government retains the right to market carbon from the forestry projects, and this right passes directly to the Costa Rican Office of Joint Implementation (OCIC) to create a certified national sink of carbon emissions ready to be sold "over-the-counter". Overseeing the activities of consumers, sellers and intermediaries is the official regulator of the PES programme, the Ministry of the Environment and Energy (MINAE).

[2] FUNDECOR was created in 1991 with financial assistance from the US Agency for International Development (USAID). The motivation behind this funding was the US fear that the left-wing ideology of the Sandinistas in Nicaragua would spread throughout the region. The organisation has evolved over time and in 1997 it became the first Central American organisation to be certified by the Forest Stewardship Council (FSC). The organisation is empowered to evaluate forestry projects and to include or exclude them from the national list of certified forests and plantations.

Figure 3.2 Main stakeholders in the Virilla watershed PES scheme



With regard to the other crucial functions - technical assistance and compliance control - FONAFIFO and the National System of Conservation Areas (SINAC) are officially responsible for monitoring the implementation of the contract. Technical assistance and verification is carried out by SINAC, who might share the task with independent NGOs, such as FUNDECOR. The CNFL is also responsible to a large degree for technical assistance and environmental education, acting both as an end-user of the environmental services and as an intermediary to ensure quality.

3.4 Sources of information and sample selection

Information for the study is obtained through lists of beneficiaries provided by FUNDEDOR, FONAFIFO, CNFL, ESPH, MINAE and Plama-Virilla. The lists were reviewed, compared, updated, and a final list containing 110 landholders was produced (see Annex 1). A stratified sample selection was carried out by creating three groups categorised according to the number of hectares receiving payments for reforestation, conservation, or both, in order to obtain a total sample size of 35 landholders. They were categorised by size in order to determine equity impacts of the Payments, as the number of small landowners in the watershed is relatively small compared with the total number of beneficiaries.

Small: 1-30 ha
Medium: 30-80 ha
Large: more than 80 ha

The first group includes 70 per cent of the sample (n=25), the second and third groups include 15 per cent each (n=5 for each). Sample selection was random using an Excel function. The sample of landowners not receiving payments was more difficult to obtain, as

the last agricultural census was taken in 1984 and there is no systematic way of obtaining a list of all landholders. Following discussion, the team decided to use information from the local agricultural centres to identify a sample of 15 landholders. While a larger sample would have been preferable, this was not possible owing to lack of time and funds, the size of the area, the fact that landholders are very scattered, and that access is not very straightforward.

3.5 Data collection techniques

The first task in setting up the research programme was to carry out an exploratory tour of the site. This tour was also used to obtain basic information to establish the data collection techniques required. In the course of the tour informal meetings were held with the various actors, including recipients of the PES, the state forestry organisation, NGOs, and key informants.

As the main objective of the study was to look at the effects of the PES on individuals, a personal survey was considered to be the best way to obtain detailed information. With information from previous field visits the questionnaire was drawn up by researchers from CINPE and IIED. The survey was designed to gather information to answer the questions presented in Table 3.1. The main categories of information are presented in Table 3.2 and listed in Annex 2. The fieldwork was challenging: each interview took approximately 45 minutes to complete; long distances had to be covered; and it was difficult to find convenient times for the landowners. However, most respondents were eager to collaborate and provide information, which in many instances included showing us around the farm or just "chatting" (a very Costa Rican tradition). In some instances, respondents saw the interview as a means to air their concerns and observations about the PES programme to an independent reporter (not from the government or the intermediary).

Table 3.2 Description of the survey questions

Questions	Objective
General information on household	
Age of head of household, number of children (by age), gender of head of household, highest level of education within household.	To provide information on household characteristics and profile of recipients of payments.
Main occupation of head of household and other household members. Does the head of household have a secondary occupation?	To provide information about the wealth/income of the family.
Approximate household income	
Usual place of residence (on the farm, in the city, elsewhere)	To provide information about investment in local economies and potential local spin-offs.
General knowledge of the PES programme	
Knowledge about environmental services	To increase awareness and perception of forest services
Main reasons for accessing/not accessing the PES scheme	To provide early indication of expected benefits of the PES scheme

Questions	Objective
Information about the farm (natural assets)	
Property title? How long have they owned the farm?	To provide baseline information for assessing impacts on property rights (and thus on social assets)
Total area of farm	To provide a general profile of farm
Area under natural forest management/plantation/conservation	To provide information about shifts in land use patterns and the impact of the PES programme on landholder decision-making.
Area receiving PES	
Reasons for selecting each programme?	
What are the three main economic activities of the household (on and off the farm), ranked in order of importance.	To provide information on how participants perceive the value of forests assets and how do they are ranked within the household budget.
Transaction costs (financial assets)	
How did you apply for the PES? (yourself, intermediary, other)	To provide information about the costs of accessing the PES, and about the costs and benefits of intermediaries such as FUNDECOR. Answers from this section will be complemented with secondary information and that collected from interviews with key informants.
How much did it cost you to take part in the scheme? What documents did you have to obtain?	
How much do you pay the intermediary (i.e. FUNDECOR)	
How long did the whole process take?	
Perceived benefits of the PES	
What is the main use of the money you receive? (savings, investments in the farm, general household budget)	To provide information on effects of PES on household finances.
What other financial benefits do you receive? (credit facilities, etc)	
Who makes decisions about the final use of the money? (husband, wife, etc)	To obtain some information on gender issues that might prove valuable.
Do you think that accessing PES could affect your capacity to sell the farm in the future?	This question, complemented with local information on land prices, will provide information about the effect of PES on local land markets (financial assets).
Which other benefits (using checklist for other physical, human, social and natural benefits) do you think you receive from PES?	To provide information on technological changes, local infrastructure, etc. (financial assets)
What type of technical assistance have you received? From whom?	To provide information on capacity building (human assets).
Secondary effects of the PES	
Did you have to hire (or dispense with) additional labour once you entered the PES programme?	To provide information about effects on labour markets and costs of participation (human assets).
For each category, what did you do previously on the land that is now under PES?	To provide information about possible shifts in land use. Was it due to the introduction of PES or would it have happened anyway?
Where do you carry out those	To provide information about leakages within the scheme

Questions	Objective
activities now?	(natural assets).
For those not receiving payments, do you think that you would change your current land use if you entered the PES?	To provide a basis for comparison in assessing land-use impacts (natural assets).
Have you entered into a new/different technological system in the lands under PES? What about those not receiving PES?	To provide information about technological changes in agricultural/forestry practices and production methods (natural and human assets).
Landholder opinions of the PES scheme	
What are the main restrictions or limitations of the PES programme?	To provide general information about how the landholder perceives the system and how it can be improved. This information will be important at local and national level.
How can the PES programme be improved?	
What do you think about the length of the contracts?	
Would you consider entering the PES again once the current contract has expired?	

Before the questionnaire was written the team conducted field visits to obtain basic information, identify possible sources of information, establish contacts with key informants and to get a general feel for the area and the PES recipients. This information fed into the survey, which was designed by local researchers with IIED input. A pilot questionnaire was conducted with four participants in the PES programme (their responses were not included in the final list). The final survey was conducted in April and May 2002.

4 Socio-Economic Effects of the PES in the ACCVC

4.1 Introduction

The PES programme has generated both direct and indirect social effects. The distinction between direct and indirect effects is based on whether or not payments are received from the Costa Rican forestry administration for the environmental services rendered by the forests and plantations, and does not mean that direct costs are more important than indirect costs.

Direct social benefits are those received by landowners who are compensated financially and through other non-financial incentives by the state for the environmental services provided to society by their forests or plantations. Included within this category are those beneficiaries who undertake reforestation, protection, regeneration and sustainable management of natural forests.

Indirect social benefits include all the non-financial benefits received by individuals or communities as a result of the PES. These indirect effects are socially significant and benefit the community more than the individual, and therefore generate social capital. The recipients of this type of benefit are communities, families, organisations and individuals located in the various downstream micro-basins of the ACCVC and particularly in the Virilla watershed and its affluents. These indirect beneficiaries are included in the statistics for beneficiaries of the PES.

4.1.1 The population and sample of landowners in the Virilla watershed

By the year 2001, over 9,500 ha of land in the Virilla watershed were incorporated into the payments for environmental services programme. It is interesting to note that land under protection (92 per cent) far exceeds land under reforestation or forest management. Only one per cent of the land (three landholders) is under sustainable forest management (see Table 4.1).

Table 4.1 Total area under PES (hectares in 2001)

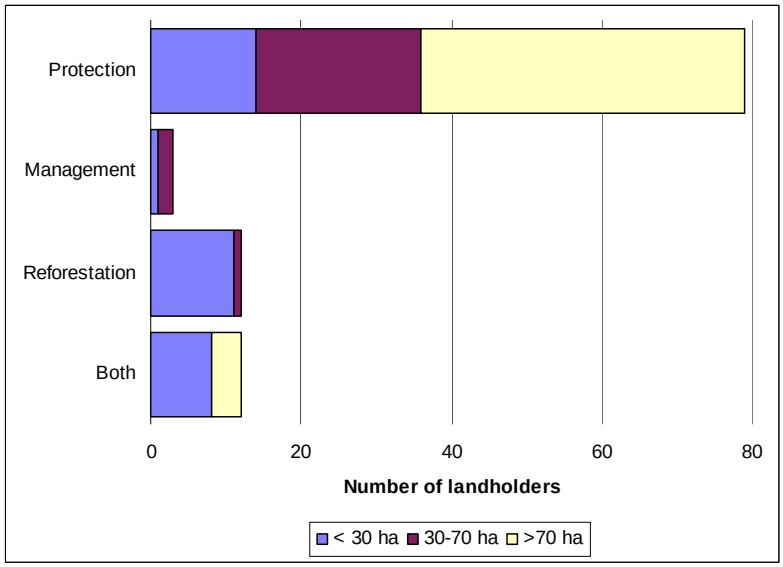
	Reforestation	**Management**	**Protection**	**Total**	**Percent**
< 30 ha	218	25	292	535	**6%**
30-70 ha	62	112	1,133	1,306	**14%**
>70 ha	329	-	7,338	7,668	**81%**
Total	**609**	**137**	**8,764**	**9,510**	**100%**
Percent	**6%**	**1%**	**92%**	**100%**	

Source: Based on information from MINAE, FONAFIFO, FUNDECOR, and ESPH.
Note: There was no initial information on the amount of land for eight small landowners.

In total, 114 landowners in the study area receive payments, and 37 per cent of the properties receive payments for 30 ha or less. While this represents a large proportion of the landowners, they only capture the equivalent of 6 per cent of the total payments, as over 80 per cent goes to properties of 70 ha or more. Smaller properties tend to be more diverse, and reforestation and protection are almost equally represented (26 per cent and 33 per cent

respectively, with 20 per cent carrying out both activities).[3] Almost 90 per cent of medium-sized properties (30-70 ha) and 92 per cent of larger properties are dedicated to protection (see Figure 4.1).

Figure 4.1 Number of landholders receiving payments (by category and area)



As explained in the methodology section, the sample was randomly selected using lists of participants available through FONAFIFO, FUNDECOR, and the ESPH. It is important to highlight that while the sample was chosen according to the amount of land within the property currently receiving payments, the following analysis and categorisation of landholders is made according to property size.[4] Although both variables are correlated (Pearson coefficient 0.86) this is not always the case, as there could be large properties with only a small part under PES. In total 46 landowners were interviewed, of whom 32 currently receive payments for environmental services and 14 do not.

Table 4.2 Detail of the sample

	No PES	Receive PES	Total	Percentage
Less than 10 ha	9	5	14	31%
11 to 30 ha	2	5	7	16%
31 to 80 ha	2	7	9	20%
81 to 130 ha	0	6	6	13%
More than 131 ha	0	9	9	20%
Total	**14***	**32**	**46***	**100%**

* no information on size of one property.

