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PAYMENT OF ENVIRONMENTAL SERVICES IN COSTA RICA: EVALUATING IMPACT AND POSSIBILITIES

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INTRODUCTION

Since the Earth Summit gathered in Rio Janeiro in 1992, more than 180 countries of the world have been negotiating the United Nations Framework Convention on Climate Change including a strategy to reduce the emissions of greenhouse gases that are thought to contribute to global warming. The Kyoto Protocol (1997) - recently ratified in 2005 - includes provisions to allow countries where emissions reductions are very costly to meet their reduction targets by buying credits from countries where emissions reductions are cheaper. This strategy is still in the process of being debated; moreover, the tenth conference of the parties carried out in Buenos Aires (COP 10) reached only partial agreements.

Costa Rica has developed a system of payment for environmental services. However, to truly mitigate the effects of greenhouse gases and to preserve its forests in favor of all humanity, the commitment of all countries is necessary to create an international market for the sale of these environmental services. Costa Rica has been a leader among Latin American countries in the design of and development of a system of payment for environmental services. Since 1997, a program locally called Pagos de Servicios Ambientales (known as PSA in Spanish, or Payments for Environmental Services, PES in English), has been providing payments to more than 4,400 farmers and forest owners for reforestation, forest conservation, and sustainable forest management activities.

In this process of developing and trying to sell emission reduction credits, a considerable amount of experience has been achieved. From this it has been detected that in the particular situation of this country, carbon credits come primarily from two sources: first, converting degraded agricultural and abandoned pasture lands into forests and second, from reducing deforestation (Castro, 1999). In 1996, in an unprecedented transaction, Costa Rica sold its first 200,000 tons of carbon emission reduction credits to Norway for $ 10 per ton of carbon. Costa Rica received no bids when it tried to auction an additional 1,000,000 tons of carbon credits with a floor price of $ 20 per ton. During the year 2001, another eight Latin American countries offered credits to the World Bank's Prototype Carbon Fund at prices between $ 2.90 and $ 20 per ton (Castro and Cordero, 2001). Carbon trade final results will depend on the ultimate rules and regulations, as well as on carbon prices.

Considering that the European Union (EU) established a scheme for greenhouse gas emission

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allowance trading within the Community by Directive 2003/87/EC (EU, 2003) which apply in 2005, new opportunities emerge for many developing countries, including Costa Rica in helping to reduce carbon dioxide through their carbon sinks, which are systems such as forests and forest plantations, which absorb CO_2 from the atmosphere (CE, 2000; Redondo-Brenes, 2005). By offering corrective and offsetting arrangements to industrial countries, developing countries can obtain financial or development benefits (Castro and Cordero, 2003).

THE GLOBAL PROBLEM

Increased emissions of carbon dioxide and other so-called greenhouse gases, GHG (methane, nitrous oxide, and related synthetic compounds), is thought by a majority of scientists and policy makers to contribute to global warming. Emissions of GHG have developed with industrialization, and burning of fossil fuels, such as coal and petroleum, to power industry; to heat, cool, and light homes and offices; and to transport goods and passengers. Following combustion of fossil fuels, deforestation is the second major source of carbon dioxide emissions to the atmosphere, ranging from 0.6 to 2.8 billion tons, compared with almost 6.0 billion tons from fossil fuel combustion (Houghton, 1991; Smith *et al*., 1993).

Global temperatures in 2004 were 0.54°C above the long-term (1880-2003) average[3], ranking 2004 the fourth warmest year on record. The warmest year on record is 1998, having an anomaly of 0.63°C, followed by 2002 and 2003 both having an anomaly of 0.56°C. Land temperatures in 2004 were 0.83°C above average, ranking fourth in the period of record while ocean temperatures were third warmest with 0.42°C above the 1880-2003 mean (NCDC, 2005).

In the framework of the Kyoto Protocol[4], forty two countries (called Annex I countries) are heavy polluters but also achieve high levels of energy efficiency (UNFCCC, 2005). Thus for many of them it will be costly to reduce emissions at home. The Kyoto Protocol requires signatories to reach its goals to reduce CO_2-equivalent emissions by an average of 5.2 % from 1990 levels by the commitment period 2008-2012. This constitutes only a small proportion of global greenhouse gas emissions. Potentially, a significant portion of required CO_2 emission reductions can be addressed using carbon sinks instead of emission reductions.

Plantation forestry in the tropics has been suggested to be small carbon sinks (Schroeder, 1992; Montagnini and Porras, 1998; Shepherd and Montagnini, 2001). However, these plantations may be larger carbon sinks since their area is expected to increase over the next few decades (Houghton, 2003; Koskela *et al*., 2000). In addition, planting trees on wasteland or degraded land provides verifiable carbon benefits, but such projects must be carefully planned in order to not disturb the local people's livelihood strategies, which are often not compatible with large-scale tree plantations.

However, carbon sink activities lead to temporary carbon storage. From this point of view, forest management and other activities that enhance carbon sinks enable countries to buy time as they

[3] The 1880-2003 average combined land and ocean annual temperature is 13.9°C, the annually averaged land temperature for the same period is 8.6°C, and the long-term annually averaged sea surface temperature is 16.1°C.

[4] Kyoto Protocol: the international agreement emerging from COP3, held in Japan in December 1997. Under the Kyoto Protocol to the United Nations Framework Convention on Climate Change, signatory countries agreed to cut greenhouse gases to 5.2% below 1990 levels, to be reached between 2008 and 2012.

develop emission reduction technologies. Furthermore, it is presumed a low cost of sink activities, which is in someways controversial, because of the analysis of some authors suggest that once the opportunity cost of land and the ephemeral nature of sinks are taken into account, costs of carbon uptake could be substantial (Manley *et al*., 2003). As well, carbon uptake via forest activities varies substantially depending on type of activity (forest conservation, reforestation, management, etc.), location (tropical, temperate, etc.), and the assumptions and methods upon which the cost estimates are based. The opportunity is that forestry projects not only are pursued because of their commercial profitability, but also because of their environmental services such as biodiversity and other non-market benefits. These projects can be considered integrated projects that provide carbon uptake benefits.

The Kyoto Protocol establishes three "flexibility mechanisms" with the objective of providing Annex I parties a means to achieve their emissions targets. These mechanisms include: International Emissions Trading (IET) (Article 17), Joint Implementation (JI) (Article 6) and the Clean Development Mechanism (CDM) (Article 12) (UNFCCC, 1997). The objective of IET is to enable trading between Annex I parties to meet their emissions targets. Only Annex I parties with emissions limitation and reduction commitments may participate in trading. Through the CDM, Annex I parties may implement projects that reduce GHG emissions, or, in specified circumstances, remove carbon from the atmosphere by sinks, in developing country parties. CDM projects are approved by both the host country and the investing Annex I party. They must result in emissions reductions that are additional to what would have occurred in the absence of the project (additionality). CDM projects are monitored by the project participants, and the resulting emissions reductions are verified and certified by independent third parties (designated operational entities) before being credited towards the emissions allowance of the Annex I party as certified emissions reductions (CERs). Implementing CDM projects has been possible since 2000 and 26 projects have been registered so far by the CDM Executive Board that supervises the mechanism (UNFCCC, 2002). The first CERs generated by a CDM project were issued in October 2005 (UNFCCC, 2005).