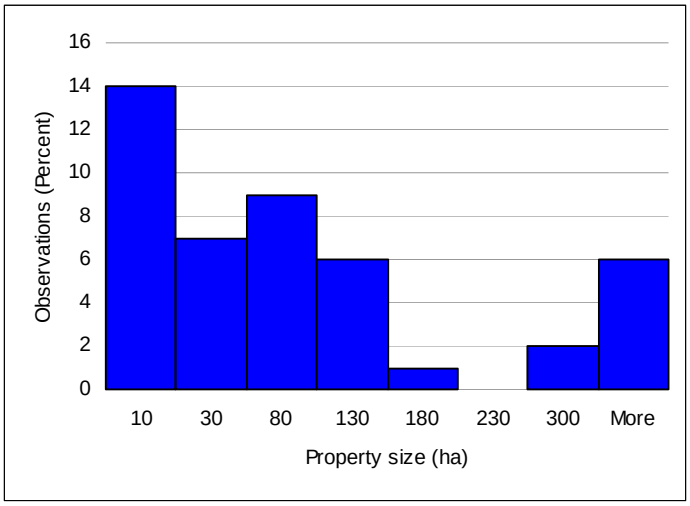
Approximately 30 per cent of sampled landholders had properties of 10 ha or less, and 67 per cent ha properties of 80 ha or less (see Figure 4.2 and Table 4.2). It is worth noting that 64

[3] Twenty per cent of small landowners did not include information about the type of programme in which they participated.

[4] This is because it was not possible to obtain information on total property size before the field work commenced.

per cent of small landholders (less than 10 ha) are not accessing the payments, while all large properties in the sample (over 80 ha) are currently receiving payments. No information about whether this is a general trend in the country was obtained in this study.

Figure 4.2 Number of households by property size

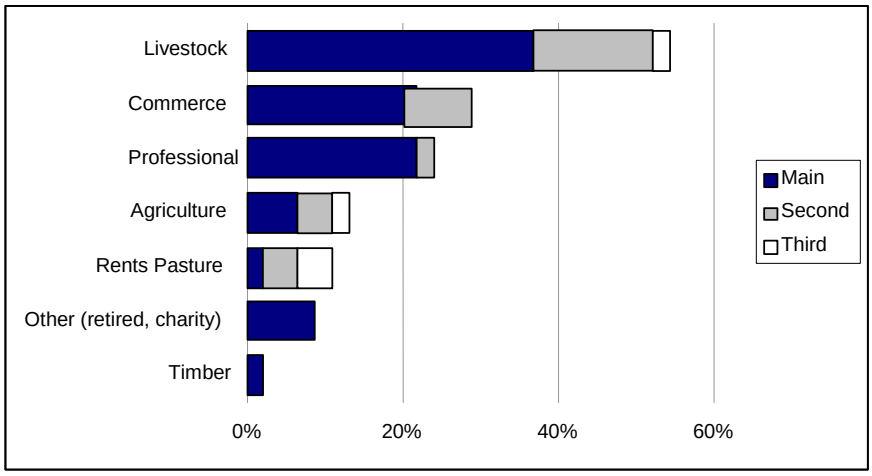


Most of the landowners are male (87 per cent), and in general all households selected in the sample are well educated. In almost 70 per cent of cases there is a household member with a university degree. Only a small percentage (8.5 per cent) had only completed primary education. The average age of the landowners is 54 years, with a minimum age of 30 and a maximum age of 89 years. The average number of children per household is three (minimum - one, maximum - six). Most families live in a city close to their property.

4.1.2 Land use activities within the sample

Forest protection and reforestation are not the only activities within the farm. When asked to name the three main economic activities of the household, 54 per cent reported livestock, either as the main economic activity or as a side-business. Agriculture was practised in some form on 13 per cent of the properties, and 11 per cent of landowners rented some of their land as pasture. It is worth noting that most of the landowners are not dependent on their land for their livelihood, as 65 per cent of them are either professionals (lawyers, engineers, etc), work in trade or commerce, or are retired from their former professions (see Figure 4.3).

Figure 4.3 Economic activities within the watershed (all households)



Note: these activities do not include selling environmental services.

Table 4.3 Ranking of economic activities within the property

	Receive PES			**NO PES**		
	Main	Second	Third	Main	Second	Third
PES	**6%**	**59%**	**34%**	**0%**	**0%**	**0%**
Professional	28%	9%	0%	14%	7%	0%
Commerce	22%	3%	0%	0%	7%	0%
Livestock	31%	16%	0%	64%	14%	0%
Rents Pasture	0%	6%	3%	0%	0%	0%
Timber/Forestry*	3%	0%	0%	0%	14%	7%
Agriculture	0%	3%	0%	21%	7%	0%
Other (retired, charity)	9%	3%	0%	0%	0%	0%
TOTAL	**100%**	**100%**	**38%**	**100%**	**50%**	**7%**
Households	**32**	**32**	**12**	**14**	**7**	**1**

* Forestry activities not receiving PES

Most of the landowners who do not receive PES receive their main income from some kind of on-farm activity (64 per cent livestock and 21 per cent agriculture), and 14 per cent have professions unconnected to the land. Only seven landowners declared a second activity; mainly livestock and timber activities, which do not receive PES at the moment (for example, forestry plantation for wood or fruits).

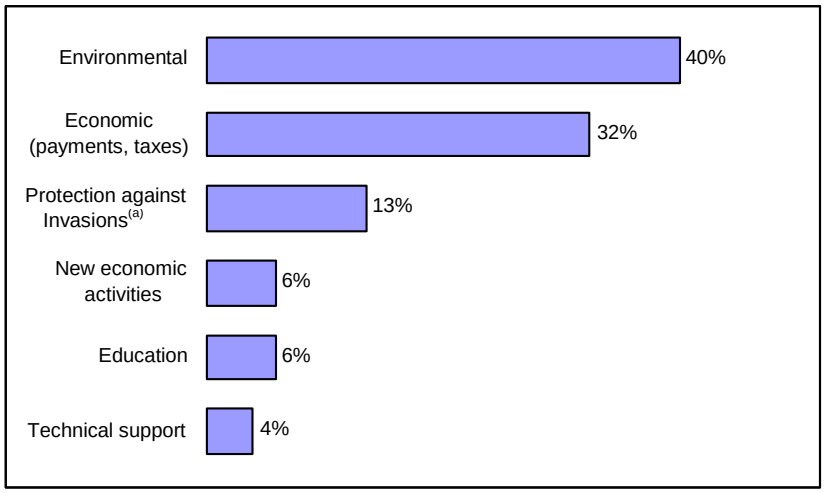
The range of economic activities for those properties receiving PES is more varied. Thirty-one per cent of landowners declared livestock to be their main income, and 59 per cent depend on their professions, commerce or other economic activities. Only two landowners declared that the payments for environmental services were their main source of income, while approximately 60 per cent said that PES was their second source of income and 11 landowners ranked PES as their third source of income (see Table 4.3). At farm level, an average of 57 per cent of the property is under some kind of protection, and no great variations were observed. Large properties of more than 130 ha tend to have, on average, a larger proportion of protected areas (63 per cent) than smaller properties of less than 10 ha,

which present an average of 56 per cent. There is, however, no clear indication as to whether property size affects the existence of on-farm activities on properties receiving payments for environmental services.

4.2 Impact on household assets

According to the survey, environmental benefits in the form of protection of water sources, improvement of water quality, protection of forest for present and future generations, and improvement of degraded lands were the most important benefits generated by the PES programme (see Figure 4.4). Economic benefits, such as the Payments and tax relief, were reported in 32 per cent of cases. Protecting the land against squatters was also seen as one of the most important benefits of the programme. Other benefits reported included potential for new economic activities (such as ecotourism projects), education, and technical support received from FUNDECOR.

Figure 4.4 Main benefits of the PES scheme according to the survey



(a) For further detail see section 4.2.4.

4.2.1 Impact on financial assets

According to the Sustainable Livelihoods framework, the financial assets of the individual determine his or her ability to access or generate cash or other forms of income. Landell-Mills and Porras (2002) present a list of potential benefits of markets for environmental services which includes: income from sales of environmental services, income from related employment (for example, sales of non-timber forest products, fuel wood, timber, ecotourism, or transport), and increased security and stability of income due to diversification of on-farm activities. The development of these markets could also carry risks, such as high costs of market access (transaction and opportunity costs), restricted forest exploitation, and less security in long-term contracts, which does not allow for a response to short-term shocks. These risks are higher for poor and/or small farmers, who often lack the necessary skills and assets to take part in the development of the markets from the beginning.

The present analysis attempts to provide information on:

- impacts distribution of income;
- whether the PES is a source of employment for rural communities;
- access to markets and transaction costs.

Impact of the Payments on the household budget

Funds distributed by the Payments for Environmental Services scheme in the Virilla watershed are substantial. As shown in Figure 4.4, economic factors were among the most important reasons reported by landowners for accessing the PES scheme. Although it was reported as the main income for only 2 per cent of the sample, it represents a substantial part of the household budget for 60 per cent of the sample.

While the amount of the payment varies each year as the colon is adjusted for inflation, in dollars the payments remain approximately US$550/ha for reforestation, US$320/ha for forest management, and US$225/ha for forest protection, all disbursed under contracts lasting five years. These payments are made in instalments during the contract period, after which contracts can either be renewed (based on availability of funds) or cancelled. The proportions vary for the different years (i.e. for reforestation 50 per cent of the payment is made in the first year, and 20 per cent, 15 per cent, 10 per cent and 5 per cent is made in the following years). Only payments for forest protection are made in equal instalments, although the amount may vary depending on the scheme that the landowner belongs to. For example, the ESPH/Cervecería pays approximately US$65/ha/yr.

In this analysis, only the average values are used (it is assumed that payments are on average $110/ha/yr for reforestation, US$70/ha/yr for forest management, and US$45/ha/yr for forest protection).

Table 4.4 Average payments per property (2002 US$)

	Minimum (US$/year)	**Maximum** (US$/year)	**Average (1)** (US$/year)	**Average (2)** (US$/month)	**Average Size** (hectares)
Reforestation	165	13,200	2,228	186	20
Management	1,050	3,290	2,170	181	31
Protection	225	27,000	4,177	348	93
Total PES	**165**	**27,000**	**4,243**	**354**	**80**

Table 4.4 presents an approximation of payments according to type of programme. The average payment that all properties enrolled in the PES programme in the Virilla watershed receive is approximately $4,200 per year, equivalent to 1.5 times the minimum monthly salary.[5] This average is larger for areas under protection, because the average size of the property is much larger (93 ha).

As Table 4.3 shows, the income received from the sale of environmental services is the main income of only two landowners, as most landowners obtain their main income from livestock, agriculture, or their own professions. It is important to bear in mind that alternative uses of land have a high opportunity cost in this area of the country. These activities, which are mainly oriented towards the export sector, include dairy farming, and coffee and ornamental plant cultivation. Seventy-five per cent of households make more than US$820

[5] The minimum monthly salary in Costa Rica is approximately US$2,640 per year.

per month, and the authors believe that even this figure is an underestimate of the monthly income of most of the landowners in the sample.

Table 4.5 presents a very simple "back of an envelope" calculation to estimate the proportion PES represents of the household budget. Using a mid-point for each income category and the average income from selling environmental services (for protection, reforestation and forest management), it is estimated that PES represents approximately 16 per cent of the household budget.[6] The proportion is largest for properties of over 130 ha (34 per cent) and substantially smaller for properties of 30 ha or less (4 per cent), where other economic activities are more prevalent.

Table 4.5 Proportion of income from PES by property size

	Income (US$ PER YEAR)			**Proportion of PES within household budget***		
	Payments	**Income**	**Proportion of PES within HB****	**Main**	**Second**	**Third**
Less than 10 ha	882	22,000	4%		2%	5%
11 to 30 ha	931	22,000	4%		5%	1%
31 to 80 ha	1,900	19,557	9%		9%	
81 to 130 ha	2,022	15,200	18%	37%	6%	14%
More than 131 ha	11,252	20,663	34%		41%	30%
Total	**4,243**	**19,787**	**16%**	**37%** (n=2)	**12%** (n=19)	**18%** (n=10)

*For landowners who ranked the areas receiving PES as their main, secondary, or third economic activity.
** HB: household budget, estimated as the mid-point income plus payments for environmental services.