WHAT ENVIRONMENTAL SERVICES MEANS

Traditionally, environmental services (ES) have been understood and defined quite narrowly in terms of facilities that provide water and waste-treatment services, often by the public sector. However, there is a need of moving beyond this stage, and to consider ES holistically. Therefore, ES can be defined as a set of benefits generated for society by the existence and dynamic development of natural resources or ecosystems, in this case with a particular interest on tropical forests. Also, ES can be seen as a set of regulatory functions (on stocks and flows of matter and energy) of the natural ecosystems and some agro-ecosystems that help to maintain or improve the environment and people's life quality (Odum and Odum, 2000; NRC, 2004). De Groot *et al*. (2002) define ecosystem functions as 'the capacity of natural processes and components to provide goods and services that satisfy human needs, directly or indirectly' and additionally, these authors identified 23 ecosystem functions that provide goods and services, making a contribution to the ecological understanding on ecosystem services and a proposal for valuing them.

In the case of forests, they produce oxygen and remove carbon dioxide from the atmosphere, regulate the surface and underground flow of water, smooth out peaks and troughs in water availability, and provide very effective filtration systems for higher water quality

(FAO/REDLACH, 2004). Additionally, forests support a diversity of native flora and fauna, and provide valuable goods and services, ranging from timber through scenic beauty.

The four main types of ES usually recognized by different authors (Mejías and Segura, 2002; Wunder, 2005) and pointed out in the Costa Rican Forestry Law 7575 (1978) are: i) Carbon sequestration and storage; ii) Watershed protection; iii) Biodiversity protection; and iv) Landscape beauty. The same services were taken into consideration in a recent questionnaire survey (Sell *el al*., 2005) on market potentials of and decision criteria for ES derived from tropical forestry projects, where the responding participants assessed the market potential of ecosystem services in the following descending order: a) carbon sequestration, b) watershed management, c) scenic beauty and d) biodiversity. Surveyed market actors from tropical countries see higher market potentials for all services; and the "business opportunity" of the projects was recognized as significantly attractive. The authors described two hypothetical forestry projects, one good in business performance and another one with good performance in sustainability aspects. The business project was assessed to be more attractive, and this was surprising because in another survey by the same research group, using direct weighting criteria associated with sustainability were assessed to be more important (Sell *et al*., 2006).

VALUATION OF ENVIRONMENTAL SERVICES

Environmental services valuation can be a difficult and controversial task. In conventional economics it is generally accepted that measures of economic value should be based on what people want or the amount of one thing a person is willing to pay. At present, the valuation of ES in agriculture, forestry and natural resources, and also in relation to ecosystem services is in a shaping state (Gutman, 2003; Lewandrowski *et al*., 2004), probably because of the term valuing ES is often used as attaching economic values to ecosystem services which are treated as public goods and therefore have no market value[5]. Therefore, attempting to assign values to ES presents several challenges because of the environment provides several services simultaneously, and different types of value are measured by different methodologies and expressed in different units, which involves subjective judgments (Fausold and Lilieholm, 1996). Although this review does not attempt to enter in a discussion on valuation, it is important to say that people are not familiar with purchasing such services if they are not specific stakeholders, then their willingness to pay may not to be clearly defined. However, this does not mean that ecosystems or their services have no value, or cannot be valued in dollar terms. The most used methods for valuing ecosystem services are stated preference techniques such as contingent valuation and choice experiments. The contingent method differs fundamentally from other conservation approaches because instead of presupposing win-win solutions, this approach explicitly recognizes hard trade-offs in landscapes with mounting land-use pressures, and seeks to reconcile conflicting interests through compensation (Wunder, 2005). Additionally, there is a large body of literature about valuation of ecosystems and environmental services (Costanza *et al*., 1997; O'Neill, 1997; Pearce, 1997; Daily *et al*., 2000; De Groot *et al*., 2002; Pagiola *et al*., 2002; NRC, 2004).

THE PROGRAM OF PAYMENTS FOR ENVIRONMENTAL SERVICES IN COSTA RICA

The Program of Payments for Environmental Services (PSA) implemented in Costa Rica is an

[5] Sell, J. 2005. Swiss Federal Institute of Technology Zurich (ETHZ) (personal communication). Zurich, CH.

alternative approach to halt environmental degradation derived from deforestation in low income nations (Castro *et al*., 2000; Castro *et al*., 2001; Ortiz, 2002). Land and forest owners are paid for the environmental services they produce when they adopt land use and forest management activities that preserve the forest and biodiversity and maintain people's life quality. The Costa Rican program of environmental services aims to protect primary forest, allow secondary forest recovering, and promote reforestation of abandoned pasture and degraded lands (Rodríguez Zúñiga, 2003). These goals are met by contracts of payments for environmental services with individual farmers. The program functions like a funds transfer system from those who are benefited of the environmental services toward those that produce such environmental services (Mejías and Segura, 2002). It was designed as a financial mechanism to promote the conservation of the forest resources of the country. It is a program where forest and plantation owners are financially and legally acknowledged for the environmental services that their forests provide to the community. In all cases, participants must present a forest management plan certified by a licensed forester, as well as carry out conservation, reforestation, or sustainable forest management activities (depending on the type of contract) throughout the life of individual contracts (Camacho Soto *et al*., 2002; Ortiz, 2002). The program was established in 1996, building upon previous experiences in Costa Rica as well as an institutional framework dating back to 1979. The legal basis for the program is Costa Rica's Forest Law 7575, which recognizes four above mentioned ES provided by the forest ecosystems: i) Carbon sequestration and storage (mitigation of GHG emissions); ii) Watershed protection (hydrological services); iii) Biodiversity protection (conservation); and iv) Landscape beauty (for recreation and ecotourism). In addition, it has also been proposed that the PSA be an instrument of wealth redistribution that comes to fortify the family economies in rural areas (FONAFIFO, 2005).

An overview of how the program works has been presented by Landell-Mills and Porras (2002). Briefly, the Ministry of Environment (MINAE), through FONAFIFO, is charged with channeling government payments to private forestry owners and protected areas. Payments vary according to the type of activity undertaken: reforestation (US$ 450/ha), forest preservation (US$200/ha) and agroforestry systems (US$ 0.75/tree). 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. They are, however, committed to managing or protecting their contracted forest for 20 years (or 15 in the case of reforestation). Their obligation is recorded in the public land register and applies to future purchasers of the land.

FINANCING THE PROGRAM

Basically, the payments are funded through a nationwide tax on fuel, international donations, and money collected by charging for the forests' environmental services with local and global stakeholders (Chomitz *et al*., 1999). The components and technical aspects of the system, as well as advances to date are presented in FONAFIFO (2005) and the website (www.fonafifo.com). The fuel tax, also referred to as the “ecotax”, is a special tax on the consumption of any crude-oil derivates, passed as part of the new Forest Law in 1996. Initially, legal interpretations of the Forest Law and disputes caused major delays in making the funds raised by this tax available to FONAFIFO. However, such problems have been in a solving process, and FONAFIFO is now receiving the funds more regularly, although with some delays and annual budget regulations by the Ministry of Finance (CR). Originally FONAFIFO was supposed to receive 5 % from every fuel

sale; however, in 2001 the law was reformed and the fund now receives 3.5 % from every fuel sale (Number 8114/2001 - Tributary Simplification and Efficiency Law), which totals approximately US$ 3.5 million annually. In addition, through agreements with hydro-electric companies, FONAFIFO obtains payments for the protection of water resources. Four companies are involved in this program, with a total investment of US$ 560 000 annually at present: Energía Global (approximately US$ 40 000 annually), Compañía Nacional de Fuerza y Luz (CNFL - US$ 436 000 annually), Hidroeléctrica Platanar (US$ 39 000 annually), and Florida Ice and Farm (Cervecería de Costa Rica - US$ 45 000 annually). It means that more than 86 % of the financing of the program comes from this national fuel tax (De Camino *et al*., 2000; Rojas and Aylward, 2003; FONAFIFO, 2005).