The proportion of PES of average income for the two landowners who declared that PES represents their main activity is 37 per cent. For those who declared that PES is their second source of income the proportion is on average 12 per cent, with most of the sample having properties of 30 to 80 ha and a proportion of about 10 per cent. Finally, for those who ranked PES as their third economic activity the average proportion is 18 per cent, and most of the landowners have properties of over 130 ha. It is worth noting that the programme does not have a significant economic effect on small landowners, for whom the sale of environmental services represents at most 5 per cent of their total income. One possible explanation is the small proportion of land that can be put aside for forest activities if other economic activities take place on the property. The other explanation is that several of these small properties (in this particular area) belong to wealthier individuals who keep the property as a residence (*quinta*).

When asked about the use of the payments, 66 per cent of households indicated that they use them for investments within the farm. This is the main use of the funds regardless of property size, although smaller properties (less than 30 ha) also use a significant amount of the money for general expenses. Likewise, landowners who are not currently under the PES scheme said that they would mainly use the additional money for investments within the

[6] Information about income was collected in four main categories: (1) less than $3,200, (2) $3,200-$6,600, (3) $6,600-$9,800, (4) more than $9,800. To convert the ranges into continuous variables the following adjustment was made: (a) for incomes less than $3,200 we used the minimum salary figure; (b) mid-point figures of $4,900 and $11,300 for ranges (2) and (3) respectively, and (c) $2,2000 for category (4).

farm. The payments are then used to increase the level of assets for the household: Some of the activities reported on the farm include:

- Physical assets: improving fences, footpaths, and roads; erecting signs;
- Natural assets: grass cutting, and improving efficiency of areas dedicated to pasture and livestock. One landowner pointed out that if livestock was doing well, there was a better chance of him keeping his forest;
- Social assets: hiring farm labourers and guards.

Thirteen per cent of households indicated that the money is used for the general household budget and its use varies from health and education to travelling. Sixteen per cent of households indicated that they do not treat the money as a separate source and it is used for everything (investment, savings, general expenditure). Only 3 per cent of households use the money for savings, and 3 per cent use it for something else, such as donations.

The Payments for Environmental Services scheme could bring additional financial benefits to the participants, in the form of exemption from property tax, better credit facilities or access to a new range of economic activities such as ecotourism. For more than half of the respondents, none of these additional benefits had been received, although 31 per cent reported property tax exemption and 6 per cent mentioned ecotourism possibilities. Nine per cent of the respondents were not aware of these benefits or did not answer. On the other hand, those landowners not involved in the programme did not believe that not having access to PES had affected their capacity to access any of the aforementioned benefits.

PES and job creation

Whenever there is a significant change in land use there are likely to be repercussions in local labour markets. In the case of markets for environmental services the impact can either be positive or negative (Landell-Mills and Porras 2002):

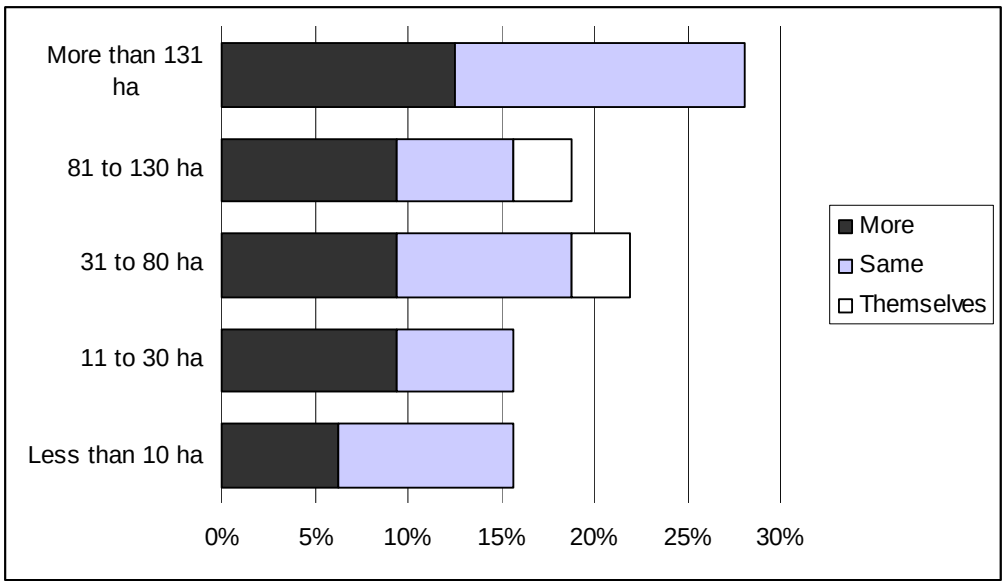
- Employment gains could arise from the creation of new jobs. This includes new jobs at farm level (guards, farm labourers for clearing, maintaining footpaths, harvesting, etc.), at intermediary level (monitoring staff, forest managers, office workers, etc.), and at national level (programme administrators and coordinators, etc.);
- Employment may decline if other existing economic activities disappear (eg. livestock) or are replaced by activities that require less (or only temporary) labour.

Although the PES scheme cannot be regarded as a large generator of employment, it does have a significant influence on job creation. While forestry activities are mainly carried out by family members and/or by workers contracted permanently by the farm, PES has created technical and professional posts in organisations that have developed around these activities. Forest engineers, geographers, biologists, economists, social scientists, ecologists, topographers and specialists in geographic information systems, amongst others, now work within state organisations, NGOs and the private sector, as a direct result of the PES programme.

The results from the survey show that approximately half of the respondents (47 per cent) have used more labour as a result of joining the PES scheme. In all the cases these new jobs are temporary, ranging from two to four weeks a year to comply with FUNDECOR

requirements, at a daily average cost of CR 5,000 (US$13,5). Jobs include maintenance of footpaths, security, harvesting, and repairing fences. Larger properties reported hiring up to seven workers every season. The same number of landowners (47 per cent) reported that they neither hire more nor less staff to comply with the programme, but use their existing workers. This in itself could be an important effect of PES on the often ignored issue of migrant workers, such as Nicaraguan labourers. However, the survey did not collect information about these labourers. Figure 4.5 shows that there is little variation in the proportion of job creation by property size.

Figure 4.5 Proportion of job creation by property size



Market access and transaction costs

When markets are developing, transaction costs are bound to be high. The task of bringing together buyers and sellers of environmental services, preparing initial studies and monitoring ongoing projects could be challenging. In Costa Rica potential sellers of environmental services have to comply with a series of legal and bureaucratic procedures that could be a serious obstacle to market entrance. Moreover, access to payments also depends on availability of funds. At present, there is a considerable number of landowners applying to participate in the protection scheme (approximately 80 per cent of the total applications, (Wandsworth 2002.), although existing funds are bound to be split in equal parts for protection and reforestation.

The study sought to find out how participants viewed transaction costs, and whether those not participating in the scheme felt they were restrictive. The main questions asked were:

1. Who completed the application to MINAE? (yourself, intermediary, other)
2. How much do you think it has cost you to participate?
3. What documents did you have to obtain to access the PES?
4. Does FUNDECOR or another intermediary require something in return for carrying out the intermediary process?
5. When did you apply for payments?

6. When did you receive the first payment?
7. (For non-participants) Why do you not access the PES?

Accessing the PES

In order to access the PES programme, potential participants must meet eleven requirements for MINAE. This is potentially a long and tedious process, and intermediaries play a key role in administering the programme. Eighty per cent of the participants have accessed the payments through an intermediary (50 per cent through FUNDECOR, 22 per cent through Plama-Virilla and 9 per cent through ESPH). Almost all of the large landowners have accessed the payments through FUNDECOR, and during the interviews several of them explained that they were approached by FUNDECOR about entering the PES programme. For smaller properties (less than 30 ha) using an intermediary is the most efficient way to participate. Only one participant completed the application process by himself. Plama-Virilla has been the means of access for 60 per cent of the smaller landowners (see Table 4.6).

Table 4.6 How participants applied for the PES

	Self	**FUNDECOR**	**Plama-Virilla**	**ESPH**	**Total**
Less than 10 ha	1	2	2		5
11 to 30 ha		1	4		5
31 to 80 ha	2	3		2	7
81 to 130 ha	2	2	1	1	6
More than 131 ha	1	8			9
Total	6	16	7	3	32
Percent	**19%**	**50%**	**22%**	**9%**	**100%**

Note: Intermediaries in the area are responsible for promotion, paperwork, advice and technical assistance. They look for innovative ways for landholders to access the payments (e.g., the Green Umbrella programme, which groups small producers together in order to reduce transaction costs; timber auctions; and future sales of timber) and carry out monitoring. FUNDECOR also approaches individual firms to engage in the programme as buyers of environmental services (i.e. Florida Ice & Farm and hydroelectric companies). FUNDECOR specialises in forest protection and CNFL specialises in reforestation projects.

Box 4.1 Requirements for entering the PES Programme

Landowners who wish to participate in the programme have to provide the following

- A letter of application to one of the regional MINAE offices
- Proof of identity or status of an organisation
- Proof of a legal title to the land
- Proof of payment of local taxes
- An official cadastral map of the property
- Verification of the size of the area by a professional topographer
- (Copy of) a cartographic map on a scale 1:50.000 to indicate location of the area
- Legal authentication of representative
- Proof that they do not owe anything to the National Health System CCSS
- Proof that IDA has not provided the land
- For sustainable forestry activities, a Forest Management Plan drafted by a professional forestry engineer and approved by the National Conservation Areas System (SINAC). Reforestation can only be financed after additional official approval by the Ministry of Agriculture.

A large number of those interviewed did not remember what type of documents they had to obtain in order to participate in the programme. The participants who used an intermediary did not know, or remember, the cost of access. Those who did their own paperwork still found it difficult to estimate the time and money spent in taking part in the programme. Time is estimated in terms of opportunity cost and this varies depending on the activities of each individual. Some of the responses were:

- two days work to obtain legal certification of documents (approximately US$55);
- several hours over one month obtaining the documents (approx US$80);
- approximately one week plus time for meetings;
- for conservation: forestry management study US$180 plus lawyers, stamps, etc (US$55);
- for reforestation: visits from forest manager US$280/yr (four visits);
- 15 days' work plus US$140 for certificates;
- two months collecting paperwork (US$220).

While it is easier and less cumbersome to use an intermediary, it is more costly. FUNDECOR charges on average 12 per cent of the payments for administering the programme, while other organisations can charge up to 18 per cent. A rough calculation, assuming an average charge of 15 per cent for intermediary services results in an average annual amount of approximately $630 per property. For contracts of five years this could mean an average of over US$3,000. CNFL, on the other hand, does not charge anything for the transaction and even donates the trees for reforesting.

Although the sample sizes are small and the values should not be taken as completely correct, Table 4.7 shows the average waiting time between submitting the application for PES and receiving the first instalment. The "success rate" for payments being delivered in less than one year is highest for landowners using FUNDECOR as their intermediary, although most of those applying on their own obtained their payments relatively quickly too.

Table 4.7 Waiting time to obtain PES

	Self	Fundecor	Other*	Total
Less than one year	33%	63%	0%	67%
One year	50%	25%	29%	0%
Two years	0%	6%	0%	0%
Three years or more	0%	6%	29%	0%
Not applicable (haven't received yet)	17%	0%	43%	33%
Total	100%	100%	100%	100%

* Plama-Virilla or ESPH

Reasons for not joining the PES

The main reason for landowners not taking part in the system is restrictions on the size of the farm or the amount of forest they have on the property, regardless of the property size. Some of these properties do not have forest because the current economic activity on the land is more profitable (i.e. cultivation of strawberries or ornamental plants), or because they own riparian forests, which, by law, are not eligible for PES.

Another major reason for not accessing the PES programme is basic mistrust of the country's legal system. Because legislation changes continually, some landowners (with areas ranging from 5 to 20 ha) are afraid that future changes in the law would bind them to undesirable commitments or restrict future use of the land. Current restrictions on use of timber was also cited as a reason for not accessing the system. Fifteen per cent of the responses related to insufficient information about the system, but only 5 per cent related to insufficient payment.

4.2.2 Impacts on social assets

There are several indicators of how social capital has been enhanced by the payments for environmental services. These indicators can be described as:

- institutional innovation;
- de-bureaucratisation;
- voluntary agreements for environmental improvement;
- organisational and community innovation; and
- promotion of inter-organisational co-ordination

Institutional innovation. The PES programme has produced a process of institutional growth and innovation within a very short period of time.[7] The process is directed towards preserving the remaining areas of natural forest and rehabilitating severely degraded riverbanks.

This institutional innovation can be illustrated by the positive responses of the various social actors to restoring the landscape and improving the natural conditions of the ACCVC. All of those interviewed showed great interest in reviving the landscape, the only frustration being the limited access to land in some cases. The small producers, who represent 80 per cent of landholders in the canton of Coronado, do not have enough land to carry out reforestation, let alone undertake conservation in accordance with current state requirements.

Further indicators of institutional innovation are the support for and participation in the various activities developed by the Plama-Virilla to improve the environment and protect and rehabilitate water resources, and the increased community and organisational involvement.

"De-bureaucratisation". The process of "de-bureaucratisation" to improve the effectiveness of the PES is an example of the institutional growth achieved in Costa Rica through the PES scheme. In the agreement signed by the CNFL and FONAFIFO in 2000 to bring areas outside of the ACCVC area under the PES scheme, account was taken of the experience of the Plama-Virilla of streamlining processes, reducing costs, improving inter-organisational co-ordination. Consequently, a much more effective PES scheme that was more attractive to the beneficiaries was developed. According to Engineer Gabriela Soto,[8] in the traditional PES scheme each operation costs approximately US$ 285, while in the CNFL-FONAFIFO system the cost of each operation is US$ 13 per hectare. Likewise, under the original system the time a beneficiary has to wait from the time of applying until the payment is received is

[7] The PES is understood to be an integrated programme that started approximately two decades earlier with forest incentives, and since 1996 has developed into payments for environmental services.

[8] Engineer Gabriela Soto is a consultant for the company Bosques Tropicales, and works with FONAFIFO on the implementation of the CNFL-FONAFIFO agreement.

between six and 12 months, while under the CNFL-FONAFIFO scheme the waiting time is two months. This is because the mediation process is reduced for the benefit of the programme.

Voluntary agreements for environmental improvement: Another element of institutional innovation is that the private sector has also become interested in regenerating the landscape. Private enterprise has joined with the government in an effort to rehabilitate the physical conditions of the watersheds, and there is a willingness within the private sector to participate actively in the PES programme through the "voluntary agreements for environmental improvement". The CNFL is extending the ACCVC experience to other regions within the country. It recently signed an agreement with FONAFIFO to set up the PES system in the Balsa Superior, Aranjuez y Laguna Cote watersheds. Projections indicate that in the next ten years the company will assign $22,920 million to pay forest owners for protecting natural vegetation for ten years. It is estimated that in that time 16,000 ha of forest will be protected.

The company Florida Ice & Farm,[9] signed a voluntary agreement in 2001 within the legal framework of Forest Law 7575, and with the support of FONAFIFO and FUNDECOR. The objective was to preserve natural forest, promote natural regeneration and encourage reforestation in order to increase infiltration and percolation capacity in the Río Segundo basin, from where the company obtains its water.

The Costa Rican Electricity Institute (ICE) has not been involved in the PES programme so far, but it is interested in implementing a PES system for protecting the hydroelectricity basins that it uses. Likewise, National Aqueduct and Sewerage Company (AyA) is interested in becoming involved in improving water resources.

Organisational and community innovation. The organisations involved in the PES have developed alongside the programme. In 1993 the National Power and Light Company (CNFL) established the innovative Environmental Improvement Project for the Upper Part of the Virilla watershed (Plama-Virilla). The programme started with four employees, and in 1997 two more officers were employed. The Plama-Virilla was consolidated with the signing of Costa Rica-Norway agreement, and by 2002 it established an Environment Directorate in which 44 staff were employed between two departments – Natural Resources and Environmental Promotion and Education. The transformation of an environment programme into an environment directorate is a good example of the social effects of the PES programme. CNFL's activities raised awareness of to the need for better watershed management and environmental improvement, and motivated other hydro-electric companies, such as ICE, to address these issues more effectively within their own organisations.

The Heredia Public Services Company (ESPH) has been building an internal infrastructure since 2000 to address payments for environmental services in the north of the province of Heredia. The PROCUENCAS programme, funded from the water tariff, was created to implement the PES system in the watersheds of the Ciruelas, Segundo, and Bermudez (see Table 2.4).

FUNDECOR, MINAE, and FONAFIFO have also been innovative in restructuring their organisations, partly because of the implementation of the PES: MINAE has initiated a

[9] Florida Ice & Farm is a company that produces beer, fruit juices and bottled water. Twenty litres of water are used to produce one tin of beer.

process of decentralisation; FONAFIFO has organised itself into different departments in order to respond to the programme; and FUNDECOR has drawn up a strategy to promote and exploit the PES for the benefit of participants and interested parties.

Some municipalities have created environmental commissions. The municipalities of Tibás, San Isidro, Moravia and Coronado have signed inter-municipal agreements to improve the environment of the micro-basins of the rivers Tibás, Macho y Pará. This agreement established as priorities work on environmental education, management of solid waste, reforestation, water resources, and inter-organisational co-ordination of the land regulations. The agreement led to the creation of an organisation called TIMAPA (Tibás, Macho and Pará) whose aim is to ensure that the clauses of the agreement are implemented. TIMAPA is a permanent member of the CNFL.

Organisational innovation has encouraged co-ordination between organisations, which has in turn resulted in more efficient use of the economic resources invested in environmental improvement programmes.

Promotion of inter-organisational co-ordination. Although it has been difficult on occasions, the organisations involved in implementing the PES programme in this area have established co-ordination among themselves. For example, the CNFL has successfully co-ordinated with the environmental commissions of the municipalities of San Isidro, Santo Domingo, Coronado and Moravia and has ensured that they have remained active.[10] The CNFL co-ordinates various activities, such as the environmental fair, with these organisations and has even promoted an inter-municipal agreement to improve the environment of the river Virilla. The municipalities agree on how to run the environmental fair.

Another example of successful inter-organisational co-ordination is that between the CNFL and the Ministry of Public Education. The environmental education programme co-ordinates activities in 29 schools and has also amended the school curriculum to include the environment as a topic, and has actively pushed for environmental education in the Ministry of Public Education's programmes.

4.2.3 Impact on human assets

Any programme that hopes to have a long-term effect must sustain its short/medium-term approaches with investment in human assets. Potential benefits from the creation of markets for environmental services include education and training and improved health. Included among these activities are: environmental management, business development, project management, marketing, negotiation, improved quality and quantity of water. There are potential risks too. For example, when inappropriate education diverts spending from broader skill development. There is also the danger that the benefits of training are only captured by the landowners. When poor people are excluded from collecting NTFPs their disposable income could be reduced, thus reducing their access to education and health (Landell-Mills and Porras 2002).

The PES programme within the Virilla watershed has had both a direct and an indirect impact on human assets. Direct beneficiaries - those receiving the payments - consider technical assistance and education to be important benefits of the programme (see Figure 4.4).

[10] The environmental commissions in the majority of the country's municipalities have not yet realised the importance of the role given to them in respect of local-level use and management of natural resources, and are not visible in this area.

According to the field work, FUNDECOR and CNFL provide training and advice on the planting process, fertilisation, adequate management, design and maintenance of footpaths, harvesting, and reducing the risk of illegal hunting within the properties.

Structured programmes of environmental education and solid waste management are important indicators of improvements in human assets. As a consequence of the bilateral agreement between Costa Rica and Norway, CNFL restructured and strengthened the Plama-Virilla, by initiating a programme of environmental education and solid waste management (Miranda 2002). This programme has a large social base as it works within the national education system, especially among primary schools, although secondary schools are also expected to be incorporated (Umaña 2002). The programme has the following objectives:

- to increase awareness of pollution and destruction of natural resources in the upper part of the Virilla river;
- to promote participation of the different stakeholders and civil society in the improvement of degraded landscapes;
- to promote integrated management of solid waste through community action.

Both programmes work within several communities located in the upper part of the Virilla watershed. Among the direct human and social effects of the programme include promotion of community organisation and networking, capacity building in solid waste management, aquifer protection, and recuperation of degraded landscapes. Special efforts are made to create and internalise a "green culture".

The programme works mainly with children, who will be the future landowners and will eventually take land management decisions. This is a key factor in the PES scheme: in the short and medium term, civil society will be informed and aware of the need to improve their environment. As a result, environmental management will be more fluid and successful. As at 2001, the programme had been working permanently in 29 schools (see Table 4.8).

Among these activities are the environmental fairs, in which children and staff take an active part through ecological clubs and committees. Other activities include training workshops directed at the community in general on solid waste management, recycling, refuse collection and tree-planting in important aquifer and other green areas.[11] The programme works with the school staff to improve the environment curriculum and to design educational material. A total of 70 workshops took place in 2001, involving approximately 2,500 children. A further 23 workshops involved as many as 700 parents and school staff (CNFL 2001). Another important activity is the Ecological Festival of Song, in which original music is performed. This festival took place for the first time in 2001 and involved over 400 people. The main theme was the importance of water resources. Other activities include wall painting exhibitions and *in-situ* visits to degraded and improved areas in order to experience first-hand the effect human activities have on the environment. The Programme's activities provide a means to educate and develop future responsible citizens.

[11] According to Plama-Virilla's 2001 report, 2,500 small trees were planted in that year, as part of the tree-planting days (*jornadas de arborización)*, the majority of which were native species grown in CNFL's nurseries.

Table 4.8 Summary of schools that participate in the Environmental Education and Solid Waste Management Programme of Plama-Virilla (2001)

School	Area	Ecological Club (children)	Ecological Committee (staff and teachers)
José Cubero Muñoz	Goicoechea	25	5
Concepción (San Rafael)	Coronado	30	3
Santo Tomás	Santo Domingo	33	2
Los Ángeles	Goicoechea	28	4
Roberto Cantillano	Goicoechea	30	5
Castilla	Santo Domingo	25	3
Santa Rosa	Santo Domingo	35	4
San Luis	Santo Domingo	29	5
Apolinar Lobo	Santo Domingo	32	2
Ricardo Salas	Santo Domingo	30	3
Concepción (San Isidro)	San Isidro	31	4
Santa Cecilia	San Isidro	18	2
San José	San Isidro	27	4
José Martí	San Isidro	35	7
Colonia Isidreña	San Isidro	30	3
Dulce Nombre	Coronado	32	5
José Ana Marín	Coronado	35	7
Estado de Israel	Coronado	25	6
Manuel María Gutiérrez	Coronado	28	5
San Rafael	Coronado	38	7
Anselmo Llorente	Tibás	40	5
La Trinidad	Moravia	35	6
La Isla	Moravia	32	3
Los Sitios	Moravia	35	7
Rogelio Fernández Güell	Ciudad Colón	71	6
Filomena Blanco	Goicoechea	25	4
Pabellón	Santa Ana	8	1
Gabriela Mistral	La Guácima	70	3
José Rafael Araya	Tibás	25	4
TOTAL	**29**	**937**	**125**

The aim of the Solid Waste Management Programme is to collect solid waste from its point of origin (homes and businesses). Training and promotion has been intensive, with activities being carried out at various levels: house-to-house, community workshops and talks, workshops in education centres and organisations. As well as awareness-raising activities, work has also been done in organising communities and schools to initiate a waste management and recycling programme. As at June 2002, the programme had established six collection centres in various communities and education centres within the watershed. A total of 300 tons of waste had been collected in the previous year. The waste is sorted in these centres so that it can be disposed of or managed in the most appropriate way.