Another mechanism implemented by FONAFIFO to promote the national and international market for environmental services are the Certificates for Environmental Services (Certificados de servicios ambientales - CSA). These CSAs are issued for voluntary contributions by the private sector, and the funds are used to finance the PES. The buyers of certificates normally define to which forest areas the funds must the applied. Moreover, a CSA can be used to provide the company with a good image, given that it is cooperating with the protection of forests, and the investment is deductible from gross income for tax purposes by presenting it as an operational cost. A budget of US$ 1.35 million annually is reported by FONAFIFO (2005) as allocated to this modality.

Additionally, the international community places a high degree of confidence in the PES Program and the institutional framework developed by FONAFIFO and the National System of Protected Areas (SINAC) to implement it. For example, the World Bank and the Global Environment Facility (GEF), through the so-called Ecomarkets Project, have provided, respectively, a credit line of US$ 32.6 million and a grant of US$ 8 million to help finance the program of payments for environmental services and to strengthen FONAFIFO, SINAC and the local non-governmental organizations involved in the implementation of the program.

COMMENTS ON THE PROGRAM AND ITS IMPACTS

The model of Payment for Environmental Services that Costa Rica has implemented since 1997 undoubtedly has been a pioneer attempt in the Central Americas region, and may be considered as fairly successful. However, what has really been fundamental in the implementation of the program has been the forest policies institutional framework. This includes, for instance, the existence of SINAC, that has a minimum of infrastructure and an institutional presence in each region of the country; the National Forest Financing Fund (FONAFIFO) that was established to handle financial issues for forests and natural resources; all the body of legislation that protect the nation's natural resources, including the Environment Law, the Biodiversity Law, and the Forest Law; the establishment of a tax on fossil fuels to pay for environmental services; the multiple efforts that have been made to protect biodiversity and generate income from it; the Costa Rican Office of Joint Implementation (OCIC) that was established to trade carbon emissions in the international market; the establishment of a national system to certify good forest management practices, including a National Commission on Forest Certification (CNCF); and a strong forest owners sector having organizations that give them technical support for reforestation, forest management, and forest conservation. The success of a PES program depends in great part on pre-existing conditions (Mayrand and Paquin, 2004). These authors observed that PES may not

constitute a cost-optimal instrument in all circumstances and concluded that PES systems work best when services are visible and beneficiaries are well organized, and when land user communities are well structured, have clear and secure property rights, strong legal frameworks, and are relatively wealthy or have access to resources.

De Camino *et al*. (2000), who made a report on Costa Rica Forest Strategy to the World Bank, analyzed several aspects of the PES program and highlighted the following:

- Payment for Environmental Services still is not well understood by Costa Rican citizens, members of government, or bilateral and multilateral organizations.
- The Secretary of Finance allocates only US$ 7 million/year for the forest services payment from an annual yield of US$ 30 million from fossil fuel taxes.
- Since most Costa Ricans are unaware of the real meaning of the tax, they do not pressure the government to allocate the full amount to forests. Most support comes from those who plant, manage, and protect forest lands.
- The policy is fragile because it depends on the influence of various parties, and because the allocation of funds can vary.
- Some international organizations, as well as some traditional economists, argue that PESs are another way of subsidy. However, PESs provide compensation using the "polluters pay" principle through the fossil fuels tax.

Rojas and Aylward (2003) noted an imbalance between supply and demand for PES, where demand for the incentives far outstrips available resources and each conservation area competes for a share of available funds. The imbalance is aggravated by the fact that if the program is to increase the total area under PES, annual commitments will need to be raised continuously, as the payments for additional hectares have to be added to commitments from previous years. For example, in 2001, only 13 % of the total funds were allocated to incorporating new land to PES. The situation has led to the pursuit of additional sources of internal funding, and FONAFIFO is seeking to sign more contracts with private sector companies that are targeted as key consumers of environmental services, such as those mentioned above. The launching of the Environmental Services Certificate (CSA) was framed within this effort to raise additional funds for the PES scheme, but not intended as a mechanism to compensate for environmental damage caused by the purchaser.