A collection centre for recyclable materials was set up in San Isidro de Heredia. A total of 500 families were trained to use the collection centre. The materials in the centre are sorted by the older members of the Albernia household and sold for the benefit of the family. This

is an important secondary social effect of the PES scheme; a marginalised group has a practical task to carry out, which is important for the adults, and also enables them to receive an income which raises the household's standard of living (Cordero and Umaña 2002). A number of schools and colleges have also established recycling programmes, and the income received is invested in education, particularly in equipping computer laboratories. The solid waste management programme aims to involve more groups.

The programme is steadily working towards the elimination of dumping of waste and reducing the amount of refuse in the riverbeds. As well as helping to decontaminate the water sources and the environment in general, it also helps to reduce the cost of transport for waste collection. The refuse collection service is more efficient because, since there is less refuse to collect, it can cover a greater area; and by sorting and distributing the waste at its point of origin the useful life of the landfill is increased.

The Plama-Virilla has produced a valuable experience in environmental education by initiating and developing an innovative process. Efforts must now be directed towards finding ways to involve the private sector, local authorities, and other government organisations that have hitherto supported the programme in only a limited way or not supported it at all.

Training in agro-conservation and management of smallholdings is part of the human capital generated by the PES. Using a holistic approach to integrated farm management, and taking into account the socio-economic conditions of the producers and the biophysical characteristics of the land, CNFL is implementing various activities aimed at promoting agro-conservation in small farms. It is also promoting agroforestry and production of organic fertiliser through vermiculture and composting. This is because the isolated activities that were being undertaken previously did not encourage real watershed management among the landholders. Within the framework of integrated farm management, the CNFL is moving away from the paternalistic attitude it adopted towards small producers in the early years. Guided by this experience, it is pushing forward a much more dynamic process which starts with a commitment from producers to participate actively and responsibly in different farm management programmes aimed at improving their own quality of life at the same time as improving the environment and society.

Small properties are very important in the upper Virilla watershed. According to the Agricultural Centre of the Coronado Canton (Centro Agrícola Cantonal de Coronado) 80 per cent of producers have less than 10 ha for productive activities.[12] In view of this and of previous experience, the CNFL has brought in integrated farm management as a tool for environmental improvement in the watershed. Producers are given training and advice in agroforestry. The mulberry and the *poró* were introduced as trees for fodder, which contribute to the rural family economy as they provide much cheaper food for cattle than animal concentrate. Both species contain high levels of protein and water; some producers have managed to reduce their reliance on concentrate, which they depended on heavily in the dry season. The producers' response has been very positive despite the limited size of their land. At present 7 ha of mulberry and *poró* is being cultivated for fodder. According to Mena, the Director of the CNFL's Environment Directorate, small producers are becoming increasingly interested in agroforestry.

[12] Land in the Upper Virilla Watershed is highly segmented.

The production of organic fertiliser is also promoted using vermiculture and composting. Twenty smallholders are being trained in the production and use of organic fertiliser. The fertiliser produced is used both to fertilise pasture land and to produce the various agricultural crops. The training laboratory is located in the CNFL's forest nursery, which contains the wormeries and composters. Here organic waste[13] is mixed with cattle and worm excrement to produce the organic fertiliser. The smallholders are trained in the various stages of the production process for this type of fertiliser.

Box 4.2 Smallholder experiences of PES

As well as receiving training in the production of organic fertiliser, smallholders are also taught about the benefits of diversifying their farm activities. The programme trains them and encourages them to take advantage of the benefits to the family economy of diversifying their agricultural activities.

The residents of the upper Virilla watershed have responded enthusiastically. An example worth citing is that of smallholder Arnoldo Chacón of San Pedro de Coronado, who has a property of 3 ha. Not only was Mr Chacón able to solve the contamination problem caused by his main economic activity of pig rearing, but he was also given advice on the possibility of diversifying his farm activities. He received training to produce organic fertilser,[14] and to use it in the cultivation of flowers, chillies and other garden produce, which he sells in the nearest city. Not only has this enabled him to augment his income but it has also meant that he is not reliant on one single economic activity.

Other small producers, Cristina Rodríguez who has 2.209 m^2 of farmland and José Vargas who has two acres, have diversified and improved their production thanks to CNFL's advice. Surface water contamination due to animal excrement is being reduced while at the same time they are being given the opportunity to learn how to produce and use organic fertiliser on their farms. Organic farming is gaining importance. A group of nine small producers has set up an organisation called the Coronado Producers (PROCOR) which farms organically, and sells its products every week at the local farmers' market. Although their products are organic, they cannot be labelled as such because they are not certified organic producers. Certification is very expensive and these producers are too small to be able to pay a certification company to accredit them.

According to Alejandra Saborío, a CNFL biologist who is jointly responsible for the agro-conservation project, small producers have a very positive approach to these types of programme. In short, despite globalisation, the CNFL is encouraging small producers to return to a local land economy. Small producers who diversify their activities have more options for improving their standard of living than those who only have one crop or productive activity.

Another element of human capital that the PES programme has encouraged is the acquisition of new knowledge relating to forest species and knowledge of the different communities. CNFL, FUNDECOR and other organisations have intensified efforts to learn more about the behaviour and adaptability of native and exotic species. The PES has been an important driver for forestry research. Much has been learnt about the adaptability, benefits, management and limitations of introducing foreign species such as pine, cypress, and eucalyptus into the central area of the country, and teak and *melina* into other areas.

[13] The CNFL annually collects approximately 40 tons of organic waste from the Coronado farmers' market. This is used to produce organic fertileser. This fertiliser is put into plastic sacks and used by the company where the trees are planted and later is used in the reforestation programmes.
[14] Pig excrement is collected and the organic fertiliser is produced through vermiculture.

Empirical research has also been encouraged on the behaviour of native species such as *jaúl*, *maría*, avocado and fig. Children have been taught how to collect seeds and take them to the CNFL nursery.

Landowners and their families have learnt about the nature and properties of native tree species. It is worth noting that most of the landowners of today were born and reared among fields; the trees had been cut down in previous centuries, so they had to start their forestry activities from scratch.

Valuable knowledge has also been gained about the social dynamics of communities, and about people's feelings about use of natural resources. An understanding of how the state, civil society and the private sector value natural capital has also been achieved.

4.2.4 Impacts on natural assets

Landell-Mills and Porras (2002) present a list of potential benefits and risks for natural assets resulting from the creation of markets for environmental services. Possible benefits include increased value of forest due to improved management and new market opportunities; increased value of land if land tenure is regulated; and the creation of a range of other positive spin-offs in the form of improved soil fertility, biodiversity conservation, improved water resources, better air quality and fewer forest fires. Potential risks include loss of access and use rights due to increased competition for resources; loss of use values (eg,. timber use); and possible negative spin-offs in biodiversity, water and if, for example, large plantations of fast-growing species used for carbon sequestration replace mixed forests.

In light of this, the study attempts to answer the following questions:

- Have there been any (predicted/unpredicted) shifts in land use patterns (including technology changes in agricultural practices and production methods)?
- What are the impacts on land prices?
- Has the value of participants' forest assets increased?

Improving Water Quality

One of the most important human impacts is the improvement in water quality, which benefits approximately 200,000 inhabitants of the lower part of the Virilla watershed who use surface waters along the various rivers within the watershed. Approximately 54 per cent of the population of the Metropolitan Area benefit from this. According to the AyA (2002), the Colima aquifer provided approximately half the water used in the Metropolitan Area in 2001.[15]

Improving the quality of surface water in the upper part of the Virilla watershed is one of the main objectives of the Plama-Virilla.[16] The waters flowing through the river and its major tributaries have been contaminated with waste from industrial and human settlements for years, which has been very damaging (FUNDEU 2000). Several years of continuous

[15] Water consumption in the Metropolitan Area in 2001was 88.9 millon m^3. Approximately 48 millon m^3 was supplied through the Colima aqueduct (AyA 2002).

[16] The Plama-Virilla is a programme established by CNFL in 1993 to improve the natural conditions in the Upper Virilla Watershed.

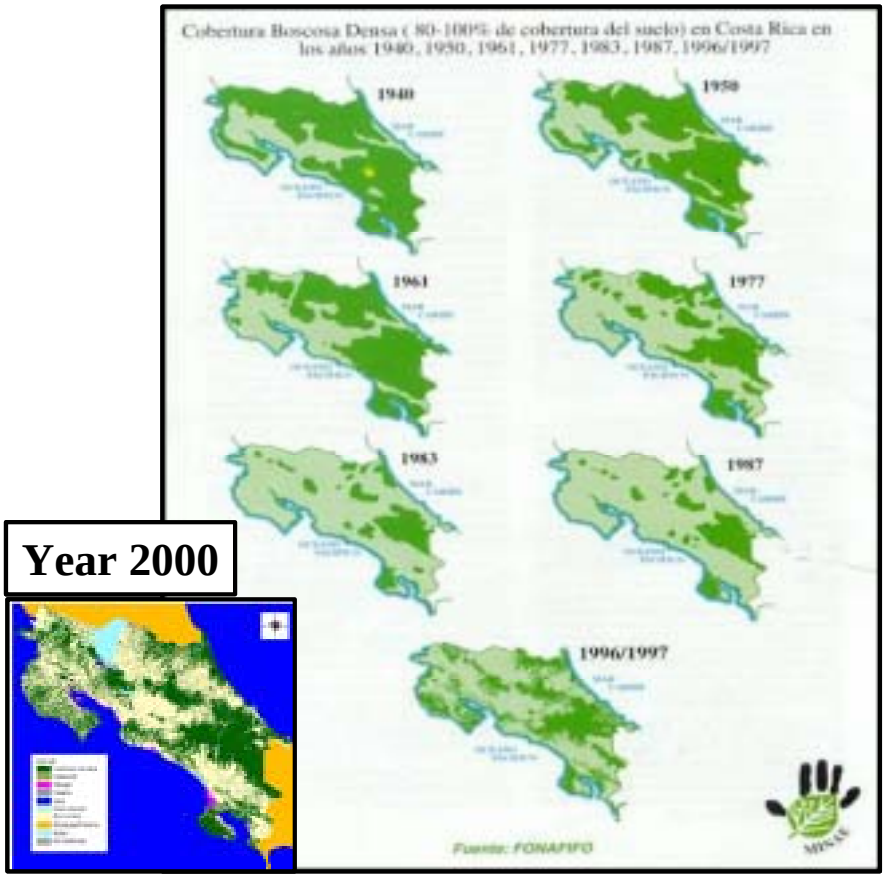
monitoring by Plama-Virilla shows that since 2001 water quality has improved,[17] mainly because of high levels of oxygen. Despite the presence of animal faecal matter in surface waters, it is expected that water quality will improve in time as a result of the implementation of PES and other related programmes (CNFL 2001).

Another indicator of improvement in the surface water quality is the reduction in the level of solid waste. Mena (2002) points out that CNFL now benefits from significantly lower levels of solid waste in the river Brasil dam than in previous years.

"Greening" the landscape

An important effect of the PES on natural capital has been the advance towards a "green" culture in the country, and particularly in the Virilla watershed, which has suffered from environmental degradation for a long time. The protection of green areas is an important benefit for those living in the metropolitan area, and for the country as whole, particularly since its economy depends heavily on tourism. Costa Rica has seen a considerable increase in forest cover since its low point in the 1970s and 1980s (see Figure 4.6). At the end of the 1980s the country had only 25 per cent forest cover. By 1997 this had increased to 40 per cent, and by 2002 it had increased to 46 per cent.

Figure 4.6 Forest Cover in Costa Rica (1950 to 2000)



Source: FONAFIFO

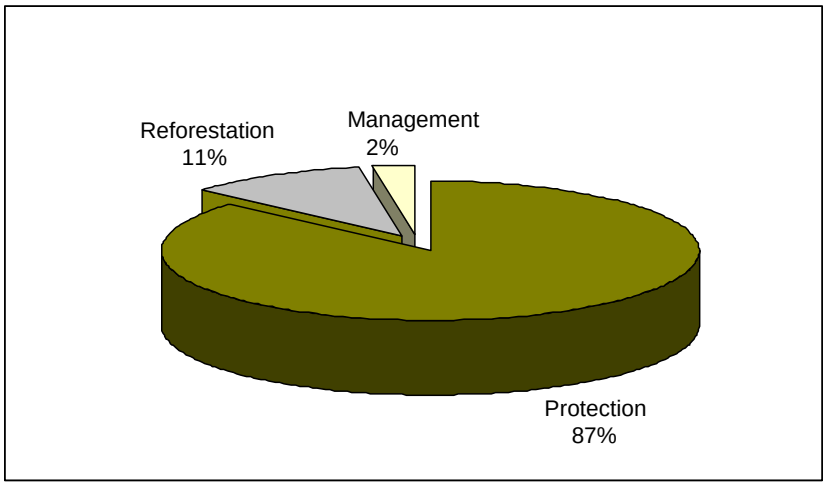
[17] Water analysis is carried out by the Water Resources Management Laboratory (Laboratorio de Manejo del Recurso Hídrico), of the National University's School of Chemistry.

As a result of the implementation of the PES programme in the ACCVC, approximately 16,600 hectares of primary forest have been protected; 2000 hectares have been managed sustainability, and 1,300 hectares have been planted with exotic and native species (FONAFIFO 2002). In the upper part of the Río Virilla watershed, thanks to the Plama-Virilla, 2,500 ha of natural forest have been protected while 497 ha have been reforested (Miranda et al. 2002). Although reforestation of these areas was carried out under the PES scheme, the community made a conscious effort to improve the natural conditions of the various micro-basins, and not to develop commercial forest activities. Reforestation with native species and extra vigilance against illegal hunting allows the possibility of recovering biodiversity on these lands. By protecting existing forest and avoiding land use change the risk of soil erosion is minimised. However, there is no definitive scientific evidence to prove this.

New Patterns of Land Use?

The majority of the area, roughly equivalent to over 2,200 ha and located in 24 properties, within the sample currently receiving payments for environmental services is devoted to forest protection (see Figure 4.7). Reforestation takes place in 14 properties and forest management in two. There are seven properties where several PES activities are carried out at the same time, for example protection and reforestation.

Figure 4.7 Proportion of area under each PES category



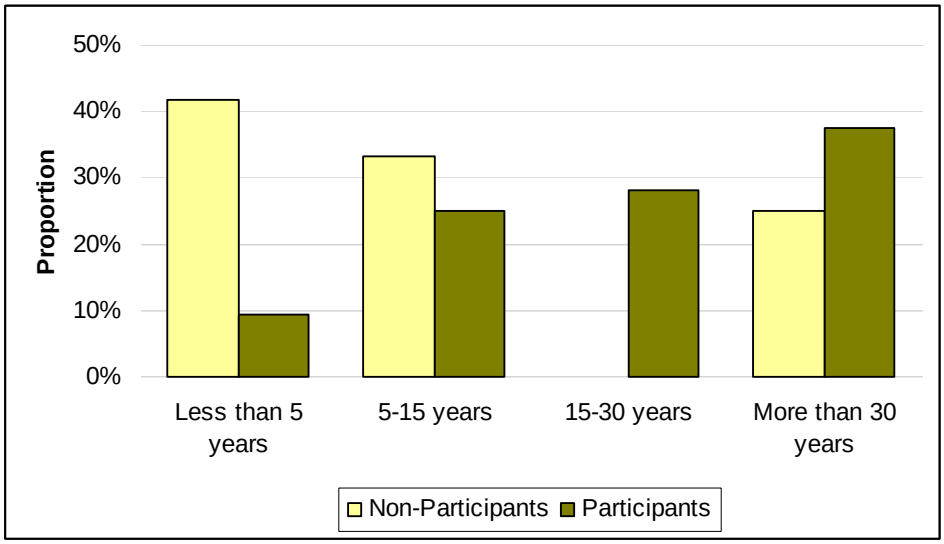
In all cases, save for three, all of the forest within the property is protected under one or two categories of PES. Private landowners have different reasons for entering the PES. The main reason for entering the programme was the desire to protect their existing forest (or to engage in reforestation activities) because of the environmental benefits it provides. Additional on-farm benefits included reduction of soil erosion, protection of existing water sources, and technical assistance to implement environmental projects on their lands. The latter were more important for properties under the protection scheme, while economic considerations were more important for activities involving reforestation or forest management (see Table 4.9).

Table 4.9 Reasons for entering each programme

	Protection	Reforestation	Both	Total
Environmental	65%	29%	25%	47%
Economic	35%	71%	75%	53%
Total	100%	100%	100%	100%
	(n=17)	(n=7)	(n=8)	(n=32)

It is significant that most properties within the sample have been owned by the current owner or his/her family for a considerable period of time. The average length of ownership of land is 33 years, and in six cases the property has been in the family for several generations[18] (see Figure 4.8), and the existing forests were protected for years before the PES programme began.

Figure 4.8 Length of ownership of land



When dealing with markets for environmental services it is important to pay attention to leakages in the system that could reduce the added value of the PES programme. In this sample, however, 60 per cent of the respondents who changed from pasture or livestock said that they did not carry out these activities in other areas of the farm, while others mentioned that they had worked hard in increasing and improving the productivity of other areas of their farm to compensate for the reduction in areas for pasture or livestock. In some cases, technical assistance is provided to accomplish this goal.

Security of land tenure

There are potential risks associated with land tenure in Costa Rica. Even if there are property titles, areas under forest or other types of land use that appear to be "abandoned", could face the threat of land invasions. This is one of the legacies of old laws that guaranteed security of

[18] It is interesting to note that the average length of ownership is shorter for non-participants in the PES programme (27.5 and 36 years respectively). Over 40 per cent of non-participants have owned their property for less than five years, while 38 per cent of landowners receiving PES have owned their property for more than 30 years.

land tenure only if “improvements” were made on the property. This usually meant cutting down the forest and placing a few head of livestock in the area. This was also a double-edged sword, as landowners who wanted to keep their forest could lose their property to squatters claiming that the land had been abandoned. The common threat of land invasions by squatters was a major concern for most of the respondents, especially those with standing forests. As Figure 4.4 shows, 13 per cent of the perceived benefits were associated with improved land tenure and protection against squatters. Once a property is signed up to the PES scheme, it is protected by the government against any type of land incursion.

Another important perceived benefit relates to potential increase in the value of the property. For 61 per cent of landowners this was definitely one of the reasons why they joined the programme, as they perceived that *protected* forest was more valuable nowadays because of its scarcity. For some landowners this was relative: the possibility of making a good sale in the future depended on the prospective buyer and his or her interest in acquiring forest for developing other activities. The PES could indeed be a restriction if the owner wanted to sell in the future and the potential buyer wanted to develop the area.

4.2.5 Impact on physical assets

Poor households could benefit from the *direct* physical assets created by the PES scheme, in the form of infrastructure development such as transport, market infrastructure, research and health care facilities. Potential negative effects include the dismantling of existing local infrastructure such as roads, in order to prevent access to natural resources, and increased inequality when investment in infrastructure is only targeted to certain groups while others are excluded (Landell-Mills and Porras 2002).

Because the PES programme is a programme for buying and selling services, it has not generated a great deal of physical infrastructure. There has, however, been some increase in physical capital in the form of halls that were built to house the CNFL nurseries, and the enclosures that were built on individual farms for producing organic fertiliser. There has also been the physical space allocated to the organic producers at the farmers market in Coronado, through the CNFL programmes. Finally, the fences and paths established to prevent illegal hunting, and the signs erected to inform people and encourage protection of natural resources, are also examples of increased physical capital.

5 Conclusions and recommendations

This section summarises the main results of the study and the recommendations for possible improvements in the system, based on the field study conducted. The impacts are divided according to the asset categorisation of the Sustainable Livelihoods Approach.

It is important to consider what the added value of the PES programme is. Sixty per cent of the areas under forest protection were already under forest cover, either primary or secondary forest, and most landowners would protect their forest even without payments. However, an important shift in the landscape is noted in almost 40 per cent of the sampled areas, where land use changed from livestock or pasture to protection (two cases), forest management (one case), or reforestation (12 cases). Particularly for the latter two, the PES programme provided the individuals with the economic means and technical assistance required to invest in such a long-term activity.

5.1 Summary of impacts on household assets

Impact on financial assets

The PES programme was not created as a "poverty reduction" strategy. However, it has important impacts on the household budget. The main financial benefits, according to the field study, are described below.

(a) Impact on disposable income
Landowners in the sample receive payments of approximately $4,200/yr on average. There is of course variation according to the property size, with large properties receiving a larger proportion of the Payments (see below).

Area	Payments (US$/yr per property)	Proportion of PES within Household Budget
Less than 10 ha	882	4%
11 to 30 ha	931	4%
31 to 80 ha	1,900	9%
81 to 130 ha	2,022	18%
More than 131 ha	11,252	34%
Total	**4,243**	**16%**

The proportion of the payments within the household budget also varies with property size. PES payments for landowners with large areas of forest could represent over 30 per cent of their total income, while the proportion is much smaller for small properties (approximately 4 per cent). This situation usually occurs because small patches of forest usually co-exist with other land uses, such as agriculture or livestock, while large forests tend to stand on their own.

The average income in the sample is quite high (approximately $22,000/yr), and the respondents were highly qualified, with more than half having their own profession,

unconnected to the farm, as their main occupation (therefore only needing the forest for protection). For most of these respondents the payment was not the main reason they joined the PES programme, rather the protection of their existing forest. Tax reductions and exemptions were reported as some of the main benefits of the programme.

(b) Increased investment opportunities
Payments received from the PES programme are mainly invested directly in the farm, partly to deal with PES requirements (signs, paths, etc) and partly to invest in increasing productivity in other areas of the farm (i.e. livestock).

(c) Impact on job creation and wages
The impact on jobs is variable. Almost half of the respondents reported that they now hire occasional workers once a year for two to four weeks at an average cost of $13.5 per person per day. Some large properties reported up to seven workers. However, a large proportion of new jobs have been created for forest managers, intermediaries, and researchers. The field work did not yield information on the impact on agricultural wages, but the PES programme is too small to have any significant impact on the market.

(d) Transaction costs
Transaction costs are high, but most landowners accessed PES through intermediaries and do not know what was required of them or how much it cost them to access the programme. Intermediaries could charge 12 to 18 per cent (CNFL does not charge). In general there was little knowledge among the landowners about the way in which PES works.

Impact on social assets

The main impacts of the PES programme in terms of social assets are:

- continuous institutional innovation, in order to adapt to the development of the PES;
- a process of "de-bureaucratisation" to increase effectiveness of the PES, with more interaction with intermediaries and local bodies and less involvement of institutions at national level;
- promotion of voluntary agreements to improve the environment;
- promotion of organisational and community innovation;
- promotion of inter-institutional co-ordination, among FUNDECOR, FONAFIFO, MINAE, CNFL, and other institutions such as the Ministry of Education, through the environmental education programme.

Impact on human assets

The main impact has been the strengthening of capacity at different levels, particularly in the areas of environmental education and solid waste management, involving schools, teaching staff, parents and civil society. Working with young people is important for the durability of the programme. Landowners have benefited directly from training and advice from FUNDECOR and CNFL on planting, fertilisation, management, design and maintenance of paths, harvesting, and reducing the risk of illegal hunting on their properties. Capacity has also been built in agro-conservation and integrated management of small farms (agro-forestry business, organic compost, organic fertilisers, wormeries, use of improved species to feed livestock, etc.) with a holistic approach to farm management.

All of the above has resulted in 'new knowledge' about forestry and farm management, with important effects on forestry research and policy in relation to both native and exotic species. Useful knowledge and awareness is gained of peoples' perceptions about the use of natural resources.

Impact on natural assets

The PES programme has contributed to the protection of approximately 16,500 ha of primary forest, sustainable management of 2,000 ha, and reforestation of 1,300,000 ha. Over one million trees have been planted in the nurseries provided by CNFL and have been used in their environmental education programmes for young people. These activities, together with the promotion of live fences and sustainable agricultural practices that help protect existing forest, have positive spin-offs for biodiversity and prevention of soil erosion (by avoiding land use conversion). There have also been important water quality improvements from parallel programmes developed by CNFL.

Landowners (especially those with existing forests) consider security against squatters to be one of the main benefits of the PES programme, and over half of the respondents believe that being part of the programme increases the value of their land.

Impact on physical assets

No major infrastructure has been built as part of any of the PES projects. However, the programme has produced the following physical assets:

- tree nurseries, established by CNFL;
- other small installations for production of organic fertiliser on individual farms;
- physical space available in the Coronado Farmers Market for selling organic produce;
- fences and paths to prevent illegal logging and hunting.

5.2 Limitations of and improvements to the PES programme

The main limitations of the Payment for Environmental Services programme in Costa Rica and possible ways forward are presented in the following sub-sections.

5.2.1 Financial aspects

The opportunity cost of land and alternative economic activities, such as dairy farming, export-oriented agriculture, and urbanisation, is high in the area. Some landowners would like forest conservation to be their main activity but believe the payment would be insufficient to cover the opportunity cost of land. Some landowners specified that delays in payment were a serious limitation of the programme, and affected its credibility.

Transaction costs in terms of waiting time are high and could prevent small landowners from participating in the reforestation scheme as they cannot afford to leave the property idle while awaiting a decision. The programme specifies that no activity can take place between submission of the proposal and acceptance of it.

Some of the landowners feel that a higher cash payment for forest protection or reforestation could result in more people entering the programme or renewing their contracts, as it would make forest activities more competitive in relation to other economic activities in the area. The economic incentive remains an important aspect, especially for changing existing land uses (for example, from livestock or pasture to reforestation), although many landowners with forests would continue to protect their forests without the payments. However, they also said that the payment was an additional incentive to continue their efforts to protect forests from other (more profitable) land uses. There were some cases of smallholders who were concerned for the future of their forests, as the low level of profit could force them to sell them in the future.

Prompt payment would be a major development for some landowners, as it would improve the credibility of the system, help them to carry out the agreed tasks, and encourage them to remain within the system. Some landowners were aware of the need to incorporate other land uses into the system, and to urge the current institutions to obtain more funds for this.

5.2.2 Education and capacity building

Most of the landowners who do not receive PES had little or no information about the system, therefore it was one of the main limitations to access. The fieldwork also showed that many landowners currently under the PES scheme had little knowledge about key aspects of the programme, such as the length of the contracts, the amount of money and time required to access the programme, initiation costs for reforestation projects, or intermediary commissions. Because FUNDECOR or the other intermediaries carry out the entire process, the landowner does not know the theoretical, practical, legal and organisational details of the PES programme.

For some landowners insufficient knowledge on their part, and that of their farm workers, on the best way to manage their environmental resources, has resulted in administrative errors that could leave them with a "black mark". They suggest that MINAE and FUNDECOR prepare a capacity building programme for owners and workers that deals with land management, environmental awareness, and networking between landowners to exchange opinions.

5.2.3 Institutional and legal coordination

The PES programme has evolved as a multi-institutional activity. Currently, there are four organisations involved in the process: MINAE, FUNDECOR, FONAFIFO and CNFL. Some landowners are very content with the work of FUNDECOR or CNFL, as it facilitates the process, and helps with technical assistance throughout the project. However, according to some participants there should be more coordination between the institutions with respect to visits to the farm, capacity building, and technical assistance. This would reduce costs both for the organisations and for the landowners, as it would make the procedures easier to deal with.

.

5.2.4 Inclusion of riparian areas

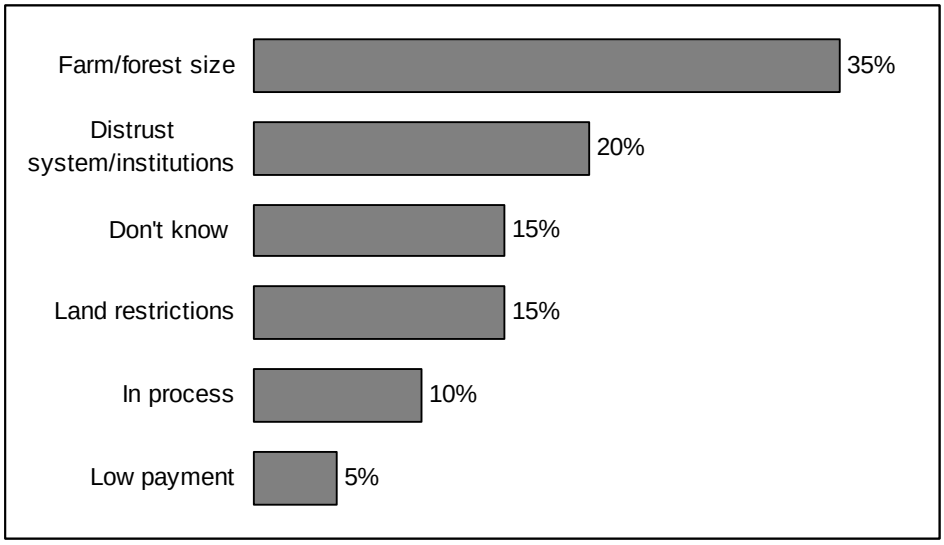
According to the law, forest adjacent to a river cannot be extracted, and Payments for Environmental Services for reforestation is only granted for areas that are *commercially* viable. There are many properties in the region containing rivers and degraded riparian areas, and although the owners might be willing to regenerate these areas, for non-commercial purposes, they cannot access PES because of legal restrictions. A number of national institutions, local projects, landowners and downstream users might benefit if the law were amended to incorporate riparian forest.

5.2.5 Improving access for poorer households

Setting aside forest from other activities within the farm is not always feasible for many small landowners. This study found that many landowners also had livestock, in some cases for generations, on the farm. Many were concerned that livestock were not permitted to graze or seek shelter in the forest during storms. They argued that they had maintained and protected the forests for years before the PES scheme, combining both activities without negative consequences for the forest. It is possible that smallholders who have to keep livestock and have reduced their grazing areas to set aside forest would be adversely affected.

The field study in Virilla found that one of the main barriers to entering the PES programme is actually farm or forest size (Figure 5.1). It is more difficult for farmers to set aside forest area on the farm than combining forestry with other economic activities (for example, shade coffee or shelter for cattle).

Figure 5.1 Principal limitations of the PES (non-participants)



While no information was collected in this field survey from poorer households, the authors conducted a parallel study in the northern region of the country to look at effects on small producers (see Miranda et al.2003). Three main observations were obtained from this study that illustrated that participation of poorer landowners was limited:

- Poorer households that depend on other governmental benefits such as housing benefit (*bono de la vivienda)* are not entitled to access the PES scheme.

- Smallholders who have been assigned lands under the Agrarian Development Institute (IDA) programme for small farmers are not entitled to access PES, even if their land contains forest, is suitable for forestry activities, or would provide environmental services by improving its land uses.

- It was only very recently that forest activities were recognised by the National Bank System for Financing (SNB), which is the main source of finance within Costa Rica and whose policies directly affect rural economies. This limited the borrowing capacity of small landowners to co-finance reforestation activities (the PES covers only a percentage of the total costs of reforestation).

Unless issues like these are tackled, it is unlikely that the PES scheme will provide a means of poverty alleviation in Costa Rica.

5.2.6 Other pressing issues

Legislation on tree felling should be more flexible. At present, it places many unnecessary restrictions on the on-farm management of the property, increases illegal activities, and deters many people from entering the programme because of the bureaucracy. With respect to transaction costs, participants suggested that all the requirements of the contract should be requested at the beginning of the contract and not as an on-going process (a common situation in Costa Rica). Moreover, the contract should be renewed automatically if all requirements have been met, unless the proprietor decides otherwise.

Restrictions on future sales of the property should also be examined. At present, all payments must be returned if a landowner sells his property and the new owner does not wish to continue with the PES programme. One suggestion is to eliminate this requirement, especially for forest protection, since the payment was given for services that have already been delivered, and the money has already been invested in the property (the fieldwork also found that most of the money from the PES is invested within the property to comply with the agreement or to increase productivity in other areas of the farm).

An alternative to the current PES programme is the introduction of livestock-forest production systems, as this is linked more to the production culture of the area, it complements existing land use patterns, and allows landowners to maximise the use of their resources.

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Annexe 1 - List of PES participants in the area

Category: small: 0-30 ha; medium: 30-70 ha; large: more than 70 ha.

Category	Name	Area of property receiving PES		
		Reforestation	Management	Protection
Small				
1	Anselmo Rodriguez			
2	Antonio Robles Oreamuno. Administrador Manfred Fishel			20.00
3	Anabelle Fernández Guell. Administrador Antonio.			10.00
4	Alex Bolaños Ocampo	x		x
5	Arce Mora Hector Ricardo			20.13
6	Bolaños Villalobos Mario	11.82		
7	Centro Ecológico El Pavo Real S. A.			4.98
8	Centro S.A. (William Espinal Money)	21.39		11.90
9	Cesar Carter	4.22		
10	El Pinar S.A. /R. Andrés Barrantes	23.00		
11	Elena Terán			
12	Ernesto Martén			x
13	Federico Lehman			
14	Flores de la Cascada S. A.	35.40		
15	Flores Vindas Ana C.	13.41		
16	González Salas María Lourdes	1.02		
17	Ign. Erick School			
18	Jorge Elias Quiros			
19	Jorge Emilio Rodriguez. Administrador Fredy Delgado	2.20		
20	Juan Elías Quirós			
21	Julieta Vargas. Administrador Eduardo Quijano	12.00		
22	Kooper Chacón William	23.75		20.81
23	La Libertad S. A.			24.20
24	Lorena Cruz Monte Alegre. Administrador Gilberto	5.00		21.00
25	Lorena San Román			
26	Luis Fernando Sage			9
27	Munguía Castro Lidiette			17.99
28	Murillo Pizarro Victor Renán			14.83
29	Manresa Internacional S.A.	4.03		3.00
30	María Gonzales Pérez			
31	Mario Gonzàles (ARONA)	3.00		5.00
32	Ricardo Ramírez	15.00		12.00
33	Rodolfo Esquivel Gómez			35.00
34	Rosa Rojas Avila y otros	10.20		
35	Rubén Martín (Usuahia S.A.)	11.00		11.00
36	Ramírez Masís Ricardo			9.49
37	Siles Rivera María Elena			13.72
38	Solano Oviedo Armando			17.36
39	Suarez Bolaños Gerardo y Otros	11.89		

Category	Name	Area of property receiving PES		
		Reforestation	Management	Protection
40	Sueño Azul S. A.			19.91
41	Vargas Guillen Roberto	9.80		
42	Wong Segura Gerardo		25.00	
Medium				
1	Adrián Sanchez Paniagua			59.00
2	Alberto Saenz Pacheco			70.00
3	Bolívar Murillo Benavides			55.00
4	Castro Harrigon Alvaro			60.53
5	Castro Tosi Claudio			30.63
6	Corporación Fegaso S. A,			33.85
7	Corrales Rodríguez José Luis (Hda. La Luisa)			35.40
8	Carlos Federspel Pinto. Administrador Lic. José Leonardo.			57.00
9	Delgado Ramírez Gonzálo			72.45
10	Empresa Abigail Viuda de Brenes Sucesores Ltda.			51.00
11	Federico Cubero González			40.52
12	Federro S. A.		44.00	
14	Gómez Ovando Fernando			43.00
15	Guevara Vargas Franklin		67.60	
16	Luis Carmona Cerdas			46.70
17	Montero Masís Henry			60.00
18	Moya Fernández José J.			58.00
19	Ovidio Fernández Mora y Propiedades AVED Flores S. A.			38.50
20	Ovinar S. A.			62.61
21	Perez Salazar Rafael Angel			48.33
22	Rodolfo Alejandro Orlich y Compañía			40.00
23	Segura Mejía Edgar	62.00		
24	Shodid Lepiz Elías			67.38
25	Víquez Jiménez Rodrigo			52.00
26	Vicente Rapacciolli Navas			51.00
Large				
1	Alberto Elizondo			160.00
2	Agroforestales La Fortuna S. A.			200.00
3	Altos Vientos S. A.			103.76
4	ARAVAR S. A.			200.00
5	Bernardo Macaya			144.00
6	Botho Steinvorth Jiménez	169.50		13.29
7	Campos Sánchez Daniel			300.00
8	Campos Sánchez Daniel			101.00
9	Castro Ulate Ovidio			195.00
10	Cía. Agrop. Laguna de Oreamuno			100.00
11	Compañía Colinas Verdes Limitada			273.00
12	Corrales Rodríguez José Luis (Hda. La Luisa)			177.80
13	Cosezinc S. A.			200.00
14	CRAVENS S. A.			150.40
15	Cubero Blanco Carlos Fdo.			150.30
16	Cubero Blanco Carlos Fdo.			102.90

Category	Name	Area of property receiving PES		
		Reforestation	Management	Protection
17	Cristian Tattembuch		x	x
18	Inmobiliaria TYO S.A.			88
19	El Angel S. A.			98.55
20	Flores de la Cascada S. A.		35.40	300.00
21	Fideicomiso Dosmil S. A.			201.51
22	Hacienda Los Cartagos Ltda. (Fernando Gurdián)			295
23	Hacienda Atirro S. A.			298.40
24	Hacienda Cachí S. A.			105.51
25	Hacienda Los Gavilanes S. A.			155.85
26	Hacienda Navarro Limitada			95.00
27	Hacienda Navarro Limitada			75.43
28	Hacienda Terranova Limitada			186.15
29	Inversiones Margonsal S. A.			77.00
30	Inversiones Tarire de Grecia S. A.			176.00
31	Isla Bonita S. A.			98.60
32	Isla Bonita S. A.			201.40
33	Lácteos Romero, S. A			139.27
34	Luzvelino S. A.			284.40
35	Maderal Atlantic S. A.			245.55
36	Morales R. Carlos Luis			148.36
37	Quiros González Edgar			139.85
38	Mario Gargollo			152.52
39	Reserva Biológica La Tirimbina SRL			294.70
40	Ricavi de Alajuela S. A.			300.00
41	Rodríguez Rojas Rafael A.			181.04
42	Sobrado Cháves Juan José			103.84
43	Sociedad Negociaciones Financieras Mercantiles GUNTHA S. A.			160.00
44	Suerkata y Central Hidroelect.			73.00
45	Valverde Sanabria Leonardo			103.72
46	Wsteinvorth Jiménez Hnos. Ltda.Jorge Steinvorth		124.45	274.24
47	Refugio Privado Yaguarundì			97.00

Annexe 2 – The Survey

CINPE-IIED
Way of life, capital and vulnerability strategies
Qualitative and quantitative analysis of community profiles

Introduction

The International Centre for Economic Policy for Sustainable Development (CINPE-UNA) and the International Institute for Environment and Development are developing a project on the Social Impact of Payments for Environmental Services in this area. Your opinion is very important to us, whether you are a participant in this scheme or not. We would therefore like to ask you some questions on this topic. Your information is very valuable and will be used confidentially.

Note:
Questions in **bold type** apply to both participants and non-participants.
Questions in blue apply to participants only.
Shaded questions apply to non-participants only.

General Information:

1. **Area** _____
2. **Location of the farm** _____
3. **Age of head of household**_____
4. **Number of children** _____
5. **Number of children: under 15** ____ **over 15** _____
6. **Sex of head of household** ____ **male** ____ **female**
7. **Total area of the farm** _____
8. **Do you have deeds to the property?** ____**YES** ___**NO** Explain (renting, in receipt of IDA [Institute of Agricultural Development] benefit, etc)

_____
_____
_____
_____

9. How long have you owned or lived on this farm?

_____
_____

10. **Where do you usually live?**
    ___ **on the farm**
    ___ **in a nearby city**
    ___ **in another area (give details)**

General knowledge of Environmental Services:

11. **Do you know what forest environmental services are? YES** __ **NO**__

12. What do you consider to be the benefits that your forest/plantation offers?

_____
_____
_____
_____
_____

13. Do you know what the Costa Rican Government's Payments for Environmental Services (PES) scheme is?
YES _____ NO ___

14. Do you receive payments for environmental services? Yes _____ (Go to Question 15)
No _____ (Go to Question 17)

15. Since when have you been receiving PES (year)? _____.

16. What are your **three** main reasons for **PARTICIPATING** in PES? *(give three from the following list)*

___ **cash payments (to supplement family income)**
___ technical assistance
___ increased land value
___ deeds to the farm
___ secure land tenure (as opposed to squatting)
___ protection for future generations
___ increased value of forest products
___ incentives from intermediary (Fundecor, ESPH, other _____)
___ public relations *(worth more in the case of ecotourism projects or forest certification)*

_____
_____
_____
_____
_____

17. Have you applied for PES before? Yes _____ No _____

18. What are your **three** main reasons for **NOT PARTICIPATING** in PES? (explain in detail)

_____
_____
_____
_____
_____
_____
_____
_____

General Information about current land use:

19. Area of the farm under forest/plantation _____

20. Area under Payment for Environmental Services.

Protection _____ha.
Reforestation _____ha.
Forest Management _____ha.

21. For what reasons did you choose to participate in that particular programme? *(Explain why you chose one category over others, eg, conservation costs less than forest management, etc)*

Conservation:

_____
_____
_____

Forest Management:

_____
_____
_____

Forest Plantation:

_____
_____
_____

22. What are the three main economic activities that you carry out, apart from forestry, (on the farm, and outside the farm if you have other employment)? Give the area in hectares (eg., 3 ha for chilli cultivation)

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

23. Please list the above activities in order of profitability (including forestry activities)

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

Transaction costs of PES (Evaluation of access mechanisms)

24. Who carried out the MINAE [Environment Ministry] application process:

- __ Yourself
- __ FUNDECOR [Foundation for the Development of the Central Volcanic Mountain Range]
- __ Other intermediary (specify)
  _____

25. Approximately how much does it cost you to take part in the PES scheme? (give costs for each category)

For this question we have to prepare a separate table to specify the requirements for each of the programmes (see the example below). In many cases the person may not know the approximate cost (we have to define the units) because somebody else carried out the application process.

This information will help us to link up with other information from FONAFIFO [National Forestry Finance Fund] or FUNDECOR. (SEE THE QUESTIONNAIRE ON KEY INFORMATION)

Programme	Requirements	Aproximate cost (days, colons), specify	Don't know
Conservation	(a)		
	(b)		
	Etc		
Reforestation	(a)		
	(b)		
	Etc		
Management	(a)		
	(b)		
	Etc		

26. How much did you pay FUNDECOR (intermediary) to process your application to MINAE?

_____
_____
_____

27. What documents did you have to obtain in order to participate in PES?

_____
_____

28. When did you first apply for the PES? _____

29. When did you receive your first payment for PES?

_____

Benefits of Payments for Environmental Services:

30. What do you consider to be the benefits you obtain from PES?

_____
_____
_____
_____
_____
_____
_____

31. What is/are the main use/s of the money you receive from PES? (specify the amounts)

___ Savings

___ Investment in the farm (give details below)
____ general farm activities (eg., other activities apart from PES)
____ commitments associated with PES (eg., roads, forest management, etc)

___ General household expenditure (travel, health, education, etc)

(give details)

_____
_____
____
_____
_____

32. Who in the household makes the decisions about use of the money received from PES? (husband, wife, other)

_____
_____
_____
_____

33. If you had access to PES, in what would you invest the income you received?

_____
_____
_____
_____
_____
_____
_____
_____

34. What other financial benefits, apart from cash, have you received from PES?

___ the farm or the payments act as collateral for obtaining bank loans,
___ access to soft credit,
___ subsidised interest rates,
___ additional income for future timber sales from the plantations,
___ access to eco-tourism projects
___ sales of other non-wood forest products

Give details

_____
_____
_____
_____
_____

35. Do you consider that not having access to PES has restricted your access to any of the following:

___ the farm or the payments acting as collateral for obtaining bank loans,
___ access to soft credit,

___ subsidised interest rates,
___ additional income for future timber sales from the plantations,
___ access to eco-tourism projects
___ sales of other non-wood forest products

Give details

_____
_____
_____
_____
_____
_____

36. Do you think that the fact that you receive PES affects the value of your property or your ability to sell it in the future? Explain (also in KEY INFO)

_____
_____
_____
_____

37. What other general benefits do you think you have received from PES? **Prepare a list of the other benefits, such as those described by FUNDECOR, proyecto PLAMA-VIRILLA, etc, and ask if they receive these benefits. Also use the list of other capital we prepared previously. (See the list at the end of this questionnaire).**

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

38. Although you do not receive Payments for Environmental Services, do you think you have received other benefits from this scheme? Give details

_____
_____
_____
_____
_____
_____

_____
_____
_____

39. What type of technical assistance have you received since being approved for the PES scheme? from whom?

_____
_____
_____
_____
_____
_____

Secondary Effects of PES

40. With regard to your PES commitments have you had to:

	Amount (day's wages or days)
____ hire additional labour	_____
____ cease hiring labour	_____
____ carry out the work yourself (with family)	_____

41. For the three activities below, what did you do previously, and what would you be doing if you had not had access to PES payments?

Conservation:

_____
_____
_____

Forest Management:

_____
_____
_____

Forest plantation:

_____
_____
_____

42. Where do you carry out these activities now?

___ on another farm/site
___ no longer carry it out
___Give details

_____
_____
_____

43. Do you think that receiving payments for environmental services would affect the way you see your land? YES _____ NO _____

EXPLAIN_____
_____
_____
_____

44. Do you think that participating in PES would make you change the way you are managing your property at the moment? ____ YES _____NO

EXPLAIN_____
_____
_____
_____
_____

45. Have you changed the way the land is worked, either in the areas under PES or the areas not under PES? Eg., tecnological change, intensifying labour in other areas, etc.

_____
_____
_____
_____

Producers' Expectations:

46. In your opinion, what are the main restrictions or limitations of PES?_____
___
_____
_____
_____
_____

47. How could PES be improved? _____
_____
_____
_____
_____

48. Do you think the length of the contract is:

_____ **too short**
_____ **too long**
_____ **about right**
_____ **n/a**

49. What do you consider to be the right length for the contracts?

_____

50. Would you take part in PES again? YES ___ NO ____ (Explain)

_____
_____
_____
_____

Socioeconomic Aspects:

51. Level of education (highest in the family)

__ **Primary**
__ **Secondary**
__ **University**
__ **Other (give details)** _____

52. Main occupation of head of household:

___ **(other) agricultural activities on the farm**
___ **agricultural activities outside the farm**
___ **other occupation outside the farm (give details)**
_____

53. Occupation of other members of the family: *(give details for the partner, children, etc, and whether they work on the farm or contribute in any way to the family's income*)

_____
_____
_____
_____
_____

54. Does the head of household have a secondary occupation? *eg., day labourer, tradesperson, etc – give details*

_____
_____
_____
_____
_____

55. Approximate household income

- __ **less than 100,000**
- __ **100,000 to 200,000**
- __ **200,000 to 300,000**
- __ **more than 300,000**

Name of interviewer _____

Name of interviewee _____

Date _____

For Question 37:

Physical capital

___ Investment in buildings, construction, schools, sqares, gates, etc.
___ Timber from trees used in construction
___ Establishment of forest nurseries, seeds, etc
___ Irrigation
___ Communication / transport

Human capital

___ Training
___ Training in sustainable forest management
___ Agricultural/forest extension services
___ Health

Social capital

___ Clarification of property rights
___ Squatting
___ Knowledge transfer from the project to local organisations
___ Benefits for future generations
___ Networking and organisational capacity
___ Conflict resolution (individual/communal)

Natural capital

___ Availability (or lack) of non-wood products
___ Effect on nature
___ Clean air and water
___ Protection against forest fires
___ Watershed protection
___ Landscape