The PES program has generated both direct and indirect social effects (Miranda *et al*., 2003). 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, organizations and individuals located in the various downstream micro-basins of the Central Volcanic Mountain Chain (ACCVC - Area de

Conservación de la Cordillera Volcánica Central) and particularly in the Virilla Watershed and its effluents. These indirect beneficiaries are included in the statistics for beneficiaries of the PES.

Miranda *et al*. (2003) analyzed the social effects of the PES scheme within one of the watersheds (Virilla) in Costa Rica. In this particular watershed, landowners are relatively wealthy and well educated, thus limiting the conclusions within the context of poverty alleviation. Other conclusions include: there were significant impacts on household budgets in terms of an increase (15 %) in the household income, a higher level of investment in the farm in forested areas (eg. signage, paths, etc), and investment to increase productivity in other areas of the farm (i.e. livestock). With reference to the impacts on social assets, a substantial improvement in environmental education and solid waste management, involving schools, parents and civil society, were observed.

In an econometric analysis of a survey of farmers and forest owners, including both PSA participants and nonparticipants, Zbinden and Lee (2005) demonstrated that farm size, human capital and household economic factors, and information variables significantly influence participation in PSA program alternatives. In addition, the authors noticed that large farmers and forest owners are disproportionately represented among program participants.

In his study, Castro (1999) confirmed three things. First, higher carbon prices would encourage landowners to supply more land for sequestration services. Second, Costa Rica has a comparative advantage in selling carbon sequestration services because of its tropical location. Third, if the carbon price were US$ 83 a ton, a farmer producing - or having the potential to produce - the average agricultural mix for Costa Rica might switch to forest plantations.

CONCLUSIONS

Seen from the perspective of poor rural communities, the Costa Rican experience, offers several lessons, as pointed out by Rosa *et al*. (2004):

- First, it shows the importance of broad participation in the early stages of PES schemes to ensure their long-term legitimacy and sustainability. An accelerated institutionalization of PES schemes, without adequately including the interests of small producers and indigenous communities, generates restrictions that are difficult to overcome later.
- Second, without strong and representative organizations of small producers and indigenous communities, it is difficult to ensure participation that will result in truly inclusive schemes.
- Third, the global orientation, eligibility criteria, and operational rules largely determine the capacity for inclusion in the PES schemes. In some settings, greater inclusion requires seeing beyond the forest to link up with other productive activities that are central to livelihoods.
- Fourth, a broad focus on a wide range of practices for the provision of environmental services can be important for improving, diversifying, and strengthening the livelihood strategies of rural communities. The impact of PES schemes can be enhanced when they promote environmentally improved productive activities such as agro-forestry, agro-ecotourism, non-timber products, and sustainable agriculture.
- Fifth, the incorporation of local-level perspectives, priorities, and visions can empower local communities and promote participatory management.

Finally, there are some issues on the program that would need some attention. One is the good will of the government expecting that PSE would help to alleviate poverty in small rural communities versus the facts of what actually happens. As mentioned, the recent surveys by Zbinden and Lee (2005) observed that the large farmers (not necessarily poor) are the real beneficiaries of the program. Moreover, an unpublished study by Hope *et al*. (2005) has investigated how the PES program may contribute to poverty reduction for small-scale land owners in the upper water catchment's area of the northern Tilarán region of Costa Rica. Participation in the PES program is limited due to weak dissemination, disputed land claims, and inelastic commitment to compensation payment levels. Additionally, program design and impacts may be improved by clarification of resource claims and environmental service provision rights, and simplifying program goals to defensible biophysical and/or socio-economic criteria. The authors studied three livelihood groups representing the main activities in the area, two productive (coffee and livestock) and one in the service sector (ecotourism) and no group viewed PES as a significant factor. Even in the case that the region is only a part of the entire program, these issues should be taken into consideration in a reviewing process.

